

ROSCOE WEST HALL LOWER-LEVEL AV PROJECT

TCNJ Advertised Bid # AB250009

COVER SHEET

INVITATION TO BID

MILESTONE SCHEDULE

CONSTRUCTION BID PROPOSAL FORM

GENERAL WORK DESCRIPTION

DRAWINGS

MANDATORY DOCUMENTS

CONTRACT

GENERAL CONDITIONS

November 26, 2024



Please place the following advertisement in the Legal Section of Classified Advertising. Please ensure that the invoice for this advertisement is prepared and an affidavit forwarded to The College of New Jersey, Office of Finance and Business Services, Administrative Services Building, Room 201, P.O. Box 7718, Ewing, NJ 08628-0718.

To be published on **November 26, 2024 in the Trentonian.** Contact person regarding placement of ad is Lauren Manning (609) 771-2894.

THE COLLEGE OF NEW JERSEY ADVERTISEMENT FOR BIDS BID #AB250009

Under the provisions of the State College Contracts Law, Chapter 64 of Title 18A, The College of New Jersey will receive sealed bids for the **Roscoe West Hall Lower Level AV Project** until **2:00 P.M. on the 20th day of December, 2024** at The College's Office of Finance and Business Services, Administrative Services Building, Second Floor, Room 201, Route 31 (Pennington Road), Ewing Township, New Jersey. At 2:00 P.M. all bids will be publicly opened and read in Room 203 of the Administrative Services Building.

No bidder may submit more than one bid.

Bid Documents may be obtained on/after November 26, 2024 via our website (https://bids.tcnj.edu/home/construction-projects/).

A pre-bid conference/on-site inspection is scheduled on December 3, 2024 at 10:00 A.M. in the West Hall Lobby of Roscoe Hall, located on The College's Ewing Township, New Jersey campus on 2000 Pennington Road. While attendance is not mandatory, bidders are strongly encouraged to attend.

Bidders are required to comply with the requirements of P.L. 1975 c. 127 (N.J.S.A. 10:5-31 et seq. and N.J.A.C. 17:27 - Affirmative Action); the New Jersey Prevailing Wage Act, N.J.S.A. 34:11-56.25 et seq.; N.J.S.A. 52:25-24.2, "Statement of Ownership Disclosure"; the Public Works Contractor Registration Act (N.J.S.A. 34:11-56.48 et seq.); the New Jersey Business Registration of Public Contractors provisions (N.J.S.A. 52:32-44) and all amendments thereto.

A bid guarantee is required in the amount of 10% of the total bid. Bid guarantee shall consist of a certified check or cashier's check to the order of The College of New Jersey, or an individual or annual bid bond issued by an insurance company or surety company authorized to do business in the State of New Jersey. The successful Bidder(s) is required to provide a Performance and Payment Bond equal to 100% of the contract. A Surety Disclosure Statement and Certification form must accompany the performance bond.

The College will award the contract to the lowest responsible bidder who satisfies the qualification criteria as set forth in the contract documents.

The College of New Jersey reserves the right to reject all bids or to waive any minor informalities in the bidding in accordance with law. No bid shall be withdrawn for a period of sixty (60) days subsequent to the opening of bids without the consent of The College of New Jersey.

The College requires that its contractors/vendors agree to take all necessary and responsible steps, in accordance with N.J.S.A. 52:32-17 et seq. and N.J.A.C. 17:13-1 et seq. to ensure that SBE's have these opportunities, as an aid in meeting the commitment of its SBE Programs and to ensure that DVOBs have these opportunities per N.J.S.A. 52:32-31.1 et seq. (P.L. 2015, c. 116) in meeting the commitment of its DVOB Programs.



ROSCOE WEST HALL LOWER LEVEL AV PROJECT

MILESTONE SCHEDULE

As of November 26, 2024

Request for Proposal Released	November 26, 2024
Pre-bid Meeting (Roscoe West Hall Lobby at 10:00AM)	December 3, 2024
Cut off for questions	December 5, 2024
Addendum Issued by	December 10, 2024
Bids Received	December 20, 2024
Notice of Intent to Award issued by	January 2, 2025
Notice to Proceed issued by	January 10, 2025
Submittals & Permit	January – March, 2025
AV Installation Begins in Field	April, 2025
Substantial Completion by	May 30, 2025
Final DCA Inspections	June 2 – 6, 2025
Punch List Completion by	June 27, 2025

Note

This project consists of bi-weekly project meetings with TCNJ, the General Contractor (M&M Construction), and Architect (NORR) on Thursdays at 10:00 AM. The next scheduled meeting is December 12th. The AV vendor must include in their bid the cost to attend bi-weekly project meetings starting immediately after this contract is awarded and until the project is substantially complete.



Bid # AB250009

For: Roscoe West Hall Lower Level

AV Project

Event	Date	Time
Pre-bid Conference and Site Visit at The College of New Jersey's Administrative Services Building, Room #	12/03/2024	10:00 AM
Question Cut Off Date (Refer to Bid Section # 2 for more information.)	12/05/2024	4:00 PM
Addendum Date (Refer to Bid Section # 2 for more information.)	12/10/2024	11:00 AM
Bid Submission Due Date (Refer to Bid Section # 3 for more information.)	12/20/2024	2:00 PM

Dates are subject to change. All times contained in the Bid refer to Eastern Time. All changes will be reflected in Addendum to the Bid posted on the College's website.

Bid Issued By:

The College of New Jersey Office of Finance & Business Services Purchasing Department Administrative Services Building, Room 201 2000 Pennington Road Ewing, NJ 08628 Phone: (609) 771-2894 <u>https://bids.tcnj.edu/home/construction-projects/</u> Assigned Purchasing Contact: Lauren Manning E-mail: <u>manningl@tcnj.edu</u>

Date Issued: 11/26/2024 Fiscal Year: 2025

Required Procurement Documents & Bidder's Checklist

This bid proposal MUST be received by The College of New Jersey, Purchasing Department before or at 2:00 p.m. on Friday, December 20, 2024 at which time responses will be publicly opened and read. Any proposal arriving at the Purchasing Department after the submission due date and time will not be accepted.

The following <u>Bidder's Checklist</u> is provided as an aid to the bidder. It does not in any way relieve the bidder of its responsibility to ensure that its bid proposal is complete. It is the bidder's responsibility to ensure documents are submitted and that all requirements of the bid solicitation have been met.

Procurement Documentation & Bidder's Checklist FORMS, REGISTRATIONS, AND CERTIFICATIONS THAT MUST BE SUBMITTED BY THE BIDDER AT THE TIME OF SUBMISSION OF THE BID. FAILURE TO INCLUDE THE BELOW REOUESTED DOCUMENTATION MAY RESULT IN REJECTION OF BIDDER'S SUBMISSION. Required Vendor's Initials next to each item submitted with proposal **Bidder Information** Х Х General Agreement including Acknowledgement of Receipt of Addendum (if any issued) Х Cost Sheet Х Subcontractor Information Page Small Business, Minority and/or Female-owned Business Reporting Х Acknowledgement of Mandatory Equal Employment Opportunity Language for Х Construction Contracts (NJAC 17:27-1.1 et seq. - P.L. 1975 C.127) Completed Statement of Ownership Disclosure (N.J.S.A. 52:25-24.2) Х Completed Non-Collusion Affidavit Х Х Completed Vendor Qualification Sheet Enclosed Certified Check, Cashier's Check or Bid Bond for ten percent (10%) of the Х amount of the bid Х Copy of Electrical License (the license must be valid at the time of bid.) Copy of latest Experience Modification Rating (EMR Safety Rating). The College requires an average rating over the last 5 years of 1.25 or less. FORMS, REGISTRATIONS, AND CERTIFICATIONS THAT MUST BE SUBMITTED BY THE BIDDER PRIOR TO AWARD (EXCEPT AS OTHERWISE NOTED BELOW). Completed Certification of Non-Involvement in Prohibited Activities in Russia (P.L. Х 2022, c.3) Х Completed Disclosure of Investment Activities in Iran (N.J.S.A. 52:32-58) Completed Federal Non-Debarment Certification (N.J.S.A. 52:32-44.1) Х Copy of Public Works Contractor Registration Certificate for the bidder and disclosed Х subcontractors (the certificate must be valid at the time of bid.) Proof of Affirmative Action Compliance - Initial Project Workforce Report, AA-201 Х (must be submitted after notification of award, prior to signing of the contract) New Jersey Business Registration Certificate (N.J.S.A. 52:32-44) Х Х Taxpayer Identification Request (W-9 Form) Х Certificate of Insurance

THE COLLEGE OF NEW JERSEY Construction Bid Proposal Form

Office of Finance & Business Services Administrative Services Building, Rm. 201 2000 Pennington Road Ewing, New Jersey 08628-0718 Bid Number: AB250009 Bid Due Date: December 20, 2024

Project Name: Roscoe West Hall Lower Level AV Project

BIDDER INFORMATION

Firm Name:

Contact Person: Address: Telephone Number:

Fax Number:

Email Address: Federal I.D. Number:

SOLICITATION OF CONSTRUCTION BIDS

1. BID PROPOSALS ARE SOLICITED AS FOLLOWS:

- A. Single Bid (Lump Sum) which combines all trades.
 - 1. The total number and types of trades are set forth in the Specifications.
 - 2. Bidder enters the Bid Price on the line provided on the Cost Sheet.
 - 3.Pursuant to the requirements of N.J.S.A. 18A:64-76.1., bidder lists the names of the subcontractors on the Subcontractor Information page.

2. THE SCOPE OF WORK INCLUDES:

- **A.** The purchase, installation, and programming of the AV equipment for Roscoe Hall Lower Level. The awarded contractor will be responsible for pulling the electrical permit with the State of NJ, Division of Consumer Affairs.
- B. See Specifications and Drawings for Details (included in Bid package).
- **C.** The College may issue Addenda or Clarifications which may include additions to or deletions from the scope of work; changes to the Specifications, Drawings, and proposal form; and clarifications of requirements. Bidder is advised to review all Addenda and/or clarifications carefully, and shall note the receipt of same with their bid package.

GENERAL INSTRUCTIONS AND REQUIREMENTS

1. PRICES

- **A.** Bidder submits prices for the Base Bid and any Alternate Proposals and Unit Prices which are listed for the contract of the bid. If there is no cost associated with the Alternate or Unit Price, bidder is required to enter "0.00" or "no change".
 - 1. Prevailing wage rates apply (Mercer County).
 - 2. Bid is to remain good for sixty (60) days after the Bid Due Date.

2. QUESTIONS

- A. Direct inquiries and correspondence relating to this proposal form and questions regarding the technical specifications and requests for clarification must be submitted in writing via email to <u>manningl@tcnj.edu</u> and must be received prior to 4:00 PM on December 5, 2024.
- **B.** Should any questions be received, the notice of revisions or addenda to advertisements or bid documents relating to bids shall be published in a legal newspaper or newspapers no later than seven days, Saturdays, Sundays and holidays excepted, prior to the bid due date. The notice shall be provided to any person who has submitted a bid or who has received a bid package, in one of the following ways: in writing by certified mail or (b) by certified facsimile transmission, meaning that the sender's facsimile machine produces a receipt showing date and time of transmission and that the transmission was successful or (c) by a delivery service that provides certification of delivery to the sender.
- C. The addendum or clarification will be available on **December 10, 2024 on the College's website at** <u>https://bids.tcnj.edu/</u>. If an addendum and/or clarification is posted, it SHOULD be noted in the General Agreement section of the bidder's proposal. Failure to do so may subject Bidder to disqualification.

3. HOW TO SUBMIT THE COMPLETED CONSTRUCTION BID PROPOSAL FORM

- A. Bidder places all pages of the completed form and the requisite additional documents in an envelope, seals the envelope, and labels it with his/her firm name, address, and "Sealed Bid Enclosed for (Bid Number and Project Name)".
- B. Bidder mails or deliver by hand the sealed bid, no later than 2:00 p.m., December 20, 2024, to The College of New Jersey, Attention: Lauren Manning for (specify the Bid Number), Office of Finance & Business Services, Room 201, 2000 Pennington Road, Ewing, New Jersey 08628-0718. At 2:00 p.m., all bids will be publicly opened and read in Room 203 of the Administrative Services Building.
- **C.** Contractors are advised that the U.S. Postal Service and all express mail companies deliver to The College's Mail Room or Receiving Department, not directly to the Office of Budget & Finance. The College is not responsible for lost or misdirected bids.

4. BOND REQUIREMENTS AND SURETY STANDARDS

- A. A bid guarantee is required in the amount of 10% of the total bid. Bid guarantee shall consist of a certified check or cashier's check to the order of The College of New Jersey, or an individual or annual bid bond issued by an insurance company or surety company authorized to do business in the State of New Jersey. The successful bidder must submit a Performance and Payment Bond equal to 100% of the contract. A completed Surety Disclosure Statement and Certification must accompany the Performance and Payment Bond.
 - 1. The Performance and Payment Bond form and a sample Surety Disclosure Statement and Certification form are included at the end of this Construction Bid Proposal Form.
- **C.** All bid deposits shall be returned within three (3) days, Sunday and holidays excepted, after the awarding of the contract and the approval of the successful bidder's performance bond, if any, the bid guaranty of the remaining bidders shall be returned to them.
- **D.** Should the successful bidder fail to enter into said contract after acceptance of bid by the College, then the check or security deposited by that bidder shall, at the option of the College, be retained as liquidated damages, or if Bid Bond has been supplied, principal and surety shall be liable to the amount of the Bid Bond.

- **E.** Attorneys-in-fact who sign bid bonds or contract bonds must file with each bond a certified copy of their Power of Attorney to sign said bonds.
- **F.** Contractor shall provide a Maintenance Bond at job completion for a period of one year for 100% of the final contract price.

5. LICENSES, CERTIFICATIONS, REGISTRATIONS, QUALIFICATIONS

- **A.** The bidder or, as applicable, its subcontractors shall at the time of bid have those required licenses, certifications, registrations, qualifications and the like ("LCRQ") listed below and shall present satisfactory evidence thereof upon request of the College prior to award.
 - 1. The electrical contractor or subcontractor as applicable shall have a valid electrical license. (An electrical license is not required when the work is below 110Volt)
- **B.** The selected bidder/contractor or, as applicable, its subcontractors shall have and shall present satisfactory evidence of all other required LCRQ noted in the Specifications after execution of contract during the submittal process and prior to the start of the applicable work, unless otherwise requested by the College or a date or event specified for that LCRQ in the Specifications.

6. SUBCONTRACTORS

A. Pursuant to the State Colleges Contract Law, N.J.S.A. 18A:64-76.1, all bids submitted shall set forth the names and license numbers of all subcontractors to whom the bidder intends to subcontract the plumbing and gas fitting work; the refrigeration, the heating and ventilating systems and equipment; the electrical work, including any electrical power plants; tele-data, fire alarm, or security systems; the structural steel and ornamental iron work. The Subcontractor Information sheet is provided for this purpose.

7. CERTIFICATE OF INSURANCE

A. The bidder is required to submit proof of liability insurance in accordance with The College's contract.

8. ACCEPTANCE/REJECTION OF BIDS

- **A.** Pursuant to State College Contract Law, Contracts shall be awarded to the lowest responsible bidder whose bid, conforming to the invitation for bids, will be the most advantageous to the State college.
- **B.** Any award made to the bidder by the College, shall bind the bidder and the bidder's heirs, executors, administrators, successors or assigns.
- **C.** Award of contract shall be made to the lowest responsible bidder, whose bid, conforming to the invitation for bids, is the most advantageous to the College.
- D. The award of the contract or the rejection of the bids shall be made within sixty (60) days of the date of receiving bids, unless written extensions are requested by the College and accepted by the bidder(s). All bid securities shall be returned immediately if all bids are rejected. The successful bidder(s) to whom the award is to be made will be notified by receipt of a written "Intent to Award" from the College.
- **E.** When award of contract is made in one fiscal year with effective date in the next fiscal year, award shall be contingent upon the availability and appropriation of sufficient funds for that purpose for the year in which said contract takes effect. When a contract shall be awarded for a period in excess of one year, said contract shall be contingent upon the annual availability and appropriation of sufficient funds for that purpose for each year of the contract term.

9. VENDOR RIGHT TO PROTEST-INTENT TO AWARD

A. Bidders have the right to protest the College's proposed award of the contractor as announced in the notice of intent to award. Unless otherwise stated, a bidder's protest must be received no later than 5-business days after the date on the notice of intent to award. Bidder's protest must be in writing and delivered to the College's Purchasing Department via email. The protests much include the specific grounds for challenging the award. Within one week of receipt of the written protest, the College's Purchasing Director shall give written notification of the College's acceptance or rejection of the protest.

10. WITHDRAWAL OF BIDS

- **A.** A written request for the withdrawal of a bid, or any part thereof, will be granted if the request is received by the College prior to the specified time of the bid opening.
- **B.** Should the bidder refuse to perform the work for the price provided, they will forfeit their bid security.

11. BID COMPLIANCE

- **A.** Bidders desiring to modify TCNJ's general conditions of the construction contract must submit the proposed modifications within the question period set forth in Section 2 or such modifications will not be considered by the College.
- **B.** Any bid not prepared and submitted in accordance with the provisions described herein may be rejected by the College. Any bid received after the time and date specified will not be considered. No bidder shall withdraw a bid within sixty (60) days after the date of the bid opening. Contracts shall be awarded to the lowest responsible bidder whose bid, conforming to the invitation for bids, will be the most advantageous to the State college
- **C.** Any bidder who has defaulted on any contract with the College or any other State Agency may be considered as not responsible and their bid may be rejected. THE COLLEGE OF NEW JERSEY reserves the right to exercise this option, as the College deems proper and/or necessary in accordance with applicable law.
- **D.** Bids shall include all costs of any nature necessary to complete the project in the manner and within the time required by the contract.
- **E.** The College reserves the right to require bidders to provide a schedule of values of their lump sum bid price upon request.
- **F.** The College is exempt from all taxes including Federal Excise Tax, Transportation Taxes, State Excise, Sales Tax and local taxes. Rentals of equipment for 28 days or less is not exempt from any tax under the State sales tax act.
- **G.** Before submitting a bid, the bidder shall be familiar with the Drawings, Specifications, and other Documents that will form part of the contract and the site conditions to confirm for themselves the character and amount of work involved.
- **H.** No bidder shall be allowed to offer more than one price on each item even though he/she may feel that he/she has two or more types or styles that will meet specifications. Bidders must determine for themselves which to offer. This may be cause for automatic rejection of bid.
- I. It is understood and agreed that all prices quoted are firm and not subject to any increase during the life of the contract.
- **J.** Should any difference arise between the contracting parties as to the meaning or intent of these instructions or specifications, the College's decision shall be final and conclusive.
- **K.** Should the bidder discover discrepancies in this Request for Bids, the matter shall be at once brought to the attention of the College, and the discrepancies corrected by written agreement before submission of bid. The correction will be issued by addendum.

12. OSHA COMPLIANCE:

A. The Contractor shall guarantee that all materials, supplies and equipment to be provided under his contract shall meet all applicable requirements, Specifications and standards of the Federal Occupational Safety and Health Act (OSHA) of 1970 as amended to date of acceptance by the College, and shall also apply to Contractors Construction procedures.

13. EXAMINATION OF SITE, DRAWINGS AND SPECIFICATIONS

- **A.** Each Bidder should familiarize the site of the proposed work and fully acquaint themselves with the conditions as they exist so that they may fully understand the facilities, difficulties, and restrictions attending the execution of the work under this Contract.
- **B.** Bidders shall also thoroughly examine and be familiar with the Drawings and Specifications. The failure to receive or examine any form, instrument or document, or to visit the site and acquaint himself with conditions there existing shall in no way relieve any bidder from obligation with respect to his bid. By submitting a bid, the bidder agrees and warrants that he is familiarized with the site, the Drawings and Specifications and, that the Specifications and Drawings are adequate and the required result can be produced under the Drawings and Specifications. No claim for any extra will be allowed because of alleged impossibilities in the productions of the results specified or because of

unintentional errors or conflicts in the Drawings and Specifications. No change orders will be issued for items, materials or issues that existed on or with respect to the site prior to bidding.

14. DRAWINGS AND SPECIFICATIONS

- **A.** The project shall be performed in accordance with the requirements of the Drawings and Specifications, subject to modification as provided in General Conditions. The Drawings and Specifications are intended to complement and supplement each other.
- **B.** Any work required by either of them and not by the other shall be performed as if denoted in both. Should any work be required which is not also denoted in the Specifications or on the Drawings because of an obvious omission, but which is, nevertheless, necessary for the proper performance of the project, such work shall be performed as fully as if it were described and delineated.

15. FORM OF AGREEMENT

A. Every successful bidder shall be required to sign the standard form contract, a copy of which is attached. Any proposed language or form changes which in any way modifies the contractor's responsibilities as set forth in the Contract Documents will not be acceptable and will be deemed to constitute a bid exception.

16. MULTIPLE BIDS NOT ALLOWED:

A. No bidder is allowed to submit more than one bid from an individual, firm, partnership, corporation or association under the same or different name. This will be cause for automatic rejection of each bid.

17. SUBSTITUTIONS:

- **A.** The bidder may include in their bid substitute materials or equipment or methods in lieu of those specified in the contract documents, but they do so at their own risk. Any substitution must be equivalent in type, function and quality to the item required in the contract. The successful bidder must submit all information required within 20 days of contract award to determine if the proposed substitute is equal to the contract requirements, and any substitution must be approved by the architect and the College.
- **B.** The College may investigate/evaluate/be the sole judge of the equivalency of 'or equals' products. It shall be the Contractor's responsibility to document the equivalence claim. No substitution shall result in any increase in the contract price or times. The successful bidder in its application for the substitution must certify in writing that the substitution is equal to what is specified in the contract documents in all material respects and will not increase the time or price of the contract work.
- **C.** Should the substitution be rejected, the contractor will then be required to provide the specified product, material or method at no additional cost to the College and no change in the project schedule.
- **18. APPLICABLE LAWS:** The following list of statutes and regulations, which may be applicable in whole or in part, is provided for the benefit of the Contractor and is not meant to be all-inclusive. In the event that other laws are applicable, it shall be the responsibility and obligation of the Contractor to ascertain and comply with them.
 - A. SET ASIDE PROGRAM FOR SMALL BUSINESS ENTERPRISE (SBE): It is the policy of the entities small business enterprises ("SBE") determined State that as and defined by the State of New Jersey, Division of Revenue and Enterprise Services ("Division") in the Department of the Treasury (N.J.A.C.17:13-1.2) have the opportunity to compete for and participate in the performance of contracts and subcontract for construction and for the purchase of goods and services. The State further requires that its contractors/vendors agree to take all necessary and responsible steps, in accordance with N.J.S.A. 52:32-17 et seq. and N.J.A.C. 17:13-1 et seq. to ensure that SBE's have these opportunities, as an aid in meeting the commitment of its SBE Programs. N.J.S.A. 52:32-17 et seq. and Executive Order 71 requires that each State department make a good faith effort to award a total of 25% of the dollar value of contracts for goods and services and construction to eligible small businesses.
 - **B. SET ASIDE PROGRAM FOR DISABLED VETERAN-OWNED BUSINESS (DVOB):** In accordance with the New Jersey Set-Aside Act for Disabled Veterans' Businesses, N.J.S.A. 52:32-31.1

et seq. (P.L. 2015, c. 116), it is the policy of State entities that Disabled Veteran-Owned Businesses ("DVOBs"), as determined and defined by the State of New Jersey, Department of Treasury, Division of Revenue and Enterprise Services in N.J.A.C. 17:14-1.1 et seq., have the opportunity to compete for and participate in goods and services contracts and subcontracts for construction services. The Contractor shall agree to take all necessary and responsible steps, in accordance with the aforementioned regulations, to ensure that DVOBs have these opportunities. N.J.S.A. 52:32-31.1 et seq. (P.L. 2015, c. 116) requires that each State department make a good faith effort to award a total of 3% of the dollar value of contracts for goods and services and construction to eligible DVOBs.

- C. EXECUTIVE ORDER #34 MINORITY AND WOMEN BUSINESS ENTERPRISES: On September 15, 2006, Governor Corzine signed Executive Order 34 establishing a Division of Minority and Women Business Development. The Division is charged with administering and monitoring policies, practices, and programs to ensure that minority and women business enterprises (MWBE) are afforded an equal opportunity to participate in New Jersey's purchasing and procurement processes.
- **D. STATEMENT OF OWNERSHIP DISCLOSURE:** Pursuant to N.J.S.A. 52:25-24.2, in the event the Bidder is a corporation, partnership or limited liability company, the Bidder must disclose their ownership. Bidder completes and submits the form along with bid proposal.
- E. NON-COLLUSION AFFIDAVIT: Bidder completes and submits the form along with bid proposal.
- F. PREVAILING WAGE (N.J.S.A. 34:11-56.25 et seq.) AND PUBLIC WORKS CONTRACTOR REGISTRATION ACTS (N.J.S.A. 34:11-56.48 et seq.):
 - 1. The work described in this project is subject to the New Jersey Prevailing Wage Act, N.J.S.A. 34:11-56.25 et seq. and the Public Works Contractor Registration Act, N.J.S.A. 34:11-56.48 et seq.
 - 2. The Public Works Contractor Registration Act requires the bidder and any subcontractors listed in the bid to be registered with the New Jersey Department of Labor and Workforce Development at the time the bid is submitted. The contractor must submit registration certificates for all listed subcontractors prior to award of the contract.
 - 3. The Contractor must comply with the New Jersey Prevailing Wage Act, N.J.S.A. 34:11-56.25 through 56.47. Workers employed by the Contractor or any subcontractor or sub-subcontractor in the performance of services directly on the project must be paid prevailing wages. Additionally, pursuant to N.J.S.A. 34:11-56.27(a), a bidder in competitive bidding for public work, whose bid is the lowest and is 10% or more lower than the next lowest bid, must certify (form to be provided by TCNJ if applicable) to TCNJ that the bidder shall pay prevailing wage rates as required by the Act. Also, as required by N.J.S.A. 34:11-56.27 and 56.28, the contract cannot become effective until the College obtains from the New Jersey Department of Labor and Workforce Development a determination of the prevailing wage rates applicable to the project as of the contract award date and attaches a copy to the contract. As required by N.J.S.A. 34: 11-56.27, the Contractor or any subcontractor may be terminated if any covered worker is not paid prevailing wages on the project, and the Contractor and its surety shall be liable for any additional costs which result.
 - 4. Please refer to <u>https://www.nj.gov/labor/wageandhour/prevailing-rates/public-works/currentprevailingwage.shtml</u> for official wage rate determinations for Mercer County, NJ.

G. NEW JERSEY EQUAL PAY ACT:

- 1. On April 24, 2018, Governor Phil Murphy signed into law New Jersey's Diane B. Allen Equal Pay Act (N.J.S.A. 34:11-56.13 et seq.) The law provides in pertinent part that as of July 1, 2018, any employer entering into a contract with the State of New Jersey or an instrumentality of the State for "qualifying services" or "public works" must provide to the Department of Labor and Workforce Development upon commencement of the contract wage and demographic data for all employees who are employed in connection with the contract (for public works) and for all employees (for qualifying services). This requirement DOES NOT apply to employers who are contracting with local governments (for example: municipalities and counties). The report must contain the gender, race, ethnicity, job category, compensation, and number of hours worked by each employee.
- 2. The extent of the Department of Labor and Workforce Development's responsibilities under the Equal Pay Act is the collection of data regarding compensation, hours worked, job/occupational category, job title, gender, race, and ethnicity for State contactors and making

that data available to the Division on Civil Rights (DCR), within the Department of Law and Public Safety, and upon request to certain individuals. Complaints of unlawful discrimination under the Equal Pay Act should be directed to the DCR, as should any questions regarding the filing of such a complaint.

- 3. The Department of Labor and Workforce Development requires, by the law, the Payroll Certification for Public Works Projects form to completed by employers. This form should be used to report the employee's wage and demographic data and can be found on the LWD website (<u>https://www.nj.gov/labor/wageandhour/tools-resources/equal-pay</u>). Upon commencement of the contract, submit the form via the NJ Wage Hub (njwages.nj.gov). IMPORTANT: For purposes of law, you must also submit this form to the College, either via the NJ Wage Hub or other methods.
- H. N.J.S.A. 10:5-31 et seq. and N.J.A.C. 17:27-1 et seq., AFFIRMATIVE ACTION: The bidder is required to complete and submit a copy of Initial Project Workforce Report (AA-201) to the College and the New Jersey Department of Labor & Workforce Development Construction EEO Compliance Monitoring Unit verifying that the bidder is operating under a federally approved or sanctioned Affirmative Action program after notification of award, prior to signing of the contract. The bidder also agrees to submit a copy of the Monthly Project Workforce Report once a month thereafter for the duration of this contract to The College and the Department.

I. New Jersey Business Registration Certificate, N.J.S.A. 52:32-44:

- 1. Pursuant to -<u>N.J.S.A.</u> 52:32-44, The College of New Jersey ("Contracting Agency") is prohibited from entering into a contract with an entity unless the bidder/proposer/contractor, and each subcontractor that is required by law to be named in a bid/proposal/contract has a valid Business Registration Certificate on file with the Division of Revenue and Enterprise Services within the Department of the Treasury.
- 2. Prior to contract award or authorization, the contractor shall provide the Contracting Agency with its proof of business registration and that of any named subcontractor(s).
- 3. Subcontractors named in a bid or other proposal shall provide proof of business registration to the bidder, who in turn, shall provide it to the Contracting Agency prior to the time a contract, purchase order, or other contracting document is awarded or authorized.
- 4. During the course of contract performance:
 - (a) the contractor shall not enter into a contract with a subcontractor unless the subcontractor first provides the contractor with a valid proof of business registration.
 - (b) the contractor shall maintain and submit to the Contracting Agency a list of subcontractors and their addresses that may be updated from time to time.
 - (c) the contractor and any subcontractor providing goods or performing services under the contract, and each of their affiliates, shall collect and remit to the Director of the Division of Taxation in the Department of the Treasury, the use tax due pursuant to the Sales and Use Tax Act, (<u>N.J.S.A.</u> 54:32B-1 et seq.) on all sales of tangible personal property delivered into the State. Any questions in this regard can be directed to the Division of Taxation at (609)292-6400. Form NJ-REG can be filed online at http://www.state.nj.us/treasury/revenue/busregcert.shtml.
- 5. Before final payment is made under the contract, the contractor shall submit to the Contracting Agency a complete and accurate list of all subcontractors used and their addresses.
- 6. Pursuant to <u>N.J.S.A.</u> 54:49-4.1, a business organization that fails to provide a copy of a business registration as required, or that provides false business registration information, shall be liable for a penalty of \$25 for each day of violation, not to exceed \$50,000, for each proof of business registration not properly provided under a contract with a contracting agency.
- J. RECORD RETENTION: Pursuant to N.J.A.C. 17:44-2.2, the vendor shall maintain all documentation related to products, transactions or services under this contract for a period of five years from the date of final payment. Such records shall be made available to the New Jersey Office of the State Comptroller upon request.
- **K. ENERGY STAR ENERGY EFFICIENT PRODUCTS**: Under Executive Order #11 (Corzine), the College is required to select ENERGY STAR energy-efficient products when acquiring new energy-using products or replacing existing equipment. For products that do not have ENERGY STAR labels, vendors shall follow guidelines established by the New Jersey Clean Energy Program.

L. The following list of statutes and regulations, which may be applicable in whole or in part, is provided for the benefit of the Contractor and is not meant to be all-inclusive. In the event that other laws are applicable, it shall be the responsibility and obligation of the Contractor to ascertain and comply with them.

 Federal Statutes: Civil Rights Act of 1964 – 42 U.S.C.A. Section 1971 *et seq*. The Americans with Disabilities Act of 1990

GENERAL AGREEMENT

- 1. Having examined the plans and specifications with related documents and the site of the proposed work and being familiar with all of the conditions surrounding the construction of the proposed project including the availability of materials and labor, the undersigned hereby proposes to furnish all labor, materials, and supplies, and to construct the project in accordance with the Contract Documents, within the time set forth therein, and at the price stated. This price covers all expenses incurred in performing the work required under the Contract Documents, of which this proposal is a part.
- 2. Bidder acknowledges receipt of the following Addendums/Clarifications:

No Addenda Issued		
Addendum Number	Date	
Addendum Number	Date	
Addendum Number	Date	

- **3.** Bidder acknowledges and affirms that he/she has personal knowledge of or has obtained and reviewed a copy of the valid prevailing wage rates at the time of the bid and for the duration of the contract for all trades involved in the project for the geographical location of the project as issued by the Commissioner of the Department of Labor & Workforce Development, Trenton, NJ 08625 (609) 292-2259 or visiting the Department of Labor website at (<u>https://www.nj.gov/labor/wageandhour/prevailing-rates/public-works/currentprevailingwage.shtml</u>). All pre-determined rate increases listed at the time the contract is awarded must also be paid, beginning on the dates specified. Select Mercer for the applicable prevailing wage rates.
- **4.** Bidder agrees that its price is good and the bid shall not be withdrawn for a period of 60 calendar days after the scheduled Bid Due Date and Time.
- 5. The attached bid security is to become the Property of the Owner in the event that the Contract and bond are not executed within the time set forth, as liquidated damages for the delay and additional expense (including the difference between the price provided with said bond and the next lowest responsive bidder) to the Owner caused thereby.
- 6. Upon conclusion of the 5-business day protest period, Bidder will execute the formal contract for the stated work and compensation on the Standard Form of Agreement Between Owner and Contractor within 5 business days and deliver as required in the General Conditions: a Performance and Payment Bond; Surety Disclosure and Certification Statement; and certificates of insurance for general liability, automobile and worker's compensation. Contractor shall provide a Maintenance Bond at job completion for a period of one year for 100% of the final contract price.
- 7. Bidder acknowledges work to commence on site not later than ten (10) calendar days after receipt of a Notice to Proceed.

Respectfully submitted,

(Seal if bid is by Corporation)

(Signature of Principal)

(Printed Name of Principal)

(Title of Principal)

COST SHEET SINGLE BID (LUMP SUM): BASE BID, ALTERNATE PROPOSALS, AND UNIT PRICES

To: The College of New Jersey

for: Roscoe West Hall Lower Level AV Project

Date

A. BID:

1.**Base:** We, ______, the Undersigned, in accordance with the published advertisement inviting proposals, will furnish all labor, material, equipment and services necessary for the complete construction, as defined in the advertisement, specimen contract, specifications, addendums/clarifications/bulletins, drawings, and proposal, for the Contract amount indicated below for the **above noted project** in strict accordance with the Contract Documents and Addenda thereto for the total sum of:

PROJECT GRAND TOTAL – INCLUSIVE ONE YEAR WARRANTY (AS SPECIFIED ON THE EXCEL SUMMARY PAGE)

____ Dollars \$_____

ALL BIDDERS MUST COMPLETE THE PRICING SHEET USING THE EXCEL DOCUMENT. A COPY OF THE SHEET MUST BE SUBMITTED WITH YOUR BID. VENDOR'S SHOULD SUBMIT ONE (1) HARD COPY OF THEIR PROPOSAL AND ONE (1) DIGITAL COPY (FLASH DRIVE) OF THEIR PROPOSAL.

General Construction (Single overall Prime Contract)

(words)

2. Add /Deduct Alternate: NONE

3. Check List for Bidders: A check list has been provided in these specifications for the use in completing this proposal. Bidders are encouraged to reference said list to minimize the opportunity for errors by the bidder.

B. STATEMENT:

We, the Undersigned, acting through its authorized officers and intending to be legally bound, agree that this bid proposal shall constitute an offer by the Undersigned to enter into a Contract with the acts and things therein provided and accept this offer at any time during said period by notifying the Undersigned of the acceptance of said offer.

Dated	
Firm Name	
Phone Number	
Address	

**If a corporation, give the State of I "A corporation organized under the la If a partnership, give names of the pa "Co-partners trading and doing busin	ncorporation, using t aws of rtners, using also the ess under the firm na	the phrase: " e phrase: ame and style of	
If a Limited Liability Company, give "A owner/member doing business un If an individual using a trade name, g "An individual doing business under	the names of the ow der the firm name ar ive individual name, the firm name and st	wners/members, using also the phrase: nd style of , also using the phrase: tyle of	
Dated:			
STATE OF	SS.		
proposal are in all respects true, and t in any way in this proposal. Sworn and subscribed before me	being duly swo that no member of th	orn say that the several matters stated in the State or employee of the College are interested	is ed
this day of	20	Bidder signs above line	
uno uuy oi	20		
Print Name	and	Title	

SUBCONTRACTOR INFORMATION FOR SINGLE BID (LUMP SUM)

Pursuant to the State Colleges Contract Law, N.J.S.A. 18A:64-76.1, all bids submitted shall set forth the names and license numbers of all subcontractors to whom the bidder intends to subcontract the plumbing and gas fitting work; the refrigeration, the heating and ventilating systems and equipment; the electrical work, including any electrical power plants; tele-data, fire alarm, or security systems; the structural steel and ornamental iron work (individually, the "Trade" or collectively, the "Trades").

For each Trade listed below for which the work will be completed by a

- Subcontractor you must list for each such subcontractor the name, license number (or in lieu thereof enclose a copy of the license with this form), address, and telephone number.
- Self-performed you must list the name of the bidder (next to "Name") and license number.
- Not required if that Trade is not required per the scope of work of the project, indicate that by inserting "Not required" (next to "Name").

Failure to complete this form as required may result in your bid being disqualified.

Plumbing and Gas Fitting Work

Telephone:

Must complete information for License Holder (Self-performed or Subcontractor):

Name:	
License Number:	
Address:	

Refrigeration, Heating and Ventilating Systems and Equipment

Must complete information for License Holder (Self-performed or Subcontractor):

Name:	
License Number:	
Address:	
Telephone:	

Electrical Work, including any Electrical Power Plants, Tele-data, Fire Alarm, or Security Systems

REQUIRED FOR THIS PROJECT

Must complete information for License Holder (Self-performed or Subcontractor):

Name:	
License Number:	
Address:	
Telephone:	

Structural Steel Work and Ornamental Iron Work

Must complete information if required (Self-Performed or Subcontractor):

 Name:

 Address:

Telephone:

Bidder Name

By: _____

Signature

Printed Name of Signing Individual

Date

DEMOGRAPHIC INFORMATION

Under Executive Order 34 (Corzine), the College is responsible for soliciting demographic information from its vendors. The College is required to seek the following information from each firm under contract with the College:

- 1. Is more than fifty percent (50%) of your company minority owned? (circle one) YES NO (African-American, Hispanic, Asian, and/or Native American)
- 2. Is more than fifty percent (50%) of your company woman owned? (circle one) YES NO
- 3. What is the ethnicity of the owner of your company: (check applicable according to 51% ownership)
 - □ Asian American
 - □ Multiple Ethnicities
 - □ Non-Minority
 - □ Hispanic American
 - \Box African American
 - Caucasian American Female
 - \Box Native American
 - \Box Unspecified

The College is required to solicit the foregoing information. Your response, however, is **strictly voluntary**. Please be advised that any contracting decisions made by the College will **not** be influenced in any way by your decision to provide the above information.

Bidder Name

By:

Signature

Printed Name of Signing Individual

Date

SMALL BUSINESS, MINORITY AND/OR WOMEN, VETERAN AND DISABLED VETERAN OWNED BUSINESS REPORTING

- **1.** Contractor and sub-contractors are requested to check all of the following that apply to their company and, if applicable, submit a copy of their certificate(s):
 - **A.** My company is certified by the NJ Department of Treasury, Division of Revenue and Enterprise Services as a:
 - ____ Small Business Enterprise, SBE
 - _____ Minority-owned Business Enterprise, MBE
 - Women-owned Business Enterprise, WBE
 - _____ Veteran-owned Business, VOB
 - Disabled Veteran-owned Business, DVOB
 - **B.** My company is not certified by either NJ Department, but is:
 - _____ Small Business, SBE
 - _____ Minority-owned Business, MBE
 - _____ Women-owned Business, WBE
 - _____ Veteran-owned Business, VOB
 - Disabled Veteran-owned Business, DVOB
 - C. _____ My company is not certified as one of the categories listed above.

Bidder Name

By:

Signature

Printed Name of Signing Individual

Date



PERFORMANCE BOND & PAYMENT BOND

NEW JERSEY	BOND NO
KNOW ALL MEN BY THESE PRESENTS, that as Principal, and	we, the undersigned, a
corporation of the State of	, duly authorized to do business in the State of New
Jersey, having an office at	, are hereby held and
firmly bound unto The College of	New Jersey in the Penal Sum of DOLLARS, for payment of which
well and truly to be made, we hereby jointly and seve successors and assigns.	rally bind ourselves, our heirs, executors, administrators,
SIGNED this day of	, 20
THE CONDITION OF THE ABOVE OBLIGATION I did on the day of of New Jersey for of this bond as set forth herein;	S SUCH THAT, WHEREAS, the above named Principal , 20, enter into a written contract with The College which said contract is made a part
NOW, if the said	shall well and faithfully
do and perform the things agreed by	to be done and performed according to the
terms of the said contract; shall pay all lawful claims of other suppliers or teams. fuel, oils, implements or machin performing, or completing of said contract, we agreeing of any subcontractor, materialman, laborer, person, fir obligee herein; then this obligation shall be void, otherw expressly understood and agreed that the liability of the exceed the penal amount of this obligation as herein stat	sub-contractors, materialmen, laborers, persons, forms of inery furnished, used or consumed in the carrying forward, and assenting that this undertaking shall be for the benefit m or corporation having a just claim, as well as for the vise the same shall remain in full force and effect; it being e surety for any and all claims hereunder shall in no event red.

The said surety hereby stipulated and agrees that no modifications, omissions, or additions in or to the terms of the said contract, or in or to the plans and specifications therefore shall in any wise effect the obligation of said surety on its bond.

This bond is given in compliance with the requirements of the statutes of the State of New Jersey including N.J.S.A. 18A:64-68 and any amendments thereof.

SIGNED, SEALED AND DELIVERED IN THE PRESENCE OF

	BY:
Witness	
	BY:
Witness as to Surety	ATTORNEY-IN-FACT
Countersigned	
	NOTE: General Power of Attorney and the current
this day of, 20	financial statement of the bonding company
BY:	of the Performance Bond.

SURETY DISCLOSURE STATEMENT AND CERTIFICATION

____, surety(ies) on the attached bond, hereby certifies(y) the following:

- (1) The surety meets the applicable capital and surplus requirements of R.S. 17:17-6 or R.S. 17:17-7 as of the surety's most current annual filing with the New Jersey Department of Insurance.
- (2) The capital (where applicable) and surplus, as determined in accordance with the applicable laws of the State of New Jersey, of the surety(ies) participating in the issuance of the attached bond is (are) in the following amount(s) as of the calendar year ending December 31, _____, (insert most recent calendar year for which capital and surplus amounts are available), which amounts have been certified as indicated by certified public accountants (indicating separately for each surety that surety's capital and surplus amounts, together with the name and address of the firm of certified public accountants that shall have certified those amounts):
- (3) (a) With respect to each surety participating in the issuance of the attached bond that has received from the United States Secretary of the Treasury a certificate of authority pursuant to 31 U.S.C. 9305, the underwriting limitation established therein and the date as of which that limitation was effective is as follows (indicating for each surety that surety's underwriting limitation and the effective date thereof):

(b) With respect to each surety participating in the issuance of the attached bond that has not received such a certificate of authority from the United States Secretary of the Treasury, the underwriting limitation of that surety as established pursuant to R.S. 17:18-9 as of date on which such limitation was so established, is as follows (indicating for each such surety that surety's underwriting limitation and the date on which that limitation was established:

(4) The amount of the bond to which this statement and certification is attached is \$_____

- (5) If, by virtue of one or more contracts of reinsurance, the amount of the bond indicated under item (4) above exceeds the total underwriting limitation of all sureties on the bond as set forth in items (3) (a) or (3) (b) above, or both, then for each such contract of reinsurance:
 - (a) The name and address of each such re-insurer under that contract and the amount of that re-insurer's participation in the contract is as follows:

(b) Each surety that is party to any such contract of reinsurance certifies that each reinsurer listed under item (5) (a) satisfies the credit for reinsurance requirement established under P.L. 1993, c. 243 (C. 17:51B-1 *et seq.*) and any applicable regulations in effect as of the date on which the bond to which this statement certification is attached shall have been filed with the appropriate public agency.

CERTIFICATION

(to be completed by an authorized certifying agent for each surety on the bond)

I, _____ (name of agent), as _____ (title of agent)

for _____ (name of surety),

______(state of domicile), DO HEREBY CERTIFY that, to the best of my knowledge, the foregoing statements made by me are true, and ACKNOWLEDGE that, if any of those statements are false, this bond is VOID and I am subject to punishment.

(Signature of certifying agent)

(Printed name of certifying agent)

(Title of certifying agent)

(Date of Certification)

PROJECT MANUAL

FOR:

THE COLLEGE OF NEW JERSEY ROSCOE WEST HALL RENOVATION

PREPARED FOR

THE COLLEGE OF NEW JERSEY 2000 PENNINGTON ROAD EWING, NJ 08628-2815

August 5, 2024

100% Construction Documents

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SECTION 01 1000 – SUMMARY

PART 1 - GENERAL

1.1 WORK OF THIS PROJECT

- A. The Project consists of all work described herewith along with all drawings, specifications, addendums/bulletins/clarifications, General Terms and Conditions and all contract bid documents.
- B. The contract documents are those contained in these specifications, drawings and addendum/clarifications issued during the bidding process.

1.2 CONTRACTS

- A. The Work will be performed under **<u>one prime contract</u>**.
 - 1. General Construction Contract:
 - a. <u>The General Construction</u> Contract shall include all labor, materials, equipment and services necessary for the complete construction of all work shown on the Drawings and described in Divisions 0, 1, and 2 through 33 Specifications.
 - b. <u>Structural Steel Work</u>: shall include the fabrication, delivery and installation of all steel elements. Include all clips, shims and plates as required for a complete installation.
 - c. <u>The Heating Ventilation and Air Conditioning Work</u>: shall include all labor, material, equipment and services necessary for the complete construction of all heating, ventilating and air conditioning work and work of other ducted systems shown on the Drawings and described in Divisions 0, 1 and 23 of the Specifications and may include other divisions where noted. Include all work to five feet outside the building and close coordination with all other Contractors.
 - d. <u>The Plumbing Work</u>: shall include all labor, material, equipment and services necessary for the complete construction of all plumbing, drainage and fire protection work and work of other piped systems shown on the Drawings and described in Divisions 0, 1 and 22 of the Specifications and may include other divisions where noted. Include all work to five feet outside the building and close coordination with all other Contractors.
 - e. <u>The Electrical Work</u>: shall include all labor, material, equipment and services necessary for the complete construction of all electrical, electronic security, data and telecommunications, video, fire alarm work shown on the Drawings and described in Divisions 0, 1 and 26 of the Specifications and may include other divisions where noted. Include all Electrical site work, connection of all devices to power sources and close coordination with all other Contractors.
 - f. <u>The Elevator Work</u>: shall include all labor, material, equipment and services necessary for the complete construction of all elevator work if

shown on the Drawings and described in Divisions 0, 1, and 14 of the Specifications and

may include other divisions where noted.All contractors are responsible for their respective sections of work, which may include work in other sections or shown on drawings other than their respective format.

g. All contractors must make themselves familiar with the total project and all the project documents. No additions to Contract sums will be approved for any contract where work may be shown for that Contract on Drawings typical for other trades.

1.3 ALTERATIONS AND COORDINATION

A. The General Contractor shall coordinate the entire work of Project, including preparation of general coordination drawings through the HVAC Contractor (i.e. ductwork shop drawings and then overlays by each subcontractor), diagrams and schedules, and control of site utilization; from the beginning of activity, through the project closeout and warranty periods.

1.4 KNOWLEDGE OF CONTRACT REQUIREMENTS

- A. Each Contractor will be held to have examined the site of the Work prior to submitting his proposal and informed himself, his Subcontractors, Sub-subcontractors and material suppliers of all existing conditions affecting the execution of the work.
- B. Each Contractor will be held to have examined the Contract Documents, and Modifications thereto, as they may affect subdivisions of the Work and informed himself, his Subcontractors, Sub-subcontractors and material suppliers of all conditions thereof affecting the execution of the Work.
- C. Each Contractor will be held to be thoroughly familiar with all conditions affecting labor in the neighborhood of the Project including, but not limited to, Unions, incentive pay, procurement, living and commuting conditions and to have informed his Subcontractors and Sub-subcontractors thereof.
- D. The Specifications and Drawings shall be considered as a whole and shall not be separated during the bidding or construction period. Division of specifications into Divisions and Sections is solely for organization and is not intended to define trade responsibilities, unless specifically stated. Each Contractor shall be responsible for all work and, if he/she divides the Drawings or Specifications for use of subcontracts and material suppliers, he does so at his own risk.

1.5 CONTRACT DOCUMENTS INFORMATION

- A. The Contract Documents are prepared in accordance with available information as to existing conditions and locations. If, during construction, conditions are revealed at variance with the Contract Documents, notify the Architect immediately so that supplementary instructions may be issued.
- B. The Specifications determine the kinds and methods of installation of the various materials, the Drawings establish the quantities, dimensions and details of materials, the schedules on the Drawings, give the location, type and extent of the materials.

- C. In case of any discrepancy between the various Drawings, or between various parts of the Specifications or between Drawings and Specifications, the matter shall immediately be submitted to the Architect and for Contractual purposes, the most expensive condition shall apply.
- D. Dimensions given on the Drawings govern scale measurements and large scale drawings govern small scale drawings, except as to anything omitted unless such omission is expressly noted on the larger scale drawings.
- E. The techniques or methods of specifying to record requirements varies throughout text, and may include "prescriptive", "open generic/descriptive", "compliance with standards", "performance", "proprietary", or a combination of these. The method used for specifying one unit of work has no bearing on requirements for another unit of work.
- F. Whenever a material, article or piece of equipment is referred to in the singular number in the Contract Documents, it shall be the same as referring to it in the plural. As many such materials, articles or pieces of equipment shall be provided as are required to complete the Work.

1.6 STANDARDS

- A. Whenever a material, article, or piece of equipment is specified by reference to a governmental, trade association or similar standard, it shall comply with the requirements of the latest publication thereof and amendments thereto in effect on the bid date.
- B. Applicable standards of construction industry have same force and effect, and are made a part of Contract Documents by reference, as if copied directly into Contract Documents, or as if published copies were bound herewith.
- C. Where compliance with 2 or more industry standards or sets of requirements is specified, and overlapping of those different standards or requirements establishes different or conflicting minimums or levels of quality, most stringent requirement, which is generally recognized to be also most costly, is intended and will be enforced, unless specifically detailed language written into the Contract Documents clearly indicates that a less stringent requirement is to be fulfilled. Refer, apparently equal but different requirements, and uncertainties as to which level of quality is more stringent, to Architect for a decision before proceeding. Except for overlapping or conflicting requirements, where more than one set of requirements are specified for a particular unit of work, option is intended to be Contractor's regardless of whether specifically indicated as such.
- D. Reference standards referenced directly in Contract Documents or by governing regulations have precedence over nonreferenced standards that are recognized in industry for applicability to work.
- 1.7 DEFINITIONS (Also refer to 014200 for further references)
 - A. A substantial amount of specification language constitutes definitions for terms found in other contract documents, including drawings, which must be recognized as diagrammatic in nature and not completely descriptive of requirements indicated

thereon. Certain terms used in contract documents are defined generally in this article. Definitions and explanations of this section are not necessarily either complete or exclusive, but are general for the work to extent not stated more explicitly in another provision of contract documents.

- B. General requirements apply to entire work of Contract and, where so indicated, to other elements which are included in the project.
- C. The term "indicated" is a cross reference to details, notes or schedules on the Drawings, to other paragraphs or schedules in the Specifications, and to similar means of recording requirements in the Contract Documents. Where terms such as "shown", "noted," "scheduled," and "specified" are used in lieu of "indicated," it is for purpose of helping to locate cross reference, and no limitation of location is intended, except as specifically noted.
- D. Where the term "Owner" is used, this shall designate the: The College of New Jersey
- E. Where the term "Architect" is used this shall designate the firm of: See the Project Cover for the "ARCHITECT" information.
- F. Where the term "Construction Manager" is used this shall designate the Owner's Project Manager.
- G. Where not otherwise explained, terms such as "directed", "requested", "authorized", "selected", "approved", "required", "accepted", and "permitted" mean "directed by Architect", "requested by Architect", etc. However, no such implied meaning will be interpreted to extend Architect's responsibility into Contractor's area of construction supervision.
- H. Where used in conjunction with Architect's response to submittals, requests, applications, inquiries, reports and claims by Contractor, the meaning of term "approved" will be held to limitations of Architect's responsibilities and duties as specified in General and Supplementary Conditions. In no case will "approval" by Architect be interpreted as a release of Contractor from responsibilities to fulfill requirements of the Contract Documents.
- I. Whenever the word "equivalent" is used it shall be understood to indicate that the Architect will consider substitutions for the product and/or manufacturer named in the Specifications, provided that the proposed substitution meets or exceeds the performance of the specified item. It shall be further understood that the judgment of "equivalency" rests solely with the Architect. Equipment, products, materials, etc. will be judged by the Architect according to the criteria listed below. Criteria shall be applied according to the Architect's discretion and are not listed in order of importance.
 - 1. Ability to fit into space provided.
 - 2. Quality.
 - 3. Serviceability.
 - 4. Esthetics.
 - 5. Availability of finishes.
 - 6. Workmanship.
 - 7. Economy of operation.
 - 8. Suitability for purpose intended.
 - 9. Performance to meet design requirements

- J. The project site is the space available to Contractor for performance of the Work, either exclusively or in conjunction with others performing other work as part of the Project. The extent of project site is shown on the Drawings, and may or may not be identical with description of the land upon which project is to be built.
- K. Except as otherwise defined in greater detail, term "furnish" is used to mean supply and deliver to project site, ready for unloading, unpacking, assembly, installation, etc., as applicable in each instance.
- L. Except as otherwise defined in greater detail, term "install" is used to describe operations at project site including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning and similar operations, as applicable in each instance.
- M. Except as otherwise defined in greater detail, term "provide" means furnish and install, complete and ready for intended use, as applicable in each instance.
- N. An installer is the entity, person or firm, engaged by the Contractor or his subcontractor or sub-subcontractor for the performance of a particular unit of work at the project site, including installation, erection, application and similar required operations. It is a general requirement that such installers be expert in operations they are engaged to perform.
- O. The testing laboratory is an independent entity engaged to perform specific inspections or tests of the work, either at project site or elsewhere; and to report and interpret results of those inspections or tests.
- P. Where the words such as "The Contractor shall" and similar words are omitted, the sentence structure shall be considered to include such words since the Specifications are directional in nature, indicating work to be performed by the Contractor.
- Q. The term "Subcontractor" is used hereinafter only to delineate the work of the various trades. The term "Subcontractor" shall not be construed as a firm direction to subcontract a particular Section of the Work.
- R. "Piping" includes, in addition to pipe, all fittings, valves, hangers, and other accessories related to such piping.
- S. "Concealed" means hidden from sight as in chases, furred spaces, shafts, hung ceilings, or embedded in construction.
- T. "Exposed" means "not concealed" as defined above. Work in trenches, crawl spaces, and tunnels shall be considered "exposed" unless otherwise specifically noted.
- U. Damage: Any sort of deterioration whether due to weather, normal wear and tear, accident, or abuse, resulting in soiling, marring, breakage, corrosion, rotting, or impairment of function.
- 1.8 PARTIAL OCCUPANCY

- A. Each Contractor agrees to use and occupancy of a portion or unit of the Project before formal acceptance by the Owner under the following conditions:
 - 1. A certificate of Substantial Completion shall be prepared and executed as provided in the General Conditions. If, in the opinion of the Architect, the Contractor is chargeable with unwarranted delay in completing the Work or other Contract requirements, the signature of the Contractor will not be required. The certificate of Substantial Completion shall be accompanied by a written endorsement of the Contractor's insurance carrier and surety permitting occupancy by the Owner during the remaining period of Project work.
 - 2. Occupancy by the Owner shall not be construed by the Contractor as being an acceptance of that part of the Project to be occupied.
 - 3. Contractor will not be held responsible for any damage to the occupied part of the Project resulting from the Owner's occupancy.
 - 4. Occupancy by the Owner shall not be deemed to constitute a waiver of existing claims in behalf of the Owner or Contractor against each other.
 - 5. Use and occupancy of any portion of the building by the Owner prior to Project acceptance does not relieve the Contractor of his responsibility to maintain all insurance and bonds required of the Contractor under the Contract until the Project is completed and accepted by the Owner.
 - 6. The Contractor agrees that the Owner may place and install as much material, equipment and furnishings as is possible during construction without interfering with orderly progress of the Work and prior to use and occupancy of the various parts of the Work, and further agrees that such placing and installation shall not evidence completion of the Work or signify the Owner's acceptance of the Work or of any part thereof.

1.9 REGULATIONS AND CODES

- A. Work shall be in accordance with the latest applicable requirements, regulation and codes as set forth below.
 - 1. See Drawings for all listed Regulations and Codes that have been applied to this project.

1.10 LIMITED USE OF PREMISES

- A. General: The prime contractors shall limit their use of the premises to construction activities in areas indicated; allow for Owner occupancy and use by the public.
 - 1. Confine operations to areas within contract limits indicated. Portions of the site beyond areas in which construction operations are indicated are not to be disturbed.
 - 2. Keep driveways and entrances serving the premises clear and available to the Owner and the Public at all times. Do not use these areas for parking or storage of materials and equipment on site.
 - 3. This project will be completed in phases and thus the contractor is to make sure that all exits and entrances are accessible at all times. Coordinate the phasing in such a way that disruption to the occupants is kept to a minimum.

1.11 OWNER OCCUPANCY
- A. The Owner may wish to occupy a portion of the building prior to full completion. Contractor will cooperate to maintain construction operations in this area to a minimum to avoid conflicts with Owner usage and operations.
 - 1. Refer to the project bidding schedule included in the bid documents for additional information.

1.12 PROJECT SCHEDULE

A. A project bidding schedule is included with these bid documents, which is solely for the purpose of informing the bidders of the "overall" projected schedule and milestone dates. A "Construction" Schedule will be developed by the General Contractor upon contract award per other sections of these Specifications.

PART 2 - PRODUCTS - Not Used

PART 3 - EXECUTION - Not Used

END OF SECTION 01 1000

SECTION 01 2500 - SUBSTITUTION PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. LEED Building General Requirements: The Owner requires the Contractor to implement practices and procedures to meet the project's environmental performance goals, which include achieving the equivalent of LEED Silver Certification. Specific project goals that may impact this area of work include: use of recycled-content materials; use of locally-manufactured materials; use of low-emitting materials; and construction waste recycling The Contractor shall ensure that the requirements related to these goals, as defined in the sections below, are implemented to the fullest extent. Substitutions, or other changes to the work proposed by the Contractor or their Subcontractors, shall not be allowed if such changes compromise the stated LEED Building Performance Criteria. The Owner does not intend to apply for LEED Certification.
- C. Related Requirements:
 - 1. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

1.2 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and assemblies which deviate from the requirements of the Contract Documents and proposed by Contractor which the Contractor deems will perform the same function and have equal capabilities, service life, economy of operations, and suitability for the intended purpose.
 - 1. Substitutions for Cause: Changes proposed by Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
 - 2. Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to Contractor or Owner.
 - 3. The requirements for substitutions do not apply to specified Contractor options on products and construction methods. Revisions to Contract Documents, where requested by Owner or Architect are changes, not substitutions. Contractor's determination of and compliance with governing regulations and orders issued by governing authorities do not constitute substitutions and do not constitute a basis for change orders. Otherwise, Contractor's requests for changes in products, materials, and methods of construction required by Contract Documents are considered requests for substitutions, and are subject to requirements hereto.

- 4. Any and all contractor substitutions that require additional work by other trades not specifically called for in the documents shall be paid for by the contractor requesting the substitution if any other trade increase is required.
 - 5. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.

1.3 ACTION SUBMITTALS

- A. Substitution Requests: Submit requests for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Substitution Requests: All requests for substitutions shall be submitted within 20 days of contract award, together with all supporting information,
 - 2. Substitution Request Form: Use the electronic version of form included as an attachment to this Section; submit in portable document format (.pdf).
 - 3. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
 - a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
 - b. Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors, that will be necessary to accommodate proposed substitution.
 - c. Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
 - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures in .pdf format.
 - e. Samples, where applicable or requested.
 - f. Certificates and qualification data, where applicable or requested.
 - g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
 - h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
 - i. Research reports evidencing compliance with building code in effect for Project, from ICC-ES
 - j. Detailed comparison of Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.

- k. Cost information, including a proposal of change, if any, in the Contract Sum.
- I. Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
- m. Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
- 4. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within seven days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
 - a. Forms of Acceptance: Change Order.

1.4 QUALITY ASSURANCE

A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

1.5 PROCEDURES

- A. Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.
- B. Should a substitution be rejected by the architect and owner, the contractor is to then provide the specified product, material or method as noted in the contract documents, at no additional cost to the Owner and no change in the project schedule.
- C. Substitutions may be permitted by the Architect, if, in his opinion, the requirements of the proposed substitution comply with the requirements specified for the material, article or piece of equipment.

PART 2 - PRODUCTS

2.1 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than 30 days prior to time required for preparation and review of related submittals.
 - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

- a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
- b. Requested substitution does not require revisions to the Contract Documents.
- c. Requested substitution provides sustainable design characteristics that specified product provided for achieving LEED prerequisites and requirements.
- d. Substitution request is fully documented and properly submitted.
- e. Requested substitution will not adversely affect Contractor's construction schedule.
- f. Requested substitution has received necessary approvals of authorities having jurisdiction.
- g. Requested substitution is compatible with other portions of the Work.
- h. Requested substitution has been coordinated with other portions of the Work.
- i. Requested substitution provides specified or superior warranty.
- j. Requested substitution can be used without adversely affecting Owner's insurance coverage on completed Work.
- k. Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule; or if requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- I. Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- m. Maintenance service and source of replacement parts, as applicable, is available similar to the specified product.
- n. Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- o. Proposed substitution does not affect dimensions and functional clearances.
- p. Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.
- B. Substitutions for Convenience: Architect will consider requests for substitution if received within 20 days after the Notice to Proceed. Requests received after that time may be considered or rejected at discretion of Architect.
 - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:
 - a. Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.

- b. Requested substitution does not require revisions to the Contract Documents or, if revisions are required, the Contractor acknowledges that the cost of the Architect's redesign fee will be deducted from the Contract Price.
- c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
- d. Requested substitution provides sustainable design characteristics that specified product provided for achieving LEED prerequisites and requirements.
- e. Substitution request is fully documented and properly submitted.
- f. Requested substitution will not adversely affect Contractor's construction schedule.
- g. Requested substitution has received necessary approvals of authorities having jurisdiction.
- h. Requested substitution is compatible with other portions of the Work.
- i. Requested substitution has been coordinated with other portions of the Work.
- j. Requested substitution provides specified or superior warranty.
- k. Proposed substitution will have no adverse effect on other trades and will not affect or delay progress schedule; or if requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
- I. Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- m. Maintenance service and source of replacement parts, as applicable, is available similar to the specified product.
- n. Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- o. Proposed substitution does not affect dimensions and functional clearances.
- p. Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 2500

ATTACHMENT: SUBSTITUTION REQUEST FORM

SECTION 01 2500A - SUBSTITUTION REQUEST FORM

(After the Bidding Phase)

Project: Project Name The College of New Jersey Project # Recipient	Substitution Request Number: From: Date: A/E Project Number: Contract For:
Specification Title:	Description:
Section: Page:	Article/Paragraph:
Proposed Substitution:	
Manufacturer: _ Address:	Phone:
Trade Name:	Model No.:
Installer: Address:	Phone:
History: New product 2-5 years	ars old 5-10 yrs old More than 10 years old
Differences between proposed substitution and	specified product:
⊠Point-by-point comparative data attached - <u>F</u>	REQUIRED BY A/E
Reason for not providing specified item:	
Similar Installations: Include List of Projects wir and phone number of Architect; and date instal	th name, address and phone number of Owner; name, address led
Proposed substitution affects other parts of Wo	rk: 🗌 No 👘 Yes; explain

The Undersigned certifies:

- Requested substitution offers Owner a substantial advantage in cost, time, energy conservation, or other considerations, after deducting additional responsibilities Owner must assume. Owner's additional responsibilities may include compensation to Architect for redesign and evaluation services, increased cost of other construction by Owner, and similar considerations.
- Requested substitution does not require revisions to the Contract Documents or, if revisions are required, the

Contractor acknowledges that the cost of the Architect's redesign fee will be deducted from the Contract Price.

- Requested substitution is consistent with the Contract Documents and will produce indicated results.
- Substitution request is fully documented and properly submitted.
- · Requested substitution will not adversely affect Contractor's construction schedule.
- Requested substitution has received necessary approvals of authorities having jurisdiction.
- · Requested substitution is compatible with other portions of the Work.
- Requested substitution has been coordinated with other portions of the Work.
- · Requested substitution provides specified or superior warranty.
- Proposed substitution will have no adverse effect on other trades and will not affect or delay
 progress schedule; or if requested substitution involves more than one contractor, requested
 substitution has been coordinated with other portions of the Work, is uniform and consistent, is
 compatible with other products, and is acceptable to all contractors involved.
- Proposed substitution has been fully investigated and determined to be equal or superior in all respects to specified product.
- Maintenance service and source of replacement parts, as applicable, is available similar to the specified product.
- Cost data as stated above is complete. Claims for additional costs related to accepted substitution which may subsequently become apparent are to be waived.
- · Proposed substitution does not affect dimensions and functional clearances.
- Coordination, installation, and changes in the Work as necessary for accepted substitution will be complete in all respects.

Submitted	Signed by:
by: Firm:	
Address:	
Telephone :	
Attachmen ts:	

A/E's REVIEW AND ACTION

SECTION 01 2900 – PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 SCHEDULE OF VALUES

- A. The Contractor shall prepare a schedule of values in coordination with the preparation of progress schedule. The percent complete on the schedule of values shall match the percent complete on the monthly updated project schedule. Correlate line items with other administrative schedules and forms required for the work, including progress schedule, payment request form, listing of subcontractors, schedule of allowances if any, schedule of alternates if any, listing of products and principal suppliers and fabricators, and schedule of submittals. Break down principal subcontract amounts into multiple line items for each entity of work. Round off to nearest whole dollar, but with total equal to Contract Sum. Submit 4 copies of schedule of values to the Project Manager and Architect for review and approval.
 - 1. Upon Owner/Architect approval, Owner will return the Schedule of Values to the contractor for the contractor to submit to the bonding company for their acceptance. Payments will not be made to the contractor until the bonding company has provided a written acceptance of the schedule of values to the owner.
- B. The schedule of values shall be tabulated into subcontracts and trades with the Quantity, Labor, Material, and Total Cost indicated. The Schedule of Values shall include such items as bonds, insurance, allowances and alternates, punch list/close out documents and shall enclose copies of invoices and/or cancelled checks from bonding and insurance agents.
- C. Schedule of values shall be submitted on AIA Form G703 or similar form approved by the Architect and Owner.
- D. Contractor's monthly application for payment shall be in the same schedule form, reflecting the same items from above. Unit costs shall be realistic for their part of the Work.

1.2 CHANGES IN THE WORK

- A. When a change in the Work includes a category or categories of Work both added to and deducted from the Contract, the total quantities of added Work and of deleted Work shall be determined separately for each category and the appropriate unit price or net cost of the Work shall be applied to the difference between the two total quantities.
- B. Unit prices shall be inclusive of all costs and shall be applied to units of measure as defined in the Specifications for each category of Work.
- C. For all extra Work performed by Contractor, the gross cost to the Owner shall include the net cost of the Work to the Contractor plus an allowance for overhead and profit not to exceed 15% of the net cost.

- D. For all extra Work performed by a Subcontractor, the gross cost to the Owner shall include the net cost of the Work to the Subcontractor plus an allowance ("mark-up") for overhead and profit not to exceed 15% of the net cost, plus the Contractor's overhead and profit (mark-up) not to exceed 5% of the Subcontractor's cost. All "mark-up" includes bond and insurance costs.
- E. Net cost of extra Work shall be the actual or pro-rated cost of:
 - 1. Labor, including foreman, at the prevailing rate of wages, contributions and taxes.
 - 2. Materials entering permanently into the Work, including delivery to the site.
 - 3. The ownership or rental cost of construction equipment and expendable tools, prorated for the time necessary for the Work.
 - 4. Power and consumable supplies for the operation of power equipment, pro-rated for the time necessary for the Work.
- F. Gross costs shall be net costs plus the allowances (mark-up) described above, such markup allowances being inclusive of all costs associated with superintendence, supervision, engineering, overhead, profit, bond/insurance, administrative and site office expenses and all other general expenses.

1.3 APPLICATIONS FOR PAYMENT

- A. Except as otherwise indicated, sequence of progress payments for the Contractor shall be regular, and each shall be consistent with previous applications and payments. It is recognized that certain applications involve extra requirements, including initial applications, applications at times of substantial completion, and final payment applications.
- B. Payment Application Forms: Use AIA Document G702 and G703 Continuation Sheets; available from Publications Distribution Div., The American Institute of Architects, 1735 New York Ave., N.W., Washington, D.C. 20006 (also available at most local AIA chapter offices and on the internet) or approved equal.
- C. Except as otherwise indicated, complete every entry provided on the form, including notarization and execution by authorized persons. Incomplete applications will be returned by Architect and Owner without action. Entries shall match current data of schedule of values, progress schedules and reports. Listing shall include amounts of fully executed change orders (and issued purchase orders) issued prior to first day of the period of construction covered by application. Contractor shall furnish to the Owner certified payroll reports for each payroll period, indicating name craft, social security number and actual hourly rate of wages paid to each workman employed on the project. A certified payroll record is defined as "a payroll record which is attested to by the employer, or corporate officer of such company, or an authorized agent of the employer."
- D. Submit one "pencil" copy of each proposed payment application to the Architect and Owner in the field on or before the 25th of each of month.

- E. Submit 4 executed final copies of each payment application to the Architects office on or before the 30th of each month. Transmit with a transmittal form listing attachments, and recording appropriate information related to application.
- F. Breakdown may include a line item for General Conditions. General Conditions shall include the cost of general supervision, trailers, temporary utilities and other general expenses directly related to the project and not considered overhead. The general conditions item shall be billed on monthly progress payments on a percentage of work completed.

1.4 INITIAL PAYMENT APPLICATION

- A. The principal administrative actions and submittals which shall precede or coincide with submittal of the Contractor's first payment application can be summarized as follows, but not necessarily by way of limitation.
 - 1. Listing of subcontractors and principal suppliers and fabricators.
 - 2. Schedule of values.
 - 3. Schedule of principal products.
 - 4. Schedule of submittals (preliminary if not final).
 - 5. Copies of acquired building permits and similar authorizations and licenses from governing authorities for current performance of the work.
 - 6. Data needed by Owner to secure related insurance coverages.
 - 7. Performance and Payment Bond.
 - 8. Insurance Certificates.
 - 9. Bonding Company Acceptance of the Schedule of Values

1.5 PROGRESS PAYMENTS

- A. Based upon application for payments submitted to the Architect and the Owner, by the Contractor, on or about the 25th day of each month for the period ending the last day of the previous second month, and Certificate of Payment issued by the Architect and the Owner, the Owner will make progress payments on account of the Contract Sum to the Contractor as follows:
 - 1. On or after the 25th day of each month, the Contractor shall submit to the Architect and Owner a "pencil copy" indicating the previous payment and the proposed amounts for each line item for the current period. After review and approval or changes, the Contractor shall prepare the final billing for presentation to the Architect and Owner.
 - 2. Withholding of Payments:
 - a. Whenever any contract, the total price of which exceeds \$100,000, entered into by a State college, for the construction, reconstruction, alteration or repair

of any building, structure, facility or other improvement to real property, requires the withholding of payment of a percentage of the amount of the contract, the contractor may agree to the withholding of payments in the manner prescribed in the contract, or may deposit with the State college registered book bonds, entry municipal bonds, State bonds or other appropriate bonds of the State of New Jersey, or negotiable bearer bonds or notes of any political subdivision of the State, the value of which is equal to the amount necessary to satisfy the amount that otherwise would be withheld pursuant to the terms of the contract. The nature and amount of the bonds or notes to be deposited shall be subject to approval by the State college. For purposes of this section, "value" shall mean par value or current market value, whichever is lower.

- b. If the contractor agrees to the withholding of payments, the amount withheld shall be deposited, with a banking institution or savings and loan association insured by an agency of the Federal government, in an account bearing interest at the rate currently paid by such institutions or associations on time or savings deposits. The amount withheld, or the bonds or notes deposited, and any interest accruing on such bonds or notes, shall be returned to the contractor upon fulfillment of the terms of the contract relating to such withholding. Any interest accruing on cash payments withheld shall be credited to the State college.
- 3. Any contract, the total price of which exceeds \$100,000, entered into by a State college involving the construction, reconstruction, alteration, repair or maintenance of any building, structure, facility or other improvement to real property, shall provide for partial payments to be made at least once each month as the work progresses, unless the contractor shall agree to deposit bonds with the State college pursuant to Paragraph 2 above.
- 4. With respect to any contract entered into by a State college for which the contractor shall agree to the withholding of payments, 2% of the amount due on each partial payment shall be withheld by the State college pending completion of the contract.
- 5. Upon acceptance of the work performed pursuant to the contract for which the contractor has agreed to the withholding of payments, all amounts being withheld by the State college shall be released and paid in full to the contractor within 45 days of the final acceptance date agreed upon by the contractor and the State college, without further withholding of any amounts for any purpose whatsoever, provided that the contract has been completed as indicated. If the State college requires maintenance security after acceptance of the work performed pursuant to the contract, such security shall be obtained in the form of a maintenance bond. The maintenance bond shall be no longer than two years and shall be no more than 100% of the project costs.
- 6. Upon substantial completion, the retainage shall, upon the Architect/Owner's approval, remain at 2% of the value of work completed and the Owner will assign a value to the incomplete work which shall be added to the 2% retainage. Final release of retained monies will occur only upon the total completion of all punch list and closeout documentation to the satisfaction of the Architect and Owner.

- 7. For each day's delay in the Contractor's submission of an application for payment acceptable to the Architect and Owner, the Owner may delay one day in making his progress payment.
- 8. Owner shall make payments within 45 days of receipt of said accepted pay requisition.

1.6 APPLICATION AT TIME OF SUBSTANTIAL COMPLETION

- A. Following issuance of certificate of substantial completion on each Contractor's work, and also in part as applicable to prior certificates on portions of completed work as designated, a "special" payment application may be prepared and submitted by Contractor. The principal administrative actions and submittals which shall precede or coincide with such special applications can be summarized as follows, but not necessarily by way of limitation:
 - 1. Occupancy permits and similar approvals or certifications by governing authorities and franchised services, assuring Owner's full access and use of completed work.
 - 2. Warranties, guarantees, maintenance agreements and similar provisions of Contract Documents.
 - 3. Test/adjust/balance records, maintenance instructions, meter readings, start up performance reports, and similar change over information germane to Owner's occupancy, use, operation and maintenance of completed work.
 - 4. Final cleaning of the work.
 - 5. Advice to Owner on coordination of shifting insurance coverages, including proof of extended coverage as required.
 - 6. Listing of Contractor's incomplete work, recognized as exceptions to certificate of substantial completion.

1.7 FINAL PAYMENT APPLICATION

- A. The administrative actions and submittals which shall precede or coincide with submittal of the Contractor's final payment application can be summarized as follows, but not necessarily by way of limitation.
 - 1. Completion of project closeout requirements.
 - 2. Completion of items specified for completion beyond time of substantial completion, regardless of whether special payment application was previously made.
 - 3. Assurance, satisfactory to Owner, that unsettled claims will be settled and that work not actually completed and accepted will be completed without undue delay.
 - 4. Transmittal of required project construction records to Owner via the Architect.

- 5. Proof, satisfactory to Owner, that taxes, fees and similar obligations of Contractor have been paid.
- 6. Removal of temporary facilities, services, surplus materials, rubbish and similar elements.
- 7. Notarized consent of surety for final payment.
- 8. Complete all Owner's required forms as provided by the Owner's Representative.

1.8 WAIVER OF LIENS

- A. Each Contractor, for himself, and for all Subcontractors and material men, agrees that no mechanic's lien or other claim shall be filed or maintained by the Contractor or by any Subcontractor, materialmen, laborer or any other person whatsoever for, or on account of any work performed or materials furnished under this Contract.
- B. In every subcontract entered into by each Contractor after execution of this Contract or in connection herewith, the Contractor shall incorporate a provision, similar to the foregoing paragraph, to the effect that neither the Subcontractor nor any party acting through or under him shall file or maintain any mechanic's lien or other claim against the Owner or Architect in connection with the Work.

END OF SECTION 01 2900

SECTION 01 3100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 SPECIAL REQUIREMENTS

- A. <u>Schedule</u>: General Contractor shall provide a master schedule showing sequencing of work utilizing the CPM method. The General Contractor shall supply a schedule with all subcontractor activities, relationships, and durations, utilizing the CPM method via SureTrak/Primavera or Microsoft Scheduling program to the Owner on a working version CDROM and also through the project management website, and coordinate their schedule with the Owner.
 - 1. The General Contractor is required to update at the end of each month the CPM Schedule based on the percentage completed for each activity on the approved schedule (in concert with the submission of the percentage completed in the monthly proposed schedule of values).
 - 2. The contractor will not be paid for that month's work without providing the Owner with an updated schedule each month.
- B. <u>Coordination Drawings</u>: Refer to Section 01 3115 for requirements for coordination drawings.
- C. Each Contractor shall take all necessary precautions to ensure the safety of all structural elements during all phases of all work. No materials, cranes, trucks or any other construction loads shall be placed on any part of the structure until the Contractor has determined the adequacy of that structure to carry the intended load without damage or overstress.
- D. Entrance into, or other use of the building will not be permitted except as may be necessary for the execution of the Work, and shall be subject to the restrictions and instructions of the Owner.
- E. Routes of ingress and egress to areas where work is being performed shall be subject to the restrictions and instructions of the Owner.
- F. Materials shall be moved through the Building using rubber tired vehicles which shall be properly controlled at all times to avoid damage to existing wall, floor or ceiling surfaces.
- G. Water damage cannot be tolerated and it is incumbent upon Contractors to take any steps necessary to keep the existing premises dry at all times.
- H. Any damage to adjacent buildings or the new construction from heavy equipment, striking the Building or any other damage to any part of the premises shall be repaired at the expense of the Contractors.
- I. All welding and cutting shall be performed by qualified and certified welders. Certificates shall be on file with the Contractor prior to commencement of any welding.

J. No work shall start before 8:00am unless agreed to in advance with the Owner.

1.2 INFORMATIONAL SUBMITTALS

- A. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:
 - 1. Name, address, and telephone number of entity performing subcontract or supplying products.
 - 2. Number and title of related Specification Section(s) covered by subcontract.
 - 3. Drawing number and detail references, as appropriate, covered by subcontract.
- B. Key Personnel Names: Submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home, office, and cellular telephone numbers and e-mail addresses. Provide names, addresses, and telephone numbers of individuals assigned as alternates in the absence of individuals assigned to Project.
 - 1. Post copies of list in project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.3 REQUESTS FOR INFORMATION (RFIs)

- A. Requests for Information (RFI's) are requests for clarifications or questions regarding the contract drawings and specifications, not contract terms, scheduling items, or general correspondence, nor, are they to be as a means to describe or request approval of alternate construction means, methods or concepts or substitution for materials, systems means and methods.
 - 1. Carefully study and compare the Contract Documents, field conditions, other Ownerprovided information, Contractor-prepared coordination drawings, and prior Project correspondence and documentation prior to submitting an Request for Information.
- B. Immediately on discovery of the need for additional information or interpretation of the Contract Documents, Contractor shall prepare and submit an RFI in the form specified.
 - 1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
 - 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- C. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
 - 1. Project name.
 - 2. Project number.
 - 3. Date.
 - 4. Name of Contractor.

- 5. Name of Architect
- 6. RFI number, numbered sequentially.
- 7. RFI subject.
- 8. Specification Section number and title and related paragraphs, as appropriate.
- 9. Drawing number and detail references, as appropriate.
- 10. Field dimensions and conditions, as appropriate.
- 11. Contractor's suggested resolution. If Contractor's suggested resolution impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
- 12. Contractor's signature.
- 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.
 - a. Include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments on attached sketches.
- D. RFI Forms: Architect will furnish electronic version of form bound in Project Manual.
 - 1. Attachments shall be electronic files in Adobe Acrobat PDF format.
- E. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow five working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
 - 1. Based upon the amount of RFI's received and their level of content, the Architect will establish the level of importance of each RFI and allow sufficient time in the Architect's professional judgment to permit adequate review.
 - 2. The following Contractor-generated RFIs will be returned without action:
 - a. Requests for approval of submittals.
 - b. Requests for approval of substitutions.
 - c. Requests for approval of Contractor's means and methods.
 - d. Requests for coordination information already indicated in the Contract Documents.
 - e. Requests for adjustments in the Contract Time or the Contract Sum.
 - f. Requests for interpretation of Architect's actions on submittals.
 - g. Incomplete RFIs or inaccurately prepared RFIs.
 - 3. Architect's action may include a request for additional information, in which case Architect's time for response will date from time of receipt of additional information.
 - 4. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit a change proposal according to the General Conditions of the Contract
 - a. If the Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect and Owner in writing within 15 calendar days of receipt of the RFI response, otherwise it will be assumed there is no change in the Contract Time or Contract Sum..
- F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log weekly; include the following: .

- 1. Project name.
- 2. Name and address of Contractor.
- 3. Name and address of Architect.
- 4. RFI number including RFIs that were returned without action or withdrawn.
- 5. RFI description.
- 6. Date the RFI was submitted.
- 7. Date Architect's response was received.
- G. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

1.4 PROJECT INFORMATION MANAGEMENT (PIM) SITE

- A. It is the intent to use the Architect's Project Information Management (PIM) software transmission server software for purposes of hosting and managing project communication and documentation until Final Completion. Project Information Management (PIM) software site includes the following functions:
 - 1. Project directory.
 - 2. Project correspondence.
 - 3. Meeting minutes.
 - 4. Contract modifications forms and logs.
 - 5. RFI forms and logs.
 - 6. Task and issue management.
 - 7. Photo documentation.
 - 8. Schedule and calendar management.
 - 9. Submittals forms and logs.
 - 10. Payment application forms.
 - 11. Drawing and specification document hosting, viewing, and updating.
 - 12. Online document collaboration.
 - 13. Reminder and tracking functions.
 - 14. Archiving functions.
- B. Architect will provide Project Information Management (PIM) software user licenses for use of the Owner, Contractor, Architect, and Architect's consultants.
- C. The Architect may utilize a system similar to Newforma Project Center Project Information Management (PIM) software to track submittals and RFI's; Newforma recommends:
 - 1. Computer
 - 2. Internet Connection: High speed connection recommended.
 - 3. Internet Explorer 8 or newer.
- D. Post electronic submittals as PDF electronic files directly to Architect's Newforma Project Center server, specifically established for Project.

PART 2 - PRODUCTS- (Not Used)

PART 3 - EXECUTION

3.1 GENERAL

- A. Contractors shall perform the work on or about the premises in a careful manner with full consideration to fire protection as required by the National Fire Protection Association Standards, National Board of Fire Underwriters and State and Local Departments having jurisdiction. Fire resistant materials shall be used for temporary enclosures.
- B. Chemical extinguishers approved by the Owner shall be provided by the General Contractor during the progress of the work where and as required by the Owner, the Local Fire Marshal and the National Board of Fire Underwriters.
- C. The General Contractor shall maintain an active program of fire prevention to keep workmen fire conscious during the entire life of the Contract. Designate one member of the organization to execute and coordinate fire control measures of his own organization and that of all subcontractors under his jurisdiction.
- D. All sub-contractors shall cooperate with the General Contractor in carrying out the above program.
- E. Storage of flammable materials will not be permitted in the Building unless written permission is obtained from the Owner. Storage of all such materials shall be the Contractors' responsibility.
- F. On-site open burning of rubbish, garbage, trade waste, leaves or plant life is prohibited.
- G. Safety Program: The General Contractor shall institute a safety program in accordance with OSHA and any local, state, or federal guidelines. The contractor shall name a safety officer to monitor this program and shall submit a safety report at job meetings.
- H. Stockpiling: Stockpiling of materials on site will be allowed (but limited due to the limited space on this site). Such materials shall not impair or impede the functioning of the facility. Materials stored on site shall be secured to prevent loss from theft, damage, vandalism or fire. By stockpiling materials on site, the contractor assumes full responsibility for said materials, and shall protect them to the fullest extent possible. Specific locations for stockpiling materials shall be coordinated with the Architect and Owner.
- I. Safety Barriers: The General Contractor shall erect safety barriers to deter and prohibit unauthorized access to the construction site; such barriers may take the form of fences and shall be clearly marked with signage prohibiting unauthorized access. The General Contractor shall be responsible for safety barriers within the building. The contractor shall be liable for damages to persons or property due to the construction process if adequate safety measures are not undertaken. The Owner and Architect shall review safety precautions for their adequacy but shall not be held liable for Contractors failure to maintain or provide adequate protection.
- J. Sequencing: The General Contractor will work with the Sub-Contractors to sequence the work during the submission of monthly project schedules. Contractors shall endeavor to coordinate their work efforts with the Owner's requirements. Interruptions of utility services

shall be coordinated with the Architect and Owner, but in no instance shall last longer than 2 hours.

3.2 PROGRESS MEETINGS

- A. Progress Meetings shall be held bi-weekly at the job site at a regular time and day mutually agreed upon. The frequency may be changed by the Architect or Owner to reflect current conditions. The Contractors, those of his/their subcontractors concerned with current progress or with scheduling of future progress, the Architect and the Owner shall each be represented at these job meetings by persons familiar with the details of the work and authorized to conclude matters relative to work progress, establishment of progress schedules, etc., as may be necessary to expedite completion of the work.
- B. The Contractors and his/their subcontractors attending these meetings shall present complete and definite reports as to the status of their respective work, conditions of product and equipment manufacturer, labor availability, productivity and cooperation, shipping data, time of completion, sequence of the work, safety program, and any other information bearing upon the execution of the Contract or subcontract.
- C. The Owner will chair the meetings and take meeting minutes

3.3 OTHER MEETINGS

- A. Preconstruction Conference: Schedule and conduct a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than 10 days after execution of the Agreement.
 - 1. Conduct the conference to review responsibilities and personnel assignments.
 - 2. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 3. Agenda: Discuss items of significance that could affect progress; follow the Owner's standard agenda.
 - 4. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- B. LEED Coordination Conference: Owner will schedule and conduct a LEED coordination conference before starting construction, at a time convenient to Owner, Architect, and Contractor.
 - 1. Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Architect, and their consultants; Contractor and its superintendent and LEED coordinator; major subcontractors; suppliers; and other concerned parties shall attend the conference. Participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 2. Agenda: Discuss items of significance including the following:
 - a. LEED Project Checklist.
 - b. General requirements for LEED-related procurement and documentation.

- c. Project closeout requirements.
- d. Role of LEED coordinator.
- e. Construction waste management.
- f. Construction operations and LEED requirements and restrictions.
- 3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
 - 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect and Owner's Commissioning Authority of scheduled meeting dates.
 - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. Contract Documents.
 - b. Options.
 - c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. LEED requirements
 - i. Review of mockups.
 - j. Possible conflicts.
 - k. Compatibility requirements.
 - I. Time schedules.
 - m. Weather limitations.
 - n. Manufacturer's written instructions.
 - o. Warranty requirements.
 - p. Compatibility of materials.
 - q. Acceptability of substrates.
 - r. Temporary facilities and controls.
 - s. Space and access limitations.
 - t. Regulations of authorities having jurisdiction.
 - u. Testing and inspecting requirements.
 - v. Installation procedures.
 - w. Coordination with other work.
 - x. Required performance results.
 - y. Protection of adjacent work.
 - z. Protection of construction and personnel.
 - 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 - 4. Reporting: Distribute minutes of the meeting to each party present and to other parties requiring information.

- 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Project Closeout Conference: Schedule and conduct a project closeout conference, at a time convenient to Owner and Architect, but no later than 90 days prior to the scheduled date of Substantial Completion.
 - 1. Conduct the conference to review requirements and responsibilities related to Project closeout.
 - Attendees: Authorized representatives of Owner, Owner's Commissioning Authority, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the meeting. Participants at the meeting shall be familiar with Project and authorized to conclude matters relating to the Work.
 - 3. Agenda: Discuss items of significance that could affect or delay Project closeout, including the following:
 - a. Preparation of record documents.
 - b. Procedures required prior to inspection for Substantial Completion and for final inspection for acceptance.
 - c. Submittal of written warranties.
 - d. Requirements for completing LEED documentation.
 - e. Requirements for preparing operations and maintenance data.
 - f. Requirements for delivery of material samples, attic stock, and spare parts.
 - g. Requirements for demonstration and training.
 - h. Preparation of Contractor's punch list.
 - i. Procedures for processing Applications for Payment at Substantial Completion and for final payment.
 - j. Submittal procedures.
 - k. Coordination of separate contracts.
 - I. Owner's partial occupancy requirements.
 - m. Installation of Owner's furniture, fixtures, and equipment.
 - n. Responsibility for removing temporary facilities and controls.
 - 4. Minutes: Entity conducting meeting will record and distribute meeting minutes.

3.4 MONTHLY REPORTS

- A. The Contractor is to provide the Owner a brief monthly status report on the last working day of each month dividing the status of the project into the following categories (report must be complete in all respects, piece meal submissions will not be accepted):
 - 1. Project overview
 - 2. Financial status
 - 3. Updated project schedule
 - 4. Change order request log
 - 5. Submittal log
 - 6. RFI log
 - 7. Owner/Architect issues that need immediate resolution
 - 8. Order/delivery issues

END OF SECTION 01 3100

ATTACHMENT:

REQUEST FOR INFORMATION FORM (RFI) Form attached next page.

REQUEST FOR INFORMATION (RFI)						
Contractor Address Phone: Fax		Architect: Address Phone:				
Project Name & No.: 1013016.01		Project Location				
RFI Number: RFI Subject:		Date of Request:		Requested Date of Response:		
I have carefully studied and compared the Contract Documents, field conditions, other Owner- provided information, Contractor-prepared coordination drawings, and prior Project Check correspondence and documentation prior to submitting this Request for Information.						
Sketches of Cor (Attach)	Sketches of ConditionSpec Section:(Attach)Page:Paragraph Ref.:			Drawing No. / Detail No.: Detail Ref.:		
Question or I	nformation Ne	eeded				
Contractor's	Proposed Sol	lution				
Submitted By	/:					
Architects Re	sponse:					
Response By	/:		Date of F	Response :		
 Refer to Section 01 3100 "Project Management and Coordination" for RFI procedures. Responses from the Architect do not change any requirements of the Contract Documents. The information provided in this RFI is for clarification purposes only. It shall not be interpreted as a change order, nor an extension of time. Failure to Notify the Architect within 15 days of receipt of the response to this RFI shall indicate that there is no cost or additional time associated with the response. 						

SECTION 01 3115 - COORDINATION DRAWINGS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes preparation of coordination drawings for architectural, structural, mechanical, plumbing, fire protection, fire alarm, lighting, information technology, security, and electrical Work.
- B. Related Sections include the following:
 - 1. Division 01 Section "Project Management and Coordination" for administrative provisions for coordinating construction operations.
 - 2. Division 01 Section "Project Record Documents," for project record drawing requirements.
 - 3. Division 21, 22, 23, 26, 27 and 28 for additional requirements.

1.2 DEFINITION AND INTENT

- A. The Contract Drawings (mechanical, plumbing, electrical, and fire protection plans) are diagrammatic only and are not intended to show the alignment, exact physical locations, or configurations of such Work. Performance by the Contractor shall be required to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the intended results. Where possible, the Contractor shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the Contractor with the Contract Documents before commencing coordination drawings.
- B. Coordination drawings are drawings prepared by Contractor that superimpose Work of multiple trades involved in the construction process. Coordination drawings indicate systems and components to be installed by the Contractor to maximize clear height and free area in ceiling cavities, allow for proper and adequate equipment service clearances, minimize space required by shafts and chases and provide the most efficient functioning and use of materials possible while complying with the final performance and finished appearance required by the Contract Documents.
- C. Coordination drawings are intended to show the relationship and integration of different construction elements that require coordination during fabrication or installation to fit in the space provided, to function as intended, and to present the intended final finished appearance.
- D. Coordination Drawings are not a replacement for shop drawings specified in the technical specifications or the Record Drawings required in Division 01.
- E. The Contractor shall manage the process so that each trade/ sub contractor provides all required information in a timely manner. Coordination Drawings may be completed on a phased basis so as not to delay the overall project schedule. The CPM Schedule specified elsewhere in Division 01 Section "Construction Progress Documentation" shall include the submission of Coordination Drawings. The same shall demonstrate

how the Contractor intends to integrate the submission of Coordination Drawings to suit the overall project schedule. The Contractor shall pay all costs for reproducing copies of coordination drawings for use in the field.

1.3 CONTRACTOR'S USE OF ARCHITECT'S BIM FILES

- A. Refer to Division 01 Section "Submittal Procedures" for availability of Architect's BIM or CAD Background Drawings, required Electronic Data Transfer Agreement Between Architect and Contractor
- 1.4 SUBMITTALS
 - A. Coordination Drawings: Prepare and submit as informational submittal within 120 days of Notice to Proceed.
 - B. Submit coordination drawings in the same manner as shop drawings; refer to Section 01 3300 Submittal Procedures.
- 1.5 PROJECT CONDITIONS
 - A. Maintain marked up set of coordination drawings at Project site available for reference by Owner and Architect.
 - B. Maintain original BIM model used to produce coordination drawings updated with revisions to reflect actual construction. Make drawing revisions at time of change to construction; Transfer information to BIM no later than every 15 days.
 - C. Failure to submit coordination drawings will result in no changes to contract sum for necessary corrections to uncoordinated work.
- PART 2 PRODUCTS (Not Used)

PART 3 - EXECUTION

- 3.1 PREPARATION OF COORDINATION DRAWINGS MODEL
 - A. Produce all coordination drawings using Revit compatible Building Information Modeling (BIM).
 - 1. Utilizing the Architect's base model, each trade shall add their respective information to construct one comprehensive model integrating all trade models for the project.
 - 2. Architectural Work Information Required in the BIM Model:
 - a. Items which are recessed into ceilings and ceiling plenums, or surface mounted to ceilings.
 - b. Anchorages, fastenings, and supporting for items recessed in, attached to, or suspended from ceilings or structure above ceilings.

- c. Firewalls, Fire Barrier, Fire partitions and smoke partitions on coordination drawings for coordination of life safety requirements.
- 3. Plumbing Work Information Required in the BIM Model:
 - a. Sizes and bottom elevations of piping with insulation thickness included.
 - b. Dimensions of major components, such valves, access doors and cleanouts.
 - c. Fire-rated enclosures around piping
 - d. Support of all roof mounted plumbing piping and equipment.
 - e. Required space to install, service and maintain all plumbing mechanical items and systems.
- 4. HVAC Work Information Required in the BIM Model:
 - a. Sizes and bottom elevations of ductwork, piping with insulation thickness included.
 - b. Fire dampers.
 - c. Acoustical lining in ductwork.
 - d. Identification of ductwork pressure class.
 - e. Dimensions of major components, such as dampers, valves, diffusers, access doors, cleanouts and electrical distribution equipment.
 - f. Fire-rated enclosures around ductwork.
 - g. Support of all roof mounted HVAC piping and equipment.
 - h. Required space to install, service and maintain all HVAC items and systems.
- 5. Electrical Work Information Required in the BIM Model:
 - a. Electrical Work, including telecommunications, data, security, lighting and fire alarm systems.
 - b. Runs of vertical and horizontal conduit 1-1/4-inch diameter and larger.
 - c. Light fixture locations.
 - d. Emergency egress light locations.
 - e. Smoke detector, and other fire alarm device locations.
 - f. Panelboard, switchboard, transformer, cable tray, and motor control center, and exit signs.
 - g. Location of pull boxes and junction boxes, dimensioned from column center lines.
 - h. Bottom elevation of all conduit runs 1-1/4 -inch diameter and larger and of all cable trays.
 - i. Support of all roof mounted conduit and photovoltaic equipment, cameras, and security system devices.
 - j. Required space to install, service and maintain all electrical items and systems.
 - k. Lightning protection.
- 6. Fire Protection System Information Required in the BIM Model:

- a. Locations of standpipes, valves, mains piping, branch lines, pipe drops, and sprinkler heads.
- b. Bottom elevation of main and branch lines.
- 7. Structural Work Information Required in the BIM Model:
 - a. Ceiling system.
 - b. Openings and sleeve locations required in slabs, walls, beams and other structural elements, including required openings not indicated on Contract Documents.
 - c. Slab edge locations and locations of sleeves dimensioned from building lines and floor lines.
- 8. Ceiling Systems and Plenum Space in the BIM Model:
 - a. For mechanical, plumbing, fire protection, fire alarm, electrical, controls, and telecommunications Work penetrating acoustical ceilings, show locations of each item (including sprinkler heads, diffusers, grilles, access doors, light fixtures, smoke detectors, exit signs, speakers, and other visible ceiling mounted devices) relative to acoustical ceiling grid or to wall in gypsum board ceilings.
 - b. Locate components within ceiling plenums to maximize clear area for future installations of lights and equipment.
 - c. Clearly indicate areas of conflict between light fixtures, diffusers and grilles and plenum boxes and other components on coordination drawings.
 - d. Draw elements to dimensions appropriate for products to be installed. Use of symbols is not acceptable.
- 9.

3.2 TRADE CONFLICTS

- A. Utilize clash detection software to indicate areas of conflicts and obstacles.
 - 1. Utilize computerized clash detection to identify trade conflicts as well as clashes within each trade, until all trades conflicts are fully coordinated.
 - 2. The Contractor shall then have the trade(s) revise their respective BIM models to eliminate the collisions and interferences.
 - 3. Contractor and each trade Contractor shall approve the Coordination drawings in writing indicating approval of installation coordination and clearances
- B. Each trade Contractor shall determine that all work can be installed without interference.
- C. In the case of unresolved clash, the Contractor shall notify the Architect. The Architect will then suggest to the Contractor as to how to revise the BIM model to eliminate the interference.
 - 1. Submit a clash report identifying all the clashes and conflicts between trade systems.

3.3 PREPARATION OF COORDINATION DRAWINGS

- A. Organize coordination drawing submittals as follows:
 - 1. Floor Plans: Provide floor plans and reflected ceiling plans for all floors. Show architectural, structural, mechanical, plumbing, fire protection, fire alarm, electrical, and telecommunications elements on floor plans and reflected ceiling plans.
 - 2. Equipment Rooms and Spaces: Provide large scale drawings for equipment rooms and spaces showing plans and elevations of mechanical, plumbing, fire protection, electrical, and telecommunications equipment.
 - 3. Structural Penetrations: Provide coordination drawings for each floor indicating penetrations and openings required for all trades.
 - 4. In public and occupied areas without scheduled finish ceilings, appearance is a major coordination factor. Reposition proposed locations of work after Coordination Drawing review by the Architect. Provide adjustments to the exact size, location and offsets of ducts, pipes, and conduit to achieve reasonable appearance objectives. Provide these adjustments as part of the Contract or notify the Architect immediately as to why the adjustment cannot be made.
- B. Prepare coordination drawings to a scale of 1/4" = 1'- 0" or larger (1/2"= 1'-0" for mechanical room plans); detailing major elements, components, and systems of mechanical equipment and materials in relationship with other systems, installations, and building components. Indicate locations where space is limited for installation and access and where sequencing and coordination of installations are of importance to the efficient flow of the Work, including (but not necessarily limited to) the following:
 - 1. Detail complex areas at larger scale than typical floor plans.
 - 2. Use a common architectural layout as background.
 - 3. Indicate ductwork, pipes with 6-inch diameter and greater, and conduits with 3inch diameter and greater by double lines. Use single lines for smaller mechanical piping and all electrical conduits. Draw piping, ductwork, lighting fixtures, and cable trays in scale.
 - 4. Circle and clearly note deviations from Contract Documents with reason for deviation stated.
 - 5. Provide name of representative of each subcontractor whose Work is indicated on coordination drawings, verifying their review and approval that their Work has been coordinated with each other trade and with architectural and structural Work.

END OF SECTION 01 3115

SECTION 01 3200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Daily construction reports.
 - 2. Site condition reports.
 - 3. Special reports.
- B. Related Requirements:
 - 1. General Conditions, Section 013100 and Section 013300 for requirements relating to preparation and submission of Contractor's construction schedule.
 - 2. Section 01 3300 "Submittal Procedures" for submitting schedules and reports.
 - 3. Section 01 4000 "Quality Requirements" for submitting a schedule of tests and inspections.
 - 4. Section 01 7419 "Construction Waste Management and Disposal" for submitting LEED documentation.
- 1.2 INFORMATIONAL SUBMITTALS
 - A. Format for Submittals: Submit required submittals in the following format:
 - 1. PDF electronic file.
 - B. Daily Construction Reports: Submit at monthly intervals.
 - C. Site Condition Reports: Submit at time of discovery of differing conditions.
 - D. Special Reports: Submit at time of unusual event.

PART 2 - PRODUCTS

2.1 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
 - 1. List of subcontractors at Project site.
 - 2. List of separate contractors at Project site.
 - 3. Approximate count of personnel at Project site.
 - 4. Equipment at Project site.
 - 5. Material deliveries.
 - 6. High and low temperatures and general weather conditions, including presence of rain or snow.

- 7. Accidents.
- 8. Meetings and significant decisions.
- 9. Unusual events (see special reports).
- 10. Stoppages, delays, shortages, and losses.
- 11. Meter readings and similar recordings.
- 12. Emergency procedures.
- 13. Orders and requests of authorities having jurisdiction.
- 14. Change Orders received and implemented.
- 15. Field Orders received and implemented.
- 16. Services connected and disconnected.
- 17. Equipment or system tests and startups.
- 18. Partial completions and occupancies.
- 19. Substantial Completions authorized.
- B. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions.
- 2.2 SPECIAL REPORTS
 - A. General: Submit special reports directly to Owner within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.
 - B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION – Not used.

END OF SECTION 01 3200

SECTION 01 3233 – PHOTOGRAPHIC DOCUMENTATION

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for the following work by the General Contractor (other contractors are encouraged to document the site and construction, but not required):
 - 1. Preconstruction photographs.
 - 2. Preconstruction videos.
 - 3. Construction Progress Photo's

1.2 SUBMITTALS

- A. Qualification Data: For photographer.
- B. Key Plan: Submit key plan of Project site and buildings with notation of vantage points marked for location and direction of each photograph and video. Indicate elevation or story of construction. Include same label information as corresponding set of photographs or video.
- C. Construction Photographs: Submit two prints of each photographic view monthly
 - 1. Format: 8-by-10-inch smooth-surface matte prints on single-weight commercial-grade photographic paper, enclosed back to back in clear plastic sleeves that are punched for standard 3-ring binder.
 - 2. Identification: On back of each print, provide an applied label or rubber-stamped impression with the following information:
 - a. Name of project.
 - b. Name and address of photographer.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Date photograph was taken if not date stamped by camera.
 - f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
 - g. Unique sequential identifier.
 - 3. Digital Images: Submit a complete set of digital image electronic files with each submittal of prints as a Project Record Document on CD-ROM. Identify electronic media with date photographs were taken. Submit images that have same aspect ratio as the sensor, uncropped.
- D. DVD's: Submit 3 copies of each DVD with protective sleeve or case within seven days of recording. .

- 1. Identification: On each copy, provide an applied label with the following information:
 - a. Name of Project.
 - b. Name and address of photographer.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Date video was recorded.
 - f. Description of vantage point, indicating location, direction (by encompass point), and elevation or story of construction.
 - g. Weather conditions at time of recording.
- 2. Transcript: Prepared on 8-1/2 by 11-inch paper, punched and bound in heavy-duty, 3-ring, vinylcovered binders. Mark appropriate identification on front and spine of each binder. Include a coversheet with same label information as corresponding video. Include name of Project and date of video on each page.

1.3 QUALITY ASSURANCE

A. Photographer Qualifications: An individual who has been regularly engaged as a professional photographer of construction products for not less than three years.

1.4 COORDINATION

A. Auxiliary Services: Cooperate with photographer and provide auxiliary services requested, including access to Project site and use of temporary facilities, including temporary lighting required to produce clear, well-lit photographs without obscuring shadows.

1.5 USAGE RIGHTS

A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

1.6 EXTRA PRINTS

A. Extra Prints: If requested by Architect or Owner, photographer shall prepare extra prints of photographs. Photographer shall distribute these prints directly to designated parties who will pay the costs for extra prints.

PART 2 - PRODUCTS

2.1 PHOTOGRAPHIC MEDIA

- A. Photographic Film: Medium format, 2-1/4 by 2-1/4 inches.
- B. Digital Images: Provide images in uncompressed TIFF format, produced by a digital camera with minimum sensor size of 4.0 megapixels, and at an image resolution of not less than 1600 by 1200 pixels.
- C. Digital Video Recordings: Provide high-resolution, digital video disc in format acceptable to the Owner.

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

- A. Photographer: Engage a qualified commercial photographer to take construction photographs.
- B. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.
 - 1. Maintain key plan with each set of photographs that identifies each photographic location.
- C. Film Images:
 - 1. Date Stamp: Unless otherwise indicated, date and time stamp each photograph as it is being taken so stamp is integral to photograph.
 - 2. Field Office Prints: Retain one set of prints of photographs in the field office at Project site, available at all times for reference.
- D. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.
 - 1. Date and Time: Include date and time in filename for each image.
 - 2. Field Office Images: Maintain one set of images on CD-ROM in the field office at Project site, available at all times for reference.
- E. Preconstruction Photographs: Before commencement of excavation, commencement of demolition, or starting construction, take color and digital photographs of Project site and surrounding properties, including existing items to remain during construction, from different vantage points.
 - 1. Flag excavation areas and construction limits before taking construction photographs.
 - 2. Take 20 photographs of each existing building to accurately record physical conditions at start of excavation, demolition, or construction.
 - 3. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.
- F. Construction Progress Photographs: Provide monthly progress photographs of the project. Unless otherwise specified in the supplemental general requirements, four photographs shall be submitted each month which provide views of the project taken from the same four points each month which will be selected by the Architect
- G. Additional Photographs: The Owner may issue requests for additional photographs, in addition to photographs specified. Additional photographs will be paid for by Change Order and are not included in the Contract Sum.
 - 1. Three days' notice will be given, where feasible.
 - 2. In emergency situations, take additional photographs within 24 hours of request.

- 3. Circumstances that could require additional photographs include, but are not limited to, the following:
 - a. Special events planned at Project site.
 - b. Immediate follow-up when on-site events result in construction damage or losses.
 - c. Photographs to be taken at fabrication locations away from Project site. These photographs are not submit to unit prices or unit-cost allowances.
 - d. Substantial Completion of a major phase or component of the Work.
 - e. Extra record photographs at time of final acceptance.
 - f. Owner's request for special publicity photographs.

3.2 CONSTRUCTION DIGITAL VIDEO

- A. Video Photographer: Engage a qualified commercial videographer to record construction video.
- B. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of construction. Display continuous running time and date. At start of each video, record weather conditions from local newspaper or television and the actual temperature reading at Project site.
- C. Narration: Describe scenes on video by audio narration by microphone while video is recorded. Include description of items being viewed, recent events, and planned activities. At each change in location, describe vantage point, location, direction (by compass point), and elevation or story of construction.
 - 1. Confirm date and time at beginning and end of recording.
 - 2. Begin each video with name of Project, Contractor's name, videographer's name, and Project location.
- D. Transcript: Provide a typewritten transcript of the narration. Display images and running time captured from video opposite the corresponding narration segment.
- E. Preconstruction Video: Before starting excavation, demolition, or construction record video of Project site and surrounding properties from different vantage points.
 - 1. Flag excavation areas before recording construction video.
 - 2. Show existing conditions adjacent to Project site before starting the Work.
 - 3. Show existing buildings either on or adjoining Project site to accurately record physical conditions at the start of excavation, demolition, or construction.
 - 4. Show protection efforts by Contractor.
- F. Construction Progress Videos: Provide monthly progress videos of the project. Provide one progress video, 15 minutes long, submitted each month. Video shall show the videographer walking and recording the site, each floor and the roof.

END OF SECTION 01 3233

SECTION 01 3300 – SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action. Action submittals are those submittals indicated in individual Specification Sections as "action submittals."
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements. Informational submittals are those submittals indicated in individual Specification Sections as "informational submittals."

1.2 PROGRESS SCHEDULE / COORDINATION DRAWINGS

- A. The General Contractor's schedule, shall coordinate with all trades to produce a coordinated CPM via Suretrak/Primavera or a Microsoft Scheduling program. The schedule shall indicate the start and completion dates for each portion of the work as defined by the schedule of values, with the total time as defined by the contract time and milestone dates as set forth in these specifications. The General Contractor's CPM schedule shall be submitted in electronic format to the Owner and Architect prior to first application for payment Contractor will not be paid until the schedule has been submitted and accepted by the Owner. Any revisions or additional information requested by the Owner or Architect shall be provided. (No payment shall be made to any Contractor not providing a schedule that reflects their entire work).
 - 1. Also refer to Section 01 3100 Project Management and Coordination.
- B. General Contractor shall prepare coordination drawings for submission to Architect and Owner. Mechanical Contractor shall submit the ductwork drawings and each contractor shall prepare their own coordination drawings (as an overlay of ductwork drawings) and submit to General Contractor for final coordination within ninety (90) calendar days from Notice to Proceed. General Contractor shall submit coordination drawings to Architect and Owner within 120 days of Notice to Proceed. Failure to submit these drawings will result in no changes to contract sum for necessary corrections due to uncoordinated work.
 - 1. Also refer to Section 01 3100 Project Management and Coordination.
- C. The General Contractor shall revise the progress schedule on a monthly basis as the work progresses reflecting therein any delays, including those not within the Contractor's control, or accelerations in the progress of the work. The progress schedule, as revised for any weekly period, shall be discussed at every job meeting with the Owner, Project Manager, the Architect, and the General Contractor and the major trades in order to insure that the percentage of actual completion of any portion of the work as called for in the progress schedule for that bi-weekly period is attained. Monthly updates to the progress schedule shall be made prior to application for payment.
- D. Should any delay occur in the progress of the work or any portion thereof, the Contractors shall be required to implement all necessary measures to accelerate the construction, to meet the percentages of completion dictated by the progress schedule on the applicable dates, without additional cost to the Owner.
- E. Each Contractor will have to provide a schedule based upon "Resource Loading" for all critical activities when requested for by the Owner.

1.3 SUBMITTAL SCHEDULE

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.
 - 1. Coordinate submittal schedule with list of subcontracts, the schedule of values, and Contractor's construction schedule.
 - 2. Allow sufficient processing time; as a minimum, as indicated in this Section.
 - 3. Initial Submittal: Submit concurrently with initial submission of construction schedule (refer to Paragraph 1.2.A of this section for timeframe). Include submittals required during the first 60 days of construction. List those submittals required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
 - 4. Final Submittal: Submit concurrently with the first complete submittal of Contractor's construction schedule.
 - a. Submit revised submittal schedule to reflect changes in current status and timing for submittals.
 - b. Contractor is to provide a submittal schedule identifying the critical path submittals to assist the design team in prioritizing their review and subsequent return to the contractor prior to the first requisition for payment being processed. Every submittal is to have a required return date associated with it so the design team can schedule their reviews accordingly.
 - 5. Format: Arrange the following information in a tabular format:
 - a. Scheduled date for first submittal.
 - b. Specification Section number and title.
 - c. Submittal category: Action; informational.
 - d. Name of subcontractor.
 - e. Description of the Work covered.
 - f. Scheduled date for Architect's final release or approval.
 - g. Scheduled date of fabrication.
 - h. Scheduled dates for purchasing.
 - i. Scheduled dates for installation.
 - j. Activity or event number.
- B. Architect will review Submittal Schedule for concentrations, overloading and similar conflicts which will impact the Architect's ability to meet the schedule and propose revisions to the duration of processing time to the Contractor.

- C. No payment will be made to Contractor (except for insurance, bonds and mobilization costs) until complete Schedule of Submittal with critical path submittals has been received and accepted by Owner and Architect.
- D. The Contractor shall not be entitled to any increase in Contract Sum or extension of Contract Time based on the time required for review of submittals if the Contractor fails to submit a Submittal Schedule showing the critical path submittals and adhere to said schedule.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Architect's Digital Data Files:
 - 1. Any request for digital data files shall be solely and exclusively for use related to this Project.
 - 2. Building Information Modeling (BIM): At the Contractor's written request, electronic data files of the BIM Model will be available from the Architect as a convenience to the Contractor for use in preparing shop drawings and coordination drawings for this Project in accordance with the attached Electronic Data Order Form and following:
 - a. To the extent the Architect chooses to utilize BIM software, it shall be for the Architects use in developing the Instruments of Service.
 - b. BIM files were created by the Architect for the primary purpose of creating 2D contract documents. No implication is intended for any purpose beyond the production of 2D documents.
 - c. BIM Digital Data Files will be available to the contractor, subcontractor or supplier on written request to the Architect in accordance with this Section.
 - 3. AutoCAD: At the Contractor's written request, Digital Data Files of the Floor Plan Background Drawings in editable file format will be available from the Architect as a convenience to the Contractor for use in preparing shop drawings for this Project in accordance with the attached Electronic Data Order Form and following:
 - a. AutoCAD 2018 file (editable file format) of documents indicated above will be available to the contractor, subcontractor or supplier on written request to the Architect in accordance with this Section.
 - b. Floor Plan Background Drawings as defined in the attached Electronic Data Order Form are available as a convenience to the Contractor.
 - c. Floor Plan Background Drawings files requested will be delivered in editable file format indicated, and will not be further altered by the Architect prior to delivering them to any said party.
 - 4. Electronic Data Order Procedure:
 - a. Submit completed Electronic Data Order Form attached to this Section to the Architect's representative in .pdf format.
 - b. The Architect's representative will complete the CAD or BIM Digital Data Transfer Agreement between Architect and Contractor or Subcontractor and send it to the requesting entity for signature.
 - c. The requesting entity shall sign the Agreement and return it to the Architect in .pdf format.
 - 5. Each contractor, subcontractor, trade, supplier or entity requesting electronic data file shall submit a request for Electronic Data Files, prior to delivery of said files. No

contractor, subcontractor, trade, supplier or entity shall transfer these Electronic Files received from the Architect, or any portion thereof to any third party ("Transferee") without written permission of the Architect.

- 6. The Architect will transfer files to the requesting entity via the Project Information Management (PIM) software.
- 7. All files are a schematic representation of elements within the project. All Contractors are responsible for field verification and coordination with other trades.
- 8. Use of these files does not relieve the Contractor from producing Coordination Drawings and Shop Drawings required by the Contract.

1.5 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

- A. Shop drawings, product data and samples will not be processed by the Owner and/or Architect until the list of subcontractors, material suppliers and fabricators is submitted.
- B. The Architect shall be compensated on an hourly basis for review of all shop drawings or samples that do not meet the requirements of the contract documents after two submissions. The compensation shall be deducted from the contractors contract via a deduct change order, or other means that both parties agree to.
- C. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
 - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 - 2. Submit all submittal items required for each Specification Section concurrently unless partial submittals for portions of the Work are indicated on approved submittal schedule.
 - 3. Submit action submittals and informational submittals required by the same Specification Section as separate packages under separate transmittals.
 - 4. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- D. Processing Time: Allow sufficient time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
 - 1. Initial Review: Allow 10 days for initial review of each submittal by the design team and an additional week for the Owner's review. Allow additional time if coordination with subsequent submittals is required, and for coordination of multiple components of a submittal in a substantial submittal package. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
 - 2. Resubmittal Review: Allow 10 days for review of each resubmittal and one week for the Owner's review.
 - 3. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 10 days for initial review of each submittal

- E. Paper Submittals: Place a permanent label or title block on each submittal item for identification.
 - 1. Indicate name of firm or entity that prepared each submittal on label or title block.
 - 2. Place fully executed "Submittal Cover Sheet" attached to the end of this Section as first page of every paper submittal.
 - 3. Include the following information for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Name of subcontractor.
 - f. Name of supplier.
 - g. Name of manufacturer.
 - h. Submittal number or other unique identifier, including revision identifier.
 - Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
 - i. Number and title of appropriate Specification Section.
 - j. Drawing number and detail references, as appropriate.
 - k. Location(s) where product is to be installed, as appropriate.
 - I. Other necessary identification.
 - 4. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
 - a. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect .
 - 5. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return without review submittals received from sources other than Contractor.
 - a. Transmittal Form for Paper Submittals: Use form acceptable to Architect and Owner.
 - b. Transmittal Form for Paper Submittals: Provide locations on form for the following information:
 - 1) Project name.
 - 2) Date.
 - 3) Destination (To:).
 - 4) Source (From:).
 - 5) Name and address of Architect.
 - 6) Name of Contractor.
 - 7) Name of firm or entity that prepared submittal.
 - 8) Names of subcontractor, manufacturer, and supplier.

- 9) Category and type of submittal.
- 10) Submittal purpose and description.
- 11) Specification Section number and title.
- 12) Specification paragraph number or drawing designation and generic name for each of multiple items.
- 13) Drawing number and detail references, as appropriate.
- 14) Indication of full or partial submittal.
- 15) Remarks.
- 16) Signature of transmitter.
- F. Electronic Submittals: Identify and incorporate information in each electronic submittal file as follows:
 - 1. Assemble complete submittal package into a single indexed file incorporating submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
 - 2. Name file with submittal number or other unique identifier, including revision identifier.
 - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., LNHS-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., LNHS-061000.01.A).
 - 3. Transmittal Form for Electronic Submittals: Use software-generated form from electronic project management software or electronic form acceptable to Owner, containing the following information:
 - a. Project name.
 - b. Date.
 - c. Name and address of Architect.
 - d. Name of Contractor.
 - e. Name of firm or entity that prepared submittal.
 - f. Names of subcontractor, manufacturer, and supplier.
 - g. Category and type of submittal.
 - h. Submittal purpose and description.
 - i. Specification Section number and title.
 - j. Specification paragraph number or drawing designation and generic name for each of multiple items.
 - k. Drawing number and detail references, as appropriate.
 - I. Location(s) where product is to be installed, as appropriate.
 - m. Related physical samples submitted directly.
 - n. Indication of full or partial submittal.
 - o. Submittal and transmittal distribution record.
 - p. Other necessary identification.
 - q. Remarks.
- G. Options: Identify options requiring selection by Architect.

- H. Deviations and Additional Information: On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same identification information as related submittal
- I. Each submission shall be complete, with all options clearly marked and with all components required for the assembly fully described and detailed. Submissions missing important information will be returned unchecked.
- J. Except as otherwise indicated in individual work sections, comply with requirements specified herein for each indicated category of submittal. Provide and process intermediate submittals, where required between initial and final, similar to initial submittals.
- K. Maintain returned final set of samples at project site, in suitable condition and available for quality control comparisons by the Architect, and by Owner.
- L. Do not proceed with installation of materials, products or systems until final copy of applicable shop drawings, product data and samples are in possession of Installer.
- M. Contractor's submittal of, and Architect's acceptance of, shop drawings, product data or samples which indicate work not complying with requirements of Contract Documents, does not constitute an acceptable and valid request for, nor approval of, a substitution.
- N. Resubmittals: Make resubmittals in same form and manner as initial submittal.
 - 1. Note date and content of previous submittal.
 - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
 - 3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- O. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- P. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.
- Q. Submittals will be accepted from the Contractor only. Submittals received from other entities will be returned without review or action.
 - 1. Submittals received without a transmittal form will be returned without review or action.

1.6 SUBMITTAL PROCEDURES

A. General Submittal Procedure Requirements: Prepare and submit submittals required by individual Specification Sections. Types of submittals are indicated in individual Specification Sections.

- 1. Post electronic submittals as PDF electronic files directly to Architect's project information transmission web based software specifically established for Project.
 - a. Architect will return annotated file. Annotate and retain one copy of file as an electronic Project record document file.
- 2. Action Submittals: Submit electronic file except where paper copies of submittals are specifically required.
- 3. Informational Submittals: Submit electronic file except where paper copies of submittals are specifically required.
- 4. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - a. Provide a notarized statement on original paper copy certificates and certifications where indicated.
- B. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal based on Architect's digital data drawing files is otherwise permitted.
 - 1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
 - a. Identification of products.
 - b. Schedules.
 - c. Compliance with specified standards.
 - d. Notation of coordination requirements.
 - e. Notation of dimensions established by field measurement.
 - f. Relationship and attachment to adjoining construction clearly indicated.
 - g. Seal and signature of professional engineer if specified.
 - 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches (215 by 280 mm), but no larger than 30 by 42 inches (750 by 1067 mm).
 - 3. Submit Shop Drawings in the following format:
 - a. PDF electronic file.
 - b. In addition to submission of electronic files, submit 3 paper copies of fire alarm shop drawings and sprinkler shop drawings with Contractor approval stamps applied, signed and sealed by a NJ licensed engineer, for submittal to College Code Review for review and comment.
 - c. Additional copies of submittals may have to be provided for the Owner's insurance review (i.e. Factory Mutual).
- C. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
 - 1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
 - 2. Mark each copy of each submittal to show which products and options are applicable.
 - 3. Include the following information, as applicable:

- a. Manufacturer's catalog cuts.
- b. Manufacturer's product specifications.
- c. Standard color charts.
- d. Statement of compliance with specified referenced standards.
- e. Testing by recognized testing agency.
- f. Application of testing agency labels and seals.
- g. Notation of coordination requirements.
- h. Availability and delivery time information.
- 4. For equipment, include the following in addition to the above, as applicable:
 - a. Wiring diagrams showing factory-installed wiring.
 - b. Printed performance curves.
 - c. Operational range diagrams.
 - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
- 5. Submit Product Data before or concurrent with Samples.
- 6. Submit Product Data in the following format:
 - a. PDF electronic file.
- 7. Use a form matching the sample form attached to this section.
- D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
 - 1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
 - 2. Identification: Attach label on unexposed side of Samples that includes the following:
 - a. Generic description of Sample.
 - b. Product name and name of manufacturer.
 - c. Sample source.
 - d. Number and title of applicable Specification Section.
 - e. Specification paragraph number and generic name of each item.
 - 3. For projects where electronic submittals are required, provide corresponding electronic submittal of Sample transmittal, digital image file illustrating Sample characteristics, and identification information for record.
 - 4. Disposition: Maintain sets of approved Samples at Project site, available for qualitycontrol comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
 - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
 - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
 - 5. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

- a. Number of Samples: Submit three full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect, will return submittal with options selected.
- 6. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
 - a. Number of Samples: Submit sets of Samples. Architect will retain two Sample sets; remainder will be returned.
 - 1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
 - 2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
- E. Product Schedule: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
 - 1. Type of product. Include unique identifier for each product indicated in the Contract Documents or assigned by Contractor if none is indicated.
 - 2. Manufacturer and product name, and model number if applicable.
 - 3. Number and name of room or space.
 - 4. Location within room or space.
 - 5. Submit product schedule in the following format:
 - a. PDF electronic file.
- F. Coordination Drawing Submittals: Comply with requirements specified in Section 013115 "Coordination Drawings."
- G. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 01 4000 "Quality Requirements."
- H. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 01 7700 "Closeout Procedures."
- I. Maintenance Data: Comply with requirements specified in Section 01 7823 "Operation and Maintenance Data."
- J. LEED Submittals: Comply with requirements specified in Section 018113 "Sustainable Design Requirements LEED" and individual specification sections.

- K. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, contact information of architects and owners, and other information specified.
- L. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification and Procedure Qualification Record on AWS forms. Include names of firms and personnel certified.
- M. Installer Certificates: Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- N. Manufacturer Certificates: Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- O. Product Certificates: Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- P. Material Certificates: Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- Q. Material Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- R. Product Test Reports: Submit written reports indicating that current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- S. Research Reports: Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.
- T. Preconstruction Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- U. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed

before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

- V. Field Test Reports: Submit written reports indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements in the Contract Documents.
- W. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

1.7 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
- C. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services

1.8 COLOR SELECTIONS

- A. All colors for all finished surfaces and materials will be selected or approved by the Architect. The color selections will be made at one time to provide a complete and coordinated color schedule which, upon acceptance of the Owner, will be provided to the Contractor. Any and all specific color selections for materials not noted on drawings or in specification shall be chosen by Architect after submittal of samples.
- B. It is imperative that all color information be submitted to the Architect by the Contractor before color selections can be made. If any color selection information is not available when colors are needed to meet the project schedule, the Architect will select colors from one of the named manufacturers in the Specifications, and the Contractor will be required to exactly match that color. A claim for delay will not be accepted if the color schedule is late due to the failure of the Contractor to provide the Architect with all required color information, nor will an extra be entertained if the selected color is not available from the manufacturer the Contractor intended to use but neglected to submit.

1.9 MISCELLANEOUS SUBMITTALS

- A. Miscellaneous submittals related directly to the work include warranties, maintenance agreements, workmanship bonds, survey data and reports, physical work records, quality testing and certifying reports, copies of industry standards, record drawings, field measurement data, operating and maintenance materials, overrun stock, and similar information, devices and materials applicable to the work and not processed as shop drawings, product data or samples.
- B. Refer to sections for specific general requirements on warranties, product/workmanship bonds, and maintenance agreements. In addition to copies desired for Contractor's use, furnish 3 executed copies, except furnish one additional copy where required for operation and maintenance manuals.
- C. For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents, correspondence and records established in conjunction with compliance with standards and regulations bearing upon performance of the work.
- PART 2 PRODUCTS (not applicable)

PART 3 - EXECUTION

- 3.1 CONTRACTOR'S REVIEW
 - A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect .
 - B. Project Closeout and Maintenance Material Submittals: See requirements in Section 01 7700 "Closeout Procedures."
 - C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

- A. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- B. Architect's Actions:
 - 1. Contractor may proceed with fabrication on submittals marked "No Exception Taken" or "Make Corrections Noted" provided that the Contractor adheres to the corrections noted.

- 2. Contractor may proceed with fabrication on submittals marked "Resubmit for Record Only" provided that the Contractor makes the corrections noted and resubmits submittals for record purposes.
- 3. Contractor may not proceed with fabrication on shop drawings noted "Revise and Resubmit" or "Rejected" until "No Exception Taken" or "Make Corrections Noted" stamp is received on resubmitted drawing.
- 4. Contractor may not proceed with fabrication on the specific shop drawings noted "Partial Resubmit" until "No Exception Taken" or "Make Corrections Noted" stamp is received on resubmitted drawing.
- 5. Do not permit submittals marked "Revise and Resubmit," or "Rejected," to be used at Project site, or elsewhere where Work is in progress.
- 6. Other Action: Where submittal is primarily for information or record purposes, special processing or other activity, submittal will be returned, marked "No Action Taken."
- C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Partial submittals prepared for a portion of the Work will be reviewed when use of partial submittals has received prior approval from Architect.
- E. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- F. Submittals not required by the Contract Documents may be returned by the Architect without action.

3.3 CONTRACTOR'S ACTION

A. One copy of all submissions will be returned to the Contractor for his files. The Contractor shall mark up other copies so as to conform with the copy returned to him and forward them to all interested Contractors, Subcontractors, and Suppliers.

3.4 DISTRIBUTION

A. Provide additional distribution of submittals, not included in foregoing copy submittal requirements, to subcontractors, suppliers, fabricators, installers, governing authorities and others as necessary for proper performance of the work. Include such additional copies in transmittal to Architect where required to receive Action marking before final distribution. Show such distributions on transmittal forms.

END OF SECTION 01 3300

ATTACHMENTS:

- Submittal Cover Sheet
- Electronic Data Transfer Agreement For Building Information Modeling (BIM) Files Between Architect and Contractor
- Electronic Data Transfer Agreement For CAD Files Between Architect and Contractor
- Electronic Data Order Form

SUBMITTAL COVER SHEET

CONTRACTOR:	
STREET ADDRESS:	
CONTRACTOR'S PROJECT NO:	SUBMITTAL NO:
DATE OF SUBMITTAL:SU	
SUBMITTAL DESCRIPTION:	RESUBMITTAL: □Y □N SUBSTITUTION: □Y □N
SHOP DRAWING TITLE:	
PRODUCT DATA, TESTS, SCHEDULES:	DATE
SAMPLES:	
MANUFACTURER:	
ADDRESS:	
REFERENCES:	
SPECIFICATION SECTION - PAGE:	PARAGRAPH(S):
CUNTRACT DRAWINGS(S):	ROOM NO.(S):

CONTRACTOR'S STAMP:

ARCHITECT'S STAMP:

REMARKS:

Type Date Here

[Address]

Re: Electronic Data Transfer Agreement for BIM Model, Between Architect and Contractor The College of New Jersey, Project Name

Dear [Addressee's Name]:

Pursuant to the request of _____ ("Owner"), _____ ("Architect") will deliver to _____ ("Contractor") certain electronic files (such files and any and all drawings, models, data, and other information contained in the files are collectively referred to as the "Files") for Contractor's use in connection with the above project ("Project"), subject to the following terms and conditions.

These Files are components of the Architect's Instrument of Service and not products. They are transmitted for the Owner's benefit on this Project. Delivery of the Files to Contractor shall not be deemed to be a sale by Architect. Architect makes no representations or warranties whatsoever regarding the Files, including, without limitation, any representations or warranties of merchantability or fitness for any purpose. All rights to the Files, including all rights under the copyright and other laws, and the material objects in which the rights are embodied, are and shall be owned by Owner. Transfer of the information does not transfer any license to use the underlying software or obligate the Architect to provide the software to the recipient. The Architect retains the right to reuse the information in the general course of a professional practice.

This Agreement provides the Contractor with a nonexclusive, limited license to use the information in the Files for the specific purpose of responding to the requirements of the Contract Documents for this Project. Except as necessary to respond to the requirements of the Contract Documents for this Project, Contractor shall not reproduce the Files or any portion thereof, create any derivations of the Files, or otherwise modify them. Receipt and use of the electronic data does not relieve the recipient of any responsibility or obligation. Contractor shall treat the information contained in the Files as proprietary and confidential. Contractor understands that protection of the information outside of the scope of the Project prior or subsequent to the duration of the Project. The Contractor shall not transfer the Files or any portion thereof to any third party ("Transferee"). Trade contractors and subcontractors must execute their own Electronic Data File Agreement.

[Addressee's Name] [Date] Page 2

The Files are not Contract Documents for the Project. Only hard copy documents are Contract Documents. If any discrepancies exist at any time between the Files and the Contract Documents the Contract Documents shall control. **These BIM files were created by the designers for the primary purpose of creating 2D contract documents. No implication is intended for any purpose beyond the production of 2D documents.** Contractor shall be responsible for updating the Files throughout the course of the Project or requesting updated electronic files (if they exist) by executing a new Electronic File Data Agreement and paying an additional service fee for each requested file.

A complete list of the Files to be delivered to Contractor, including their dates and sizes, is attached. The Files are electronic source material for Contract Documents current as of **[Date files were recorded for transfer]**. Architect shall transmit the Files to Contractor in electronic form as Revit 2013 format files. Use of the electronic data is at the sole risk of the recipient, who acknowledges that the electronic data is subject to undetectable alteration or electronic corruption or degradation. Upon acceptance, Contractor shall waive any right to claims for detrimental reliance upon the information contained in the File.

Contractor acknowledges it has no contractual relationship with Architect or any relationship that is the functional equivalent of privity of contract, other than this letter agreement. Contractor shall hold Architect harmless from and against any and all losses, damages, costs, claims and any other liability relating directly or indirectly to the subject matter of this agreement. In no event shall Architect's liability exceed the amount of service fee payment made under this agreement. This agreement shall be binding upon and inure to the benefit of the successors and assigns of the parties. Contractor shall not assign or otherwise transfer this agreement to any third party without the prior written consent of Architect.

Please sign below, indicating acceptance of these terms, and return one copy of the signed letter to me. Upon receipt of the signed letter and the above fee, we will transmit the Files to you.

Very truly yours,

Architect/Engineer Name

Signature

Date

[Name of Contractor's Representative] Contractor's Representative [Addressee's Name] [Date] Page 3

Signature

1

Date

cc: [CA Person for Project]

Type Date Here

[Address]

Re: Electronic Data Transfer Agreement for AutoCAD files, Between Architect and Contractor [Project Number], [Project Name]

Dear [Addressee's Name]:

Pursuant to the request of _____ ("Owner"), _____ ("Architect") will deliver to _____ ("Contractor") certain electronic files (such files and any and all drawings, data, and other information contained in the files are collectively referred to as the "Files") for Contractor's use in connection with the above project ("Project"), subject to the following terms and conditions.

These Files are components of the Architect's Instrument of Service and not products. They are transmitted for the Owner's benefit on this Project. Delivery of the Files to Contractor shall not be deemed to be a sale by Architect. Architect makes no representations or warranties whatsoever regarding the Files, including, without limitation, any representations or warranties of merchantability or fitness for any purpose. All rights to the Files, including all rights under the copyright and other laws, and the material objects in which the rights are embodied, are and shall be owned by Owner. Transfer of the information does not transfer any license to use the underlying software or obligate the Architect to provide the software to the recipient. The Architect retains the right to reuse the information in the general course of professional practice.

This Agreement provides the Contractor with a nonexclusive, limited license to use the information in the Files for the specific purpose of responding to the requirements of the Contract Documents for this Project. Except as necessary to respond to the requirements of the Contract Documents for this Project, Contractor shall not reproduce the Files or any portion thereof, create any derivations of the Files, or otherwise modify them. Receipt and use of the electronic data does not relieve the recipient of any responsibility or obligation. Contractor shall treat the information contained in the Files as proprietary and confidential. Contractor understands that protection of the information is of vital importance and shall maintain in confidence all such information and not use the information outside of the scope of the Project prior or subsequent to the duration of the Project. The Contractor shall not transfer the Files or any portion thereof to any third party ("Transferee"). Trade contractors and subcontractors must execute their own Electronic Data File Agreement.

[Addressee's Name] [Date] Page 2

The Files are not Contract Documents for the Project. Only hard copy documents are Contract Documents. If any discrepancies exist at any time between the Files and the Contract Documents the Contract Documents shall control. Contractor shall be responsible for updating the Files throughout the course of the Project or requesting updated electronic files (if they exist) by executing a new Electronic File Data Agreement for each requested file.

A complete list of the Files to be delivered to Contractor, including their dates and sizes, is attached. The Files are **[electronic source material for] [electronic versions of]** Contract Documents current as of **[Date files were recorded for transfer]**. Architect shall transmit the Files to Contractor in electronic form as AutoCAD version 2012, format files. These Files will be accompanied, upon request, by hard copy Contract Documents current as of the same date as the Files. The Contractor shall notify the Architect of any discrepancies between the hard copy Contract Documents and the Files within 30 days of receipt of the Files or the Files will be deemed to be accepted. Upon notification that there is a discrepancy between the hard copy Contract Documents and the Files, the Architect will replace the Files. Use of the electronic data is at the sole risk of the recipient, who acknowledges that the electronic data is subject to undetectable alteration or electronic corruption or degradation. Upon acceptance, the Contractor shall waive any right to claims for detrimental reliance upon the information contained in the File.

Contractor acknowledges it has no contractual relationship with Architect or any relationship that is the functional equivalent of privity of contract, other than this letter agreement. Contractor shall hold Architect harmless from and against any and all losses, damages, costs, claims and any other liability relating directly or indirectly to the subject matter of this agreement. In no event shall Architect's liability exceed the amount of service fee payment (if any) made under this agreement. This agreement shall be binding upon and inure to the benefit of the successors and assigns of the parties. Contractor shall not assign or otherwise transfer this agreement to any third party without the prior written consent of Architect.

Please sign below, indicating acceptance of these terms, and return one copy of the signed letter to me. Upon receipt of the signed letter, we will transmit the Files to you.

Very truly yours,

Architect

Signature

Date

[Name of Contractor's Representative] Contractor's Representati [Addressee's Name] [Date] Page 3

Signature

1

Date

cc: [CA Person for Project]

Electronic Data Order	Form		
Date:			
Project Name:			
Project Number:			
Recipient Name:			
Recipient Address:			
-			
-			
Recipient Telephone:	Recipient Fax:		
Person Requesting Electronic Data:			
Signature:			
I hereby request the following electronic data:			
AutoCAD 2012 - Background Drawings			

Revit 2013 - BIM Model

Electronic Data Order Form - Definitions

Editable File Format:

Editable file format electronic data can be altered by the Recipient. These electronic data will arrive in the format utilized by the Architect and indicated above.

Sheet Drawing:

An electronic document representing a hard copy drawing, which may be used to produce a drawing sheet

Bound:

All external references to an electronic document will be included into that electronic document, delivering it as a single electronic file.

Unbound:

All external references to an electronic document will be included as separate electronic files.

Background Drawing:

- A. Floor plans including the following elements:
 - 1. Exterior walls and openings in exterior walls at or below typical window or door height.
 - 2. Interior walls and partitions and openings in interior walls and partitions at or below typical door height.
 - 3. Glazed openings
 - 4. Horizontal reference grid.
 - 5. Toilet partitions and screens.
 - 6. Cabinets, casework and countertops that are permanently installed.
 - 7. Wall cabinets shown dotted.
 - 8. Locations of elevators, dumbwaiters, escalators and chutes.
 - 9. Stairs, landings, ramps, handrails and guards.
 - 10. Plumbing fixtures visible within finished spaces.
 - 11. Permanently mounted equipment in contact with the floor except Food Service Equipment.
 - 12. Fixed seating.
- B. Separate Reflected Ceiling Plans including the following elements:
 - 1. Grid patterns for exposed grid ceilings
 - 2. Tile patterns for acoustical tile ceilings
 - 3. Ceiling bulkheads and soffits
 - 4. Ceiling mounted Light fixtures
 - 5. Fire suppression sprinkler heads
 - 6. HVAC diffusers

SECTION 01 4000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 TRADESMEN AND WORKMANSHIP

- A. Each Contractor shall ensure that tradesmen performing work at site are skilled and knowledgeable in methods and craftsmanship needed to produce required quality levels for workmanship in completed work. Remove and replace work which does not comply with workmanship standards as specified and as recognized in the construction industry for applications indicated. Remove and replace other work damaged or deteriorated by faulty workmanship or its replacement.
- B. In certain instances, specification text requires that specific work be assigned to specialists or expert entities, who shall be engaged for performance of those units of work. These shall be recognized as special requirements over which Contractor has no choice or option. These assignments shall not be confused with, and are not intended to interfere with, normal application of regulations, union jurisdictions and similar conventions. One purpose of such assignments is to establish which party or entity involved in a specific unit of work is recognized as "expert" for indicated construction processes or operations. Nevertheless, final responsibility for fulfillment of entire set of requirements remains with Contractor.

1.2 INSPECTION, TESTS AND REPORTS

- A. Required inspection and testing services are intended to assist in determination of probable compliances of the work with requirements, but do not relieve any Contractor of responsibility for those compliances, or for general fulfillment of requirements of Contract Documents. Specified inspections and tests are not intended to limit any Contractor's quality control program. Afford reasonable access to agencies performing tests and inspections.
- 1.3 The Owner is responsible for all testing and inspections (foundations, soils compaction, concrete, steel, etc.) unless specifically indicated otherwise in the Specifications. Each Contractor is responsible to coordinate the activities of the testing agency to assure that work is tested prior to being covered up or other activities associated to the work begin. Provide proper notice to the Owner's on site superintendent and/or project manager to assure the inspections are completed prior to any work requiring same is done.

1.4 SPECIAL INSPECTIONS

- A. Special Inspections: Owner will engage qualified testing agency(ies) and special inspectors to conduct special inspections required by authorities having jurisdiction as the responsibility of Owner, as indicated in New Jersey Uniform Construction Code and as follows:
 - 1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.

- 2. Notifying Architect, Commissioning Authority, Owner's Representative, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
- 3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect and Commissioning Authority, through Owner's Representative, with copy to Contractor and to authorities having jurisdiction.
- 4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
- 5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents
- 6. Retesting and re-inspecting corrected work.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For land surveyor.
- B. Final As-Built Survey of Underground Utilities: Submit two paper copies and one electronic (.pdf) file, signed by land surveyor.
- PART 2 PRODUCTS (not applicable)

PART 3 - EXECUTION

- 3.1 REPLACEMENT OF WORK
 - A. The Contractor shall, within 24 hours after rejection of Work, remove all materials and equipment so rejected and immediately replace said Work, at his/her cost, to the satisfaction of the Architect. Should the Work of the Owner or other Contractors be damaged by such removal or replacement, the Contractor shall reimburse the Owner or other Contractors for all cost incurred for correcting said damage.

3.2 SITE LAYOUT

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. Each contractor is required to complete their own surveying and layout work as required to complete their work.
- C. The contractor is required to complete a foundations survey to be issued to DCA as part of the project requirements. Contractor is to complete the foundation survey prior to backfilling the foundation. Coordinate the exact requirements with the DCA field inspectors and DCA offices.

3.3 EXAMINATION

A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate

and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.

- 1. Before construction, verify the location and points of connection of utility services.
- B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.
 - 1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
 - 2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.
- C. Acceptance of Conditions prior to work starting: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Written Report: Where a written report listing conditions detrimental to performance of the Work is required by other Sections, include the following:
 - a. Description of the Work.
 - b. List of detrimental conditions, including substrates.
 - c. List of unacceptable installation tolerances.
 - d. Recommended corrections.
 - 2. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 3. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
 - 4. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 5. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.4 PREPARATION

- A. Existing Utility Information: Furnish information to local utility and Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.
- B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Owner not less than 72 hours in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Owner's written permission.
- C. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are

indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

- D. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.
- E. Review of Contract Documents and Field Conditions: Immediately on discovery of the need for clarification of the Contract Documents, submit a request for information to Architect. Include a detailed description of problem encountered, together with recommendations for changing the Contract Documents.

3.5 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect and Owner promptly.
- B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.
 - 1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
 - 2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
 - 3. Inform installers of lines and levels to which they must comply.
 - 4. Check the location, level and plumb, of every major element as the Work progresses.
 - 5. Notify Architect and Owner when deviations from required lines and levels exceed allowable tolerances.
 - 6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.
- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect and Owner.

3.6 FIELD ENGINEERING

- A. Identification: Identify existing benchmarks, control points, and property corners.
- B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

- 1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect or Owner. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect and Owner before proceeding.
- 2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.
- C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
 - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
 - 2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
 - 3. Remove temporary reference points when no longer needed. Restore marked construction to its original condition.
- D. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework. **Coordinate the requirements of DCA for a complete foundations survey and submit same prior to backfilling.**
- E. Final Survey for Underground Utilities: Engage a land surveyor to prepare a final survey of all utilities installed during the project, including all elevations and inverts
- F. Final Property Survey: Prepare a final property survey showing significant features (real property) for Project. Include on the survey a certification, signed by land surveyor, that principal metes, bounds, lines, and levels of Project are accurately positioned as shown on the survey.
 - 1. Show boundary lines, monuments, streets, site improvements and utilities, existing improvements and significant vegetation, adjoining properties, acreage, grade contours, and the distance and bearing from a site corner to a legal point.
 - 2. Recording: At Substantial Completion, have the final property survey recorded by or with authorities having jurisdiction as the official "property survey."
 - 3. Submit final survey to the Owner in CADD format.

3.7 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
 - 3. Conceal pipes, ducts, and wiring in finished areas unless otherwise indicated.
 - 4. Maintain minimum headroom clearance of 96 inches (2440 mm) in occupied spaces and 90 inches (2300 mm) in unoccupied spaces without ceilings.
- B. Mechanical Installations: Comply with the following requirements:

- 1. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
- 2. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
- 3. Install all equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations. Extend grease fittings to an accessible location.
- C. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- D. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- E. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- F. Tools and Equipment: Only use the best quality tools and equipment with proper attenuations for the latest acceptable sound levels.
- G. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements
- H. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
 - 2. Allow for building movement, including thermal expansion and contraction.
 - 3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation
- I. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

END OF SECTION 01 4000

SECTION 01 4200 - REFERENCES

PART 1 - GENERAL

1.1 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "Approved" or "Furnished as Submitted": When used to convey Architect's action on Contractor's submittals, applications, and requests, "Approved" or "Furnish as Submitted" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "approved," "required," and "permitted" have the same meaning as "directed."
- D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Installer": Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.
 - 1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.
- J. "Experienced": When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.
- K. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.2 INDUSTRY STANDARDS

- A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
- B. Publication Dates: Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.
- C. Conflicting Requirements: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.
 - 1. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.
- D. Copies of Standards: Each entity engaged in construction on Project must be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.
 - 1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source and make them available on request.
- E. Abbreviations and Acronyms for Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADAAG	Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities		
	Available from Access Board www.access-board.gov	(800) 872-2253 (202) 272-5434	
CFR	Code of Federal Regulations Available from Government Printing Office www.access.gpo.gov/nara/cfr	(888) 293-6498 (202) 512-1530	
FS	Federal Specification Available from Defense Automated Printing Service www.astimage.daps.dla.mil/online	(215) 697-6257	
	Available from General Services Administration www.fss.gsa.gov/pub/fed-specs.cfm	(202) 619-8925	

1.3 ABBREVIATIONS AND ACRONYMS

- A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale Research's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."
- B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.
- ICC International Code Council, Inc. (888) 422-7233 www.iccsafe.org IBC International Building Code NJUCC New Jersey Uniform Construction Code

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 4200

SECTION 01 4339 – MOCKUPS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes mockups for integrated systems and components which include products and materials, including the following:
 - 1. Integrated exterior mockups.
- B. Tests to be performed on mock-ups by Owner's Testing Agency are listed in this Section.
- C. Related Sections:
 - 1. Division 2 through 33 for additional mockups of individual products or components.

1.2 DEFINITIONS

- A. Mockups: Full size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; to demonstrate compliance with specified installation tolerances; to assess conformance with historic fabric and character; and for layout or design verification. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
 - 1. Integrated Exterior Wall Assembly Mockups: Mockups of the exterior envelope erected separately from the building but on the project site, consisting of multiple products, assemblies and subassemblies.

1.3 ACTION SUBMITTALS

- A. Shop Drawings: For each mockup, provide plans, sections, and elevations, indicating materials and size of mockup construction.
 - 1. Indicate manufacturer and model number of individual components.
 - 2. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.
- B. Shop Drawings and Submittals for Materials: Provide those required for specific Division 02 through 33 specification Sections prior to starting mockup.
- C. Samples: Refer to specific Division 02 through 33 specification Sections.
- D. Mockup: Provide as many modifications to the mockup(s) as required to achieve Architect's and / or Owner's approval at no additional cost.

1.4 QUALITY ASSURANCE

- A. Source Limitations: Obtain each product from the source supplying materials and products that are not part of the mock-up
- B. Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work as follows:
 - 1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
 - 2. Notify Architect fourteen days in advance of dates and times when mockups will be constructed.
 - 3. Provide schedule of construction , determine when specific subcontractor(s) will be on site, allow for site meetings throughout the process for problem solving and coordination
 - 4. Employ supervisory personnel who will oversee mockup construction. Employ workers that will be employed during the construction of the Project.
 - 5. Demonstrate the proposed range of aesthetic effects and workmanship.
 - 6. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
 - a. Allow seven days for initial review and each re-review of each mockup.
 - 7. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work, unless removal is permitted in Article 3 of this Section
 - 8. Demolish and remove mockups when directed, unless otherwise indicated.
 - 9. No work on building elements included in any mockup shall commence without Architect's written approval of relevant mockup
- C. Pre-installation Conference: Conduct conference at Project site.
 - 1. Review methods and procedures related to for constructing mockups.
 - 2. Review submittals and confirm understandings of markups, comments and actions associated with their review.
 - 3. Confirm schedule of mock-up construction with Owner, Architect, and related Contractors.
 - 4. Include all concerned parties, including subcontractors, manufacturer's representatives, and consultants, as required.

1.5 PROJECT CONDITIONS

- A. Do not install products or materials that are wet, moisture damaged, or mold damaged.
- 1.6 COORDINATION
 - A. Coordinate construction of mockups to ensure timely approval and facilitate ordering of materials for incorporation in the Work.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Provide materials, components, and products for each integrated or room assembly mock-up as specified in individual Specification Sections.
- B. All materials shall be new and purchased specifically for the project.

PART 3 - EXECUTION

3.1 GENERAL

- A. Approval of mockups is for visual characteristics of material and construction, and other qualities specifically and approved by Architect in writing.
 - 1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected and resolved.
- B. See Contract Documents for extent, construction, and location of mock-up(s).
- C. Provide ongoing access to mockups (room, or other) during its construction and throughout the Project by Owner's additional Contractors/Forces, to allow for F.F.& E. mockups and installations; and for other uses requested.
- D. Provide all necessary structural support, including foundations, framing, and backup substrates, as required, to secure and maintain mock-ups in a stable and permanent manner. (See mock-up structural design documents, where provided).

3.2 INTEGRATED EXTERIOR WALL ASSEMBLY MOCKUPS.

- A. Integrated Exterior Wall Assembly Mockups: Construct integrated exterior wall mockup in accordance with approved Shop Drawings and as indicated on Drawings. Coordinate installation of exterior envelope materials and products for which mockups are required in individual specification sections, along with supporting materials.
- B. Build mockups for typical exterior wall of types of construction and in sizes as indicated on Drawings; include full thickness, including exterior face and backup wythes and accessories.
 - 1. Include a sealant-filled joint at least 16 inches (400 mm) long in each exterior wall mockup.
 - 2. Include through-wall flashing installed for a 24-inch (600-mm) length in corner of exterior wall mockup approximately 16 inches (400 mm) down from top of mockup, with a 12-inch (300-mm) length of flashing left exposed to view (omit masonry above half of flashing).
 - 3. Include metal studs, sheathing, sheathing joint-and-penetration treatment, air barrier, veneer anchors, flashing, cavity drainage material, and weep holes in exterior masonry-veneer wall mockup.

- 4. Include on one face of interior unit masonry wall mockup.
- C. Where masonry is to match existing, erect mockups adjacent and parallel to existing surface as directed.
- D. Clean exposed faces of mockups with masonry cleaner specified in Division 04.
- E. Timing of Exterior Wall Mock-Up: Construct exterior wall mock-up on site no later than 120 calendar days after the Commencement of the Work on site and a minimum of 60 calendar days prior to actual Work.
- F. Location of Exterior Wall Mock-up: Construct mock-up on site at location approved by the Architect. Do not construct mock-up on the actual building.
- G. Approval of mockups is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; and aesthetic qualities of workmanship.
 - 1. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Architect in writing.
- H. Field Testing of Mock-Ups: Owner's testing agency will perform the following tests on installed mock-ups:
 - 1. Window/Curtain wall systems, ASTM E 1105, ASTM E 783, AAMA 501.2
 - 2. Clay masonry, ASTM C67, ASTM C1601, ASTM C 1715
 - 3.
- I. Demolish and remove mockups when directed, unless otherwise indicated. Upon Architect's approval of removal of mockup, components from mockup may be utilized in final construction.
- 3.3 PROTECTION
 - A. Protect mockups from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

END OF SECTION 01 4339

SECTION 01 5000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

- A. Specific administrative and procedural minimum actions are specified in this section, as extensions of provisions in General Conditions and other Contract Documents. Nothing in this section is intended to limit types and amounts of temporary work required, and no omission from this section will be recognized as an indication that such temporary activity is not required for successful completion of the work and compliance with requirements of Contract Documents.
- B. Each Contractor is specifically assigned certain responsibilities for temporary facilities to be used by all Contractors, other entities at the site, the Owner's work forces and other personnel including occupants of the project, Owner's Project Manager, the Architect, test agencies, personnel of governing authorities, and similar entities and personnel authorized to be at the project site during construction. In general, each Contractor is assigned the responsibilities for installation, operation and removal of each temporary facility which is related by recognized trades to its scope of contract work; and, except as otherwise indicated, each is responsible for costs and use charges associated therewith, including fuel, power usage, water usage and similar usage costs. The Contractor is responsible for temporary facilities not related to any other Contractor's scope of contract work and not otherwise specifically assigned, as designated by the Architect.
- C. No costs or usage charges for temporary facilities are chargeable to the Owner, nor can any Contractor's cost or usage charges for temporary facilities be accepted as the basis for a change order extra. The total costs and usage charges for temporary facilities are included, collectively, in the Contract Amounts.

1.2 GENERAL REQUIREMENTS

- A. Each Contractor shall provide and operate all hoists, cranes, helicopters and furnish and erect all ladders and scaffolding as required for their work and by their subcontractors, constructed to afford proper protection to craftsmen, their Work and other Work in progress and previously executed.
- B. Informational Submittals:
 - 1. Site Plan: Submit site plan showing temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
 - 2. Moisture-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage.
 - a. Describe delivery, handling, and storage provisions for materials subject to water absorption or water damage.
 - b. Indicate procedures for discarding water-damaged materials, protocols for mitigating water intrusion into completed Work, and replacing water-damaged work.
- c. Indicate sequencing of work that requires water, such as sprayed fire-resistive materials, plastering, and terrazzo grinding, and describe plans for dealing with water from these operations. Show procedures for verifying that wet construction has dried sufficiently to permit installation of finish materials.
- 3. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Identify further options if proposed measures are later determined to be inadequate. Include the following:
 - a. Locations of dust-control partitions at each phase of work.
 - b. HVAC system isolation schematic drawing.
 - c. Location of proposed air-filtration system discharge.
 - d. Waste handling procedures.
 - e. Other dust-control measures.

1.3 JOB CONDITIONS

- A. Each Contractor shall establish and initiate use of each temporary facility at time first reasonably required for proper performance of the total work of project. Terminate use and remove facilities at earliest reasonable time, when no longer needed or when permanent facilities have, with authorized use, replaced the need.
- B. Each Contractor shall install, operate, maintain and protect temporary facilities in a manner and at locations that will be safe, nonhazardous, sanitary, protective of persons and property, and free of deleterious effects.
- C. Isolation of Work Areas in Occupied Facilities: Prevent dust, fumes, and odors from entering occupied areas.
 - 1. Prior to commencing work, isolate the HVAC system in area where work is to be performed according to coordination drawings.
 - a. Disconnect supply and return ductwork in work area from HVAC systems servicing occupied areas.
 - b. Maintain negative air pressure within work area using HEPA-equipped air-filtration units, starting with commencement of temporary partition construction, and continuing until removal of temporary partitions is complete.
 - 2. Maintain dust partitions during the Work. Use vacuum collection attachments on dustproducing equipment. Isolate limited work within occupied areas using portable dustcontainment devices.
 - 3. Perform daily construction cleanup and final cleanup using approved, HEPA-filter-equipped vacuum equipment
- D. Contractor is to provide road safety and traffic controls when working on or near any roadway or sidewalk on campus. Including flag personnel, signage, cones and all necessary safety measures to assure the safety of the pedestrians and vehicles at all times. This includes escorting deliveries using equipment other than a truck or car on roadways and walkways with a flag person. Backhoes can be run without an escort.
- E. Tree and Plant Protection: Install temporary fencing located as indicated or outside the drip line of trees to protect vegetation from damage from construction operations. Protect tree root systems from damage, flooding, and erosion

F. Scaffolding: Erect and maintain scaffolding located at existing building surfaces in such a manner as to prevent damage to existing building materials.

1.4 ENVIRONMENTAL PROTECTION

A. Each Contractor shall provide facilities, establish procedures, and conduct construction activities in a manner that will ensure compliance with environmental and other regulations controlling construction activities at project site. The Contractor shall designate one person, the Construction Superintendent or other, to enforce strict discipline on activities related to generation of wastes, pollution of air/water/soil, generation of noise, and similar harmful or deleterious effects which might violate regulations or reasonably irritate persons at or in vicinity of project site. Anti-pollution measures required by D.E.P., as applicable are to be followed.

1.5 FIELD OFFICES

- A. The Contractor shall establish a construction office on the site where directed by the Owner.
- B. Provide adequate office space for field office personnel of Contractor plus one spare work station for incidental use by Contractors' personnel; suitably finished, furnished, equipped and heated/air conditioned. Provide a Group 3 or greater facsimile machine with separate telephone lines for use of all Contractors, the Architect and the Owner on the site in the Construction Trailer as well as the Architect/Owner trailer. Include separate space for project meetings, with tables not less than 4' x 8', and seating for not less than 12 persons; cover main walls with tackboard material for posting of notices, progress schedule and similar information. Provide shelf space adequate for storage of approved samples.
- C. The Contractor shall provide a lockable office, minimum space 12' x 40' at the site for the Owner/Architect. For duration of the entire construction project, provide this office with:
 - 1. Temporary electric service sufficient for all equipment in office. Service and monthly usage is to be paid by the Contractor.
 - 2. Adequate lighting, toilet facilities chemically treated, heating, ventilation and air conditioning throughout.
 - 3. Weekly janitorial services.
 - 4. Telephone:
 - a. Provide two (2) telephone lines; one designated for fax machine. Service and monthly usage is to be paid by the Contractor.
 - b. Provide two (2) telephones. Each telephone to have the capacity of answering either line, placing calls on hold, transferring calls and conference calling. These instruments are to be located as directed by the Owner's Project Manager (phones, fax, computer).
 - c. Provide one (1) automatic telephone answering/recording device to be located in this office.
 - d. Provide an external sound-emitting device to have a different sound from other devices that may be installed outside Contractor's office.

- e. These telephones shall have listed telephone numbers and monthly bills are paid by the Contractor.
- f. Provide cable service for high speed internet access. Cost of service is to be paid by the Contractor.
- 5. Furniture and equipment as follows:
 - a. Three desks, three swivel chairs and two side chairs.
 - b. Two plan racks, two plan tables and one sample shelf.
 - c. Two 5-drawer file cabinets.
 - d. One draftsman's stool and one drafting table with a 36" x 60" top and straight edge.
 - e. Two meeting tables 8' x 4' minimum and twelve (12) folding chairs.
 - f. One copying machine, Xerox or equal complete with paper supplies and two-year maintenance contract. (Capable of producing 50 copies per minute and have sort, sort/staple function.)
 - g. One first-aid cabinet complete with supplies. Model 0412036 as manufactured by Mine Safety Appliances Company or equal.
 - h. One calculator, electric semi-automatic.
 - i. One water cooler with water service.
 - j. One plain paper fax machine with memory dial.
 - k. Provide copy/fax paper on request.
- 6. Trailer to be laid out with office at each end and conference room in the center.
- D. Other Contractors shall each provide suitable field offices for their own personnel and for incidental use by their Contractors.
 - 1. General Note: All temporary office trailers shall be strapped down to the ground.
- E. The Contractor shall provide temporary electrical service to the Contractor's and Architect/Owner field offices. Connection of other contractors' field offices shall be each contractor's responsibility, coordinated with the Contractor.

1.6 SHEDS

A. Each Contractor shall provide his own temporary sheds or trailers for storage, fabrication and similar purposes, which shall be located in accordance with the Contractor's coordinated plan for site utilization, as directed by the Architect and Owner.

1.7 WATER CONTROL

- A. Surface water drainage provisions shall be provided by the Contractor. The Contractor is to comply with Erosion and Sedimentation Control Plan on the Drawings and adjust as directed by the Owner to eliminate any interference with other trades work and access to areas of the site.
- B. The Contractor will be responsible to control all water during excavations and to maintain the bottom of footings, trenches and mass excavations in a stable condition. Replace all "soft spots" with suitable clean compactable fill as part of the base contract.

1.8 SECURITY

- A. The Contractor shall maintain complete security on the site at all times outside of normal working hours to protect the Work and all field offices, and to secure the area of construction by restricting all trespassers.
 - 1. This means locking the gates. A guard is not required.

1.9 SITE ENCLOSURE FENCE

A. The Contractor shall enclose the entire project site to be sufficient to contain entire construction activity. Provide 8' high chain link steel fence with screening with custom TCNJ logo/lettering. Provide 8' high gates for both personnel and trucks, with locks held under strict security control. A minimum of four gates will be required (locations will be coordinated in the field with the Owner). Fence to include top rail and be maintained throughout the project in a straight and plumb condition.

1.10 TEMPORARY CONSTRUCTION FACILITIES

- A. Contractor to provide temporary stairs (centrally located, meeting the latest OSHA requirements) at each story of construction as soon as construction of floor system at head of stairs is started, and retain in use until permanent stairs are placed in use. Also, provide temporary plywood walkways, scaffold and railings as needed for public areas to protect against overhead work. Also refer to Paragraph 1.10 of this section.
- B. Contractor to provide, maintain, operate and remove when no longer needed, a temporary elevator for vertical movement of personnel and materials if required. Provide full time operator if required. Also refer to Paragraph 1.10 of this section
- C. Where mud, snow, ice or other hazardous conditions exist in the purview (Scope of Work), the Contractor shall remove the hazards immediately and replace with suitable material for the other contractors use. If the Owner is compelled to remove the hazards with their own forces due to inaction by the Contractor, then that Contractor will be back-charged for the work performed by the Owner.
- D. No welding, cutting by torch, or Work utilizing or causing flammable waste shall be done unless adequate fire protection is provided and maintained for the duration of the Work in the area of operations.
- E. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction
- 1.11 DEBRIS CONTROL (Refer to Section 01 7419 for further delineation)
 - A. Each Contractor shall be responsible for daily cleaning up of spillages and debris resulting from his operations and from those of his Subcontractors; and shall be responsible for complete removal and disposition of hazardous and toxic waste materials. The Contractor shall provide containers at grade, sufficient for the depositing of nonhazardous/nontoxic waste materials, and shall remove such waste materials from project site at least weekly during cold weather (daily high temperatures below 50°F) and at least twice weekly during mild and warm weather.
 - 1. Contractor is responsible to provide all dumpsters.
 - 2. Once per week, The Contractor is to provide three laborers to clean the site/building. The GC will provide tools (i.e., brooms, etc.) to accomplish this task. This is in

addition to the proper daily cleanup by all trades of the debris they deposit throughout the course of their normal workday.

- 3. The Architect and Owner shall coordinate the dumpster location with the Contractor. The Contractor shall be responsible for obtaining, maintaining, and disposing of dumpsters, and shall maintain clean work areas throughout the course of the project.
- B. The Contractor shall daily clean all mud, dirt and debris resulting from all trades operations from the adjacent streets, sidewalks, drives and parking areas and shall repair all damage caused by the cleaning to the satisfaction of the Owner.
- C. The Contractor is to provide and maintain appropriate means of trash disposal (i.e., chutes) to grade/dumpster. Multiple units may be required and shall be figured for in the GC bid.
- D. Should cleanup not be completed to the satisfaction of the Owner, the Owner will hire additional labor to clean the site and back charge the Contractor via a deduct change order.

1.12 TEMPORARY PARKING

- A. Limited staging and on site parking will be allowed on site. The Contractor will coordinate with the owner all parking areas with all the subcontractors. Parking for contractor employees is available across Route 31, on Carlton Avenue in the Owner's Contractor parking lot. Contractor to shuttle employees accordingly.
 - 1. Contractors shall figure the site will only have enough parking for 6 vehicles (or less). All others shall park at the TCNJ Carlton Avenue parking lot, and be shuttled as necessary to the site by the Contractor or other contractor means.

PART 2 - PRODUCTS

2.1 TEMPORARY CONSTRUCTION

- A. Construction Sign: Four (4) 8'-0" x 20'-0" vinyl banners shall be provided by the Contractor with the content as shown in the drawings attached to this section. Letters shall be of sizes and colors indicated. Letters shall be adhered to the face of the sign in strict accordance with manufacturer's printed instructions. Sign shall be installed on the site (hung on a fence) in location as directed by the Architect, plumb and level in all directions. Text shown is for general scope only. The Owner reserves the right to change the text prior to installation of sign. The signs shall remain in place for the duration of the project as per Architect/Owner direction.
- B. Contractor shall provide wind bracing per FM Research approved criteria.
- C. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by Owner from fumes and noise. Provide types of partitions approved by Owner in Owner occupied areas
 - 1. Temporary partitions within the new building as required for construction shall be constructed of 2x4 studs 16" o.c. with 5/8" drywall floor to bottom side of floor above.

Drywall shall be attached to occupied face of studs and nailed/screwed 8" o.c. maximum spacing. Joints shall occur over studs and shall be taped and finish spackled along with screws. Partitions are to be painted with two coats of paint for interior or exterior type partitions.

- 2. In areas where containment of airborne particles is critical to Owner operations, construct dustproof partitions with two layers of 6-mil (0.14-mm) polyethylene sheet on each side. Cover floor with two layers of 6-mil (0.14-mm) polyethylene sheet, extending sheets 18 inches (460 mm) up the sidewalls. Overlap and tape full length of joints. Cover floor with fire-retardant-treated plywood.
 - a. Construct vestibule and airlock at each entrance through temporary partition with not less than 48 inches (1219 mm) between doors. Maintain water-dampened foot mats in vestibule.
- 3. Where fire-resistance-rated temporary partitions are indicated or are required by authorities having jurisdiction, construct partitions according to the rated assemblies.
- 4. Insulate partitions to control noise transmission to occupied areas.
- 5. Seal joints and perimeter. Equip partitions with gasketed dustproof doors and security locks where openings are required.
- 6. Protect air-handling equipment.
- 7. Provide dust control adhesive-surface walk-off mats at each entrance through temporary partition.
- D. Contractor to use ¾" plywood for exterior faced temporary partitions.

PART 3 - EXECUTION

3.1 ENCLOSURES

- A. At all times, the Contractor shall secure building against unauthorized entrance at times when personnel are not working. Provide secure temporary enclosure at ground floor and other locations of possible entry, with locked entrances.
- B. At each story of construction, as soon as the structural floor work is principally completed and the enclosure wall work is principally completed, the Contractor shall provide temporary enclosure of remaining openings. Arrange enclosure work to accommodate access, temporary heating, and natural ventilation as required for construction work by all entities on the project.
- C. Where any form of demolition will expose the interior of the building to weather, demolition shall follow the erection of weatherproof walls by the Contractor installed inside the demolition line, sealed and flashed, as required, to keep all water from the building interior. Keep temporary weatherproofing in place until new construction has been completed to the stage where water will not enter the building.
- D. The Contractor shall provide constant protection against rain, wind, storms, frost or heat to maintain the work, materials, apparatus and fixtures free from damage. At the end of each day's work, cover work likely to be damaged. During cold weather, protect work from damage by freezing and provide such enclosures and heating apparatus as may be necessary diligently to prosecute the Work without stoppage for reason of unfavorable weather.

E. Wherever a Contractor provides openings through walls or slabs, each location shall be adequately protected at the end of each working day with temporary enclosures to make these areas tight. Openings through exterior walls shall be watertight.

3.2 TEMPORARY ELECTRICITY

- A. As soon as practical after start of work at project site, the Contractor or Subcontractor(s) shall provide temporary electrical power distribution system, sufficient to accommodate temporary lighting and construction operations including the use of power tools, including heavy duty electrical welding units, electrical heating units, and start-up of specified building equipment which must be tested, started or placed into use prior to completion of its permanent power connections. Provide weatherproof, grounded wiring with overload protection; with direct wired connections, where feasible, and for voltages over 220/208 volts. Locate multiple outlets, not less than 4 gang, at each story of construction, spaced so that entire area of construction can be reached by power tools on a single extension cord of 100' maximum length.
 - 1. **The owner** shall pay for cost of all electric energy used on distribution lines installed for the duration of the project, either by means of temporary power or permanent power since this is a renovation project.
 - 2. Contractor shall provide and pay for all maintenance, servicing, operation and supervision of lines installed for the project. He shall also maintain and service electrical equipment installed by the Contractor and necessary for maintenance of temporary heat after same is required in the building.
 - 3. Provide service with ground fault circuit interrupter feature, activated from each circuit of 20 amp or less rating.
 - 4. Supply power for electric welding, if any, from either temporary power distribution system or by engine driven power generator sets, at Contractor's option.
 - 5. Where a service of a type other than herein mentioned is required, the Contractor requiring same shall install and pay all costs for such special service.
 - 6. As permanent power distribution system is accepted as substantially complete, either entire system or usable portions thereof, make suitable provisions for temporary use thereof, and remove unused portions of temporary system. Maintain and operate permanent electrical supply and distribution system until time of final acceptance and transfer of operation to Owner's personnel.
 - 7. Provide meters, if required, for electrical power.
 - 8. When temporary electrical lines are no longer required, they shall be removed by the Contractor and any part, or parts, of the grounds or buildings disturbed or damaged shall be brought back to their original condition.
 - 9. Contractor shall pay for all power up to Notice of Substantial Completion. At that time, the Owner will commence payment for all electric power usage. This is not a requirement for this project. The owner will pay for elec. usage during construction.
 - 10. Contractor shall make power and lighting available to all Contractors on a 24-hour basis at his own expense. Temporary power and lighting is to be maintained at all times unless directed otherwise by the Owner.
 - 11. Contractor shall satisfy requirements of Electricians Union for maintaining temporary power such as stand-bys etc., and pay for all associated costs.
- B. Contractor shall provide sufficient temporary lighting to ensure proper workmanship everywhere; by combined use of daylight, general lighting, and portable plug in task lighting.

- 1. Provide as a minimum uniformly spaced general lighting equivalent to not less than one 200 watt incandescent lamp per 1,000 sq. ft. of floor area, and one 100 watt lamp per 50' of corridor or per flight of stairs.
- 2. Limit lighting installations to intensities which will accommodate normal access and workmanship requirements, recognizing that each entity performing work requiring higher intensity lighting will provide supplementary plug in temporary lighting at localized areas where such work is in progress.
- 3. As permanent lighting system is substantially complete, for each story or usable portion thereof, make suitable provisions for temporary use thereof, and remove unused portions of temporary lighting system. Maintain and operate permanent lighting system until time of final acceptance and transfer of operation to Owner's personnel.
- 4. Replace all bulbs in permanent light fixtures that have been utilized for temporary lighting.
- 5. Maintain temporary lighting on a daily basis and change or adjust as new wall configurations go up.

3.3 TEMPORARY HEATING AND COOLING

- A. Prior to enclosure of building, buildings, or portions thereof, and when weather conditions indicate the necessity for temporary heat, the Contractor shall provide, maintain, operate and pay all costs, including fuel, for a sufficient number of approved portable heaters that will maintain a minimum temperature of 45 degrees Fahrenheit in all working areas of the building, unless higher temperatures are specified in individual specification sections, so that the progress of the work is not impeded. Contractor shall provide plastic tent protection, temporary window and door opening closures, and any other protection required so that <u>any</u> work can continue in cold and inclement weather. The Contractor shall include the cost of temporary heat in their contract price and shall calculate the need for heat based on historical precedent and the stage of completion of the work. Normal heating months span from November 15 to April 15. The Contractor shall have temporary heat available throughout the building for daily 24 hour use.
 - 1. Temporary enclosures shall begin one month prior to the start of temporary heat. Should the Contractor not begin the enclosure process at that time, the Owner will hire labor to have this work completed, and back charge the Contractor for all costs associated with this work.
- B. As soon as temporary, or permanent, enclosure is completed for any area or story of construction, and temporary heat is required for scheduled work, or required to facilitate proper workmanship, and permanent heating system is not yet operable or authorized for use, the Contractor shall provide temporary heat service for every entity authorized to do work at project site. Maintain temperatures as indicated by other Specification Sections for each type of work to be performed.
- C. The Contractor shall enclose the building from November 15 through the following April 15 with temporary or permanent enclosures (doors, windows, etc.) to maintain a working temperature and to secure the building from trespassers. This will coincide with the scheduled time for temporary heat.
- D. The building shall be considered enclosed when the roof is on and substantially weathertight; the exterior walls have been completed to the point that they are

weathertight (but not necessarily with final exterior finish such as brick); and when openings, doors and windows are closed with either temporary or permanent closures. Final decision of when the building is considered enclosed shall be solely the decision of the Owner.

- E. As permanent heating/cooling system is substantially complete, for each story or usable portion thereof, the Contractor shall make suitable provisions for use thereof in temporary heating and cooling, and notify the Contractor to remove unused portions of temporary heating service. The Contractor shall maintain and operate permanent system for temporary heating/cooling purposes, including service to occupied areas if any, until time of final acceptance and transfer of operation to Owner's personnel, for major parts of system if not for entire heating system.
- F. After the permanent heating system is generally ready for use and the conditions of construction requires continuous 24 hour heat in the building, the Contractor shall provide, operate and maintain temporary radiation or unit heaters to provide required temperatures for the conduct of the work. This service shall be continued until the permanent heating system has been completely installed and in operation and the buildings of the project completed. The Contractor is to provide a one year warrantee from date of substantial completion, not the date of temporary heat. The Contractor shall furnish and pay for all fuel as required for providing temporary heat via the permanent heating system.
- G. All permanent heating equipment used to supply temporary heat shall be completely cleaned and reconditioned by the Contractor prior to final acceptance. Radiator traps and valves used in the heating system during the period of its operation to supply temporary heat shall not be reinstalled in the permanent system. Install new disposable filters and clean non-disposable filters prior to final acceptance.
- H. The Contractor shall remove all soot, smudges, and other deposits from walls, ceilings, and all exposed surfaces which are the result of the use of any temporary heating equipment including the use of the permanent heating system for temporary heat purposes. There shall not be any finish work until all such surfaces are properly cleaned.
- I. The project will have two full seasons that will require full building temporary heat (either via temporary units or permanent equipment) and Contractor shall bear all costs associated with providing this temporary heat.

3.4 TEMPORARY VENTILATION

- A. A trade requiring ventilation for Work shall provide fans to induce circulation of air provided prior approval has been obtained from the Owner and Architect.
- B. Provide dehumidification systems when required to reduce substrate moisture levels to level required to allow installation or application of finishes

3.5 TEMPORARY TELEPHONES

A. The Contractor shall provide and pay for telephone instruments and all their monthly bills plus the Architect/Owner field office.

B. Each Contractor is responsible for their own telephone service and for payment of all charges relating to that service.

3.6 TEMPORARY WATER

- A. As soon as practical after start of work at project site, the Contractor shall provide temporary water distribution piping system, with meter and back flow preventer, from one of the potable water hydrants (in location as approved by the Owner), complete with 3/4" hose bib terminations and fire hose sized termination, at each story of construction work, located so that any area of building construction can be reached with a 100' length of hose. Provide hose units and protect system from freezing. Maintain system in operation at all locations until either the need for water has ended or the permanent system is placed in use for temporary water service. Maintain minimum water pressure of 30 psig at each hose bib, with 5 gpm flow rate.
- B. Where potable water is available, either for total temporary requirements or as a separate service for drinking water and sanitation, extend piping system through construction areas and to temporary offices and hand wash facilities, and provide one refrigerated drinking fountain at each temporary office and at least one fountain at every third story of construction.
- C. As permanent water distribution system is accepted as substantially completed, either entire system or usable portions thereof, make suitable provisions for temporary use thereof and remove unused portions of temporary system. Maintain and operate permanent water distribution system until time of final acceptance and transfer of operation to Owner's personnel.
- D. If the source of water supply is a well, provisions covering the supply of water shall include the installation of necessary power driven pumping facilities, as well as protection of well from contamination. The water supply shall be tested periodically by the Contractor and, if necessary, shall be chlorinated and filtered.
- E. Contractor shall pay all monthly use charges for water.
 - 1. Provide meters for water services, if required. Read meters and record readings weekly, and include in progress report to Architect at monthly intervals.

3.7 TEMPORARY SANITARY FACILITIES

A. Starting at time of start of work at project site, the Contractor shall provide and maintain selfcontained toilet units of type acceptable to governing authorities, adequate, at all stages of construction, for use of personnel at project site. Provide separate facilities for male and female personnel when both sexes are working, in any capacity, at project site. Provide selfcontained hand wash facilities. Facilities shall remain in use until completion of project. Use of permanent facilities will not be permitted.

3.8 REMOVAL AND RESTORATION

- A. Prior to acceptance of the Project, each Contractor shall remove temporary work for which he has been responsible.
- 3.9 OWNER'S RIGHTS

- A. If any Contractor fails to carry out his responsibilities in providing temporary facilities, as set forth above, the Owner shall have the right to take such action as they deem proper for the protection and conduct of the Work, and to deduct the cost thereof from the amount due the Contractor at fault.
- B. Extended work days, hours, shifts, weekend work, etc. may be allowed upon coordination and approval by Owner, and Architect at no additional cost to the Owner.
 - 1. Should the schedule begin to slip, for any reason, each Contractor will be required to work additional shifts or weekends to recover the lost time.

3.10 TEMPORARY STAIRS and ELEVATOR

- A. The Contractor will supply wooden stairs per floor suitable for other trades to access the work on upper levels including the mechanical mezzanines. The stairs shall meet the code in effect at the time of construction with handrails and guardrails of the appropriate structural capacity and dimensions. The Contractor shall submit to the local code official (if required) two sets design drawings of the stairs that have been prepared, signed and sealed by an Architect licensed in the State of the place of work. The Contractor shall maintain these stairs until such time that the permanent stairs are available for use. At that time, the Contractor shall remove the temporary stairs.
- B. The Contractor is to provide, maintain, operate, and remove when no longer needed, a temporary elevator for the vertical movement of personnel and equipment/materials and pay for all costs associated with said elevator and its operation should OSHA regulations require the use of one.
- 3.11 MOISTURE AND MOLD CONTROL
 - A. Contractor's Moisture-Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.
 - B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect as follows:
 - 1. Protect porous materials from water damage.
 - 2. Protect stored and installed material from flowing or standing water.
 - 3. Keep porous and organic materials from coming into prolonged contact with concrete.
 - 4. Remove standing water from decks.
 - 5. Keep deck openings covered or dammed.
 - C. Partially Enclosed Construction Phase: After installation of weather barriers but before full enclosure and conditioning of building, when installed materials are still subject to infiltration of moisture and ambient mold spores, protect as follows:
 - 1. Do not load or install drywall or other porous materials or components, or items with high organic content, into partially enclosed building.
 - 2. Keep interior spaces reasonably clean and protected from water damage.
 - 3. Periodically collect and remove waste containing cellulose or other organic matter.
 - 4. Discard or replace water-damaged material.
 - 5. Do not install material that is wet.
 - 6. Discard, replace, or clean stored or installed material that begins to grow mold.

- 7. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.
- D. Controlled Construction Phase of Construction: After completing and sealing of the building enclosure but prior to the full operation of permanent HVAC systems, maintain as follows:
 - 1. Control moisture and humidity inside building by maintaining effective dry-in conditions.
 - 2. Use permanent HVAC system to control humidity.
 - 3. Comply with manufacturer's written instructions for temperature, relative humidity, and exposure to water limits.
 - a. Hygroscopic materials that may support mold growth, including wood and gypsumbased products, that become wet during the course of construction and remain wet for 48 hours are considered defective.
 - b. Measure moisture content of materials that have been exposed to moisture during construction operations or after installation. Record readings beginning at time of exposure and continuing daily for 48 hours. Identify materials containing moisture levels higher than allowed. Report findings in writing to Architect.
 - c. Remove materials that cannot be completely restored to their manufactured moisture level within 48 hours

END OF SECTION 01 5000

Attachment: Project Sign Layout

SECTION 01 6000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; and equivalent products.
- B. Related Requirements:
 - 1. Section 012500 "Substitution Procedures" for requests for substitutions.
 - 2. Section 014200 "References" for applicable industry standards for products specified.

1.2 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - 1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.
 - 2. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - 3. Equivalent Product: Product that is demonstrated and approved through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Basis-of-Design Product Specification: A specification in which a specific manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating equivalent products of additional manufacturers named in the specification.

1.3 ACTION SUBMITTALS

- A. Equivalent Product Requests: Submit request for consideration of each equivalent product. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
 - 1. Include data to indicate compliance with the requirements specified in "Equivalent Products" Article.
 - Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a equivalent product request. Architect will notify Contractor of approval or rejection of proposed equivalent product request within 10 working days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.

- a. Form of Approval: As specified in Section 013300 "Submittal Procedures."
- b. Use product specified if Architect does not issue a decision on use of a equivalent product request within time allocated.
- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

1.4 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.
 - 1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
 - 2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.
- B. Mechanical Materials and Equipment: When two or more items of same material or equipment are required (pumps, valves, air conditioning units, etc.), they shall be of the same manufacturer. Product manufacturer uniformity does not apply to raw materials, bulk materials, pipe, tube, fittings (except flanged and grooved types), sheet metal, wire, steel bar stock, welding rods, solder, fasteners, motors for dissimilar equipment units, and similar items used in the work, except as otherwise indicated. Provide products which are compatible within systems and other connected items.
- C. Asbestos in Materials: All products submitted for use and incorporated into this project shall be asbestos free.
- D. Mercury-Free Products: All products submitted for use and incorporated into this Project shall be mercury-free. In the absence of mercury-free products, provide products with the lowest amount of mercury possible.
- E. Lead-Free Products: All products submitted for use and incorporated into this Project shall be lead-free.
- F. To the greatest extent possible, provide products, materials and equipment of a singular generic kind and from a single source.
- G. Performance Criteria: Provide products which comply with specific performances indicated, and which are recommended by manufacturer, in published product literature or by individual certification, for application indicated. Overall performance of a product is implied where product is specified for specific performance.

1.5 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:

- 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
- 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
- 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
- 4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.

C. Storage:

- 1. Store products to allow for inspection and measurement of quantity or counting of units.
- 2. Store materials in a manner that will not endanger Project structure.
- 3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
- 4. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
- 5. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
- 6. Protect stored products from damage and liquids from freezing.
- 7. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
 - 1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 - 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 - 3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
 - 4. Where products are accompanied by the term "as selected," Architect will make selection.
 - 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
 - 6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved equivalent," comply with requirements in "Equivalent Products" Article to obtain approval for use of an unnamed product.

7. A named product and model number establishes the characteristics and salient features of the specifications even when they are not fully described and will serve as the basis of comparison.

B. Product Selection Procedures:

- 1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Equivalent products or substitutions for Contractor's convenience will not be considered.
- 2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Equivalent products or substitutions for Contractor's convenience will not be considered.
- 3. Products:
 - a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Equivalent products or substitutions for Contractor's convenience will not be considered.
 - b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, that complies with requirements. Comply with requirements in "Equivalent Products" Article for consideration of an unnamed product.

4. Manufacturers:

- a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Equivalent products or substitutions for Contractor's convenience will not be considered.
- b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Equivalent Products" Article for consideration of an unnamed manufacturer's product.
- 5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a equivalent product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Equivalent Products" Article for consideration of an unnamed product by one of the other named manufacturers.
- C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.
 - 1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section 012500 "Substitution Procedures" for proposal of product.
- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Architect from manufacturer's full range" or similar phrase, select a product that complies with requirements. Architect will select color, gloss, pattern, density, or

texture from manufacturer's product line that includes both standard and premium items.

2.2 EQUIVALENT PRODUCTS

- A. Conditions for Consideration: Architect will consider Contractor's request for equivalent product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
 - 1. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
 - 2. Evidence that the proposed product provides sustainable design characteristics that specified product provided for achieving LEED prerequisites and credits.
 - 3. Evidence that the proposed product will not adversely affect Contractor's construction schedule.
 - 4. Evidence that the proposed product has received necessary approvals of authorities having jurisdiction.
 - 5. Evidence that the proposed product will have no adverse effect on other trades and will not affect or delay progress schedule; or if proposed product involves more than one contractor, proposed product has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
 - 6. Evidence that the proposed product maintenance service and source of replacement parts, as applicable, is available similar to the specified product.
 - 7. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
 - 8. Evidence that proposed product provides specified warranty.
 - 9. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
 - 10. Samples, if requested.

PART 3 - EXECUTION (Not Used)

END OF SECTION 01 6000

SECTION 01 7329 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes procedural requirements for cutting and patching.
- B. Related Requirements:
 - 1. Divisions 2 through 33 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.2 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other work.
- B. Patching: Fitting and repair work required to restore construction to original conditions after installation of other work.

1.3 SUBMITTALS

- A. Cutting and Patching Proposal: Submit proposal describing procedures at least 10 days prior to the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
 - 1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
 - 2. Changes to Existing Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
 - 3. Products: List products to be used and firms or entities that will perform the Work.
 - 4. Dates: Indicate when cutting and patching will be performed.
 - 5. Utilities: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out of service. Indicate how long service will be disrupted.
 - 6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
 - 7. Architect's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

1.4 QUALITY ASSURANCE

A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.

- B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
 - 1. Primary operational systems and equipment.
 - 2. Air or smoke barriers.
 - 3. Fire-protection systems.
 - 4. Control systems.
 - 5. Conveying systems.
 - 6. Electrical wiring systems.
- C. Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
 - 1. Water, moisture, or vapor barriers.
 - 2. Membranes and flashings.
 - 3. Equipment supports.
 - 4. Piping, ductwork, vessels, and equipment.
 - 5. Noise- and vibration-control elements and systems.
- D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
 - 1. If possible, retain original Installer or fabricator to cut and patch exposed Work listed below. If it is impossible to engage original Installer or fabricator, engage another recognized, experienced, and specialized firm.
 - a. Processed concrete finishes.
 - b. Ornamental metal.
 - c. Roofing.
 - d. Firestopping.
 - e. Window wall system.
- E. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.
- 1.5 Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections of these Specifications.

- B. Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
 - 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to minimize interruption of services to occupied areas.

3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
 - 1. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

- 2. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
- 3. Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
- 4. Excavating and Backfilling: Comply with requirements in applicable Sections of these Specifications where required by cutting and patching operations.
- 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
- 6. Proceed with patching after construction operations requiring cutting are complete.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
 - 1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
 - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 - 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 - 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance
 - 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weather tight condition.

END OF SECTION 01 7329

SECTION 01 7419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

- 1.1 SUMMARY
 - A. This Section includes administrative and procedural requirements for the following:
 - 1. Salvaging nonhazardous demolition and construction waste.
 - 2. Recycling nonhazardous demolition and construction waste.
 - 3. Disposing of nonhazardous demolition and construction waste.
 - B. Related Sections include the following:
 - 1. Division 02 Section "Selective Demolition" for disposition of waste resulting from selective demolition of existing buildings,
 - 2. Division 04 Section "Unit Masonry" for disposal requirements for masonry waste.

1.2 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

1.3 PERFORMANCE REQUIREMENTS

A. General: Achieve end-of-Project rates for salvage/recycling of at least 75 percent by weight of total non-hazardous solid waste generated by the Work. Practice efficient waste management in the use of materials in the course of the Work. Use all reasonable means to divert construction and demolition waste from landfills and incinerators. Facilitate recycling and salvage of materials.

1.4 INFORMATIONAL SUBMITTALS

- A. Waste Management Plan: Submit 4 copies of plan within 15 days of date established for the Notice to Proceed.
- B. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit report. Use Form CWM-8 for demolition waste. Include the following information:
 - 1. Material category.

- 2. Generation point of waste.
- 3. Total quantity of waste in tons
- 4. Quantity of waste salvaged, both estimated and actual in tons
- 5. Quantity of waste recycled, both estimated and actual in tons
- 6. Total quantity of waste recovered (salvaged plus recycled) in tons
- 7. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.
- C. Waste Reduction Calculations: Before request for Substantial Completion, submit calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.
- D. Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.
- E. Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.
- F. Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- G. Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- H. LEED Submittal: LEED letter template for Credit MR 2, signed by Contractor, tabulating total waste material, quantities diverted and means by which it is diverted, and statement that requirements for the credit have been met.
- I. Qualification Data: For refrigerant recovery technician.
- J. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.5 QUALITY ASSURANCE

- A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.
- B. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.
- C. Waste Management Conference: Conduct conference at Project site to comply with requirements in Division 01. Review methods and procedures related to waste management including, but not limited to, the following:
 - 1. Review and discuss waste management plan.
 - 2. Review requirements for documenting quantities of each type of waste and its disposition.
 - 3. Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.

- 4. Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
- 5. Review waste management requirements for each trade.

1.6 WASTE MANAGEMENT PLAN

- A. General: Develop plan consisting of waste identification, and waste reduction work plan. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing, and construction waste generated by the Work. Include estimated quantities and assumptions for estimates.
- C. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Use Form CWM-4 for demolition waste. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
 - 1. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
 - 2. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
 - 3. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
 - 4. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
 - 5. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

- A. General: Implement waste management plan as approved by the Owner. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
 - 1. Comply with Division 01 Section "Temporary Facilities" for operation, termination, and removal requirements.
- B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
 - 1. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

- C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
 - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
 - 2. Comply with Division 01 Section "Temporary Facilities" for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

A. Salvaged Items for Sale and Donation: Not permitted on Project site.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

- A. General: Recycle beverage containers used by on-site workers.
- B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.
- C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.
 - 1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.
 - a. Inspect containers and bins for contamination and remove contaminated materials if found.
 - 2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to present windblown dust.
 - 3. Stockpile materials away from construction area.
 - 4. Store components off the ground and protect from the weather.
 - 5. Remove recyclable waste off Owner's property and transport to recycling receiving or processor.

3.4 RECYCLING DEMOLITION WASTE

- A. Asphaltic Concrete Paving: Break up and transport paving to asphalt-recycling facility.
- B. Concrete: break up and sort rebar as best as possible. Recycle all concrete
- C. Recycle all unused metal products during construction of a new building and from the building before demolition remove all aluminum, copper and steel etc.
- D. Recycle as much unused and demolished products as possible and provide a complete report to Owner to confirm the percentage of waste being recycled on the project. Submit said report monthly.
- 3.5 RECYCLING CONSTRUCTION WASTE
 - A. Packaging:

- 1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
- 2. Polystyrene Packaging: Separate and bag materials.
- 3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
- 4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Wood Materials:
 - 1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.

3.6 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
 - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
 - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
- B. Burning: Do not burn waste materials on site.
- C. Burying: Do not bury waste materials on site.
- D. Disposal: Transport waste materials off Owner's property and legally dispose of them.
- E. Washing waste materials into sewers or drains is not permitted.

END OF SECTION 01 7419

SECTION 01 7700 – CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 DEFINITION

- A. Closeout is hereby defined to include general requirements near end of Contract Time, in preparation for final acceptance, final payment, normal termination of Contract, occupancy by Owner and similar actions evidencing completion of the work. Specific requirements for individual units of work are specified in sections of Divisions 2 through 33. Time of closeout is directly related to Substantial Completion. Phases may be completed and occupied before the entire project is deemed substantially complete.
 - 1. NOTE: This project will have only one Substantial Completion date upon all phases being completed.
- B. Completion in any particular Phase shall be defined that <u>every</u> material item has been installed for the Work Area defined by that Phase. Nothing is missing and therefore, the punch list can begin.

1.2 PREREQUISITES TO SUBSTANTIAL COMPLETION

- A. At least ten (10) days prior to requesting the Architect's inspection for certification of substantial completion, for either entire work or portions thereof, complete the following and list known exceptions in request:
 - 1. In progress payment request coincident with or first following date claimed, show either 100% completion for portion of work claimed as substantially complete, or list incomplete items, value of incomplete items, and reasons for being incomplete.
 - 2. Include supporting documentation for completion as indicated in these Contract Documents.
 - a. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
 - 3. Submit statement showing accounting of changes to the Contract Sum.
 - 4. Advise Owner of pending insurance change over requirements.
 - 5. For all fire sprinklers, devices, alarm system, roofing system, doors, insulation, etc. requiring FM Research approval, submit certification from Factory Mutual indicating compliance with requirements.
 - 6. Submit test/adjust/balance records.
 - 7. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
 - 8. Certificates of Release: Obtain and submit releases from authorities having jurisdiction enabling Owner's full and unrestricted use of the work and access to services and utilities, including occupancy permits, operating certificates, and similar releases.
 - 9. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
 - 10. Perform preventive maintenance on equipment used prior to Substantial Completion.
 - 11. Complete start up and testing of systems and equipment. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and

systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."

- 12. Advise Owner of changeover in heat and other utilities.
- 13. Participate with Owner in conducting inspection and walkthrough with local emergency responders
- 14. Discontinue, or change over, and remove from project site temporary facilities and services, along with construction tools and facilities, mockups, and similar elements.
- 15. Complete final clean up requirements.
- 16. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- B. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect and Owner will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection, or the Owner will notify Contractor of items, either on Contractor's list or additional items identified by Architect that must be completed or corrected before certificate will be issued.
 - a. Architect will perform inspection in areas no smaller than a floor plate. Inspection of individual rooms or spaces will not be performed.
 - b. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
 - c. Results of completed inspection will form the basis of requirements for Final Completion.
- C. Substantial Completion shall be defined for this project that every element of the project/construction and the contract, based on the contract and amended drawings and specification sections, is completed and the project is deemed complete, less repairs and/or touch up type work that would be generally referred to as punchlist work. If any components of the project, or site work associated with this contract are not installed, the project cannot be deemed substantially completed.

1.3 PREREQUISITES TO FINAL ACCEPTANCE

- A. Prior to requesting Owner and Architect's final inspection for certification of final acceptance and final payment, complete the following and list known exceptions, in request:
 - 1. Submit final payment request with final releases and supporting documentation not previously submitted and accepted.
 - 2. Submit release of liens for all subcontractors.
 - 3. Submit Contractor's statement that his final application, as presented, is the final bill and no other claims will be presented.
 - 4. Submit updated final statement, accounting for additional changes to Contract Sum including change orders and allowances.
 - 5. Submit certified copy of Architect's final punch list of itemized work to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, endorsed and dated by Architect.
 - 6. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion

construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.

- 7. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship/maintenance bonds, maintenance agreements, final certifications and similar documents
- 8. Deliver tools, spare parts, extra stocks of materials, and similar physical items to Owner, in location directed by Architect, obtaining a signed receipt of materials delivered. Refer to individual work sections for required quantities of spare parts, extra and overrun stock, maintenance tools and devices, keys, and similar physical units to be submitted. Label with manufacturer's name and model number where applicable.
 - a. Schedule of Maintenance Material Items: Prepare and submit schedule of maintenance material submittal items, including name and quantity of each item and name and number of related Specification Section.
- 9. Submit one set of record documents, bound copies of maintenance/operating manuals, final project photographs, damage or settlement survey, property survey, and similar final record information.
- 10. Complete final clean up requirements.
- 11. Touch up and otherwise repair and restore marred exposed finishes.
- 12. Submit notarized consent of surety to final payment.
- 13. Submit final liquidated damages settlement statement, if required, acceptable to Owner.
- 14. Revise and submit evidence of final, continuing insurance coverage complying with insurance requirements.
- 15. A letter from the Owner's representative certifying that he has been properly instructed in the operation and maintenance of equipment by the Contractor.
- 16. Maintenance Bond.
- 17. Underwriter's Certificate or Electrical Sub Code Official's Approval.
- 18. Fire Alarm Certification.
- 19. HVAC Contractor to submit certified balancing report.
- 20. Final acceptance by Architect of record documents
- B. Submit a written request for final inspection to determine acceptance a minimum of 10 days prior to date the work will be completed and ready for final inspection and tests Upon receipt of Contractor's notice that work has been completed, including all punch list items, but excepting incomplete items delayed because of circumstances acceptable to the Owner and Architect, the Owner and Architect will reinspect the work. Upon completion of reinspection, the Architect will either prepare the certificate of final acceptance or advise the Contractor of work not completed or obligations not fulfilled as required for final acceptance.
 - 1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected
- C. In the event that the work is not completed or obligations are not fulfilled as required for final acceptance and the Architect/Owner is required to reinspect the work more often than the two inspections the Contractor shall compensate the Architect and/or the Owner at the rate of \$1500.00 for each additional site visit required for reinspections. The compensation shall be processed by change order as a deduction to the Contractor's Contract Sum, which amount will be paid to the Architect by the Owner, through a Supplemental order as an addition to the Architect's Fee.

1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
 - 1. Organize list of spaces in sequential order, starting with exterior areas first and proceeding from lowest floor to highest floor.
 - 2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
 - 3. Include the following information at the top of each page:
 - a. Project name.
 - b. Date.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Page number.
 - 4. Submit list of incomplete items in the following format:
 - a. MS Excel electronic file. Architect will return annotated file.

PART 2 - PRODUCTS

- 2.1 MATERIALS
 - A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces. Use cleaning products that comply with the maximum allowable VOC levels.

PART 3 - EXECUTION

- 3.1 CLEANING
 - A. Where extra materials of value remaining after completion of associated work have become Owner's property, dispose of these to Owner's best advantage as directed.
 - B. After Substantial Completion of the Work, each Contractor shall do the final cleaning of the surfaces of his installations as may be required by the various Specification sections.
 - C. After each Contractor has cleaned their work, The General Contractor shall engage a professional cleaning service to perform final cleaning of the work consisting of cleaning each surface or unit to normal clean condition. Comply with manufacturer's instructions for cleaning operations and chemicals. The following are examples, but not by way of limitation, of cleaning levels required:
 - 1. Remove labels that are not required as permanent labels.
 - 2. Clean transparent materials, including mirrors and window/door glass, to a polished condition, removing substances that are noticeable as vision obscuring materials. Replace broken glass and damaged transparent materials.

- 3. Wipe surfaces of mechanical and electrical equipment clean, including elevator equipment and similar equipment; remove excess lubrication and other substances.
- 4. Remove debris and surface dust from limited access spaces including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics and similar spaces.
- 5. Vacuum and clean carpeted surfaces and similar soft surfaces.
- 6. Clean light fixtures and lamps to function with full efficiency.
- 7. Clean and wax or polish all hard floors following manufacturer's instructions.
- 8. Clean all window surfaces inside and outside.
- 9. Perform final cleaning in, on and around all casework, sinks, toilets fixtures, etc.
- 10. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
- 11. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
- 12. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
- 13. Remove tools, construction equipment, machinery, and surplus material from Project site.
- 14. Remove snow and ice to provide safe access to building.
- 15. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
- 16. Sweep concrete floors broom clean and wet mop.
- 17. Replace parts subject to unusual operating conditions.
- 18. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
- 19. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
- 20. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter on inspection.
 - a. Clean HVAC system in compliance with NADCA Standard 1992-01. Provide written report on completion of cleaning.
- 21. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
- 22. Leave Project clean and ready for occupancy.
- D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

3.2 REMOVE TEMPORARY FACILITIES

A. At the completion of the work prior to final payment, remove all temporary facilities entirely from site, including, but not limited to, the following: Field offices, trailers, shanties, sheds, job telephone, temporary toilets, temporary enclosures, dust barriers and other temporary protection devices.

3.3 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting inspection for determination of Substantial Completion.
- B. Repair or remove and replace defective construction. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment. Where damaged or worn items cannot be repaired or restored, provide replacements. Remove and replace operating components that cannot be repaired. Restore damaged construction and permanent facilities used during construction to specified condition.
 - 1. Remove and replace chipped, scratched, and broken glass, reflective surfaces, and other damaged transparent materials.
 - 2. Touch up and otherwise repair and restore marred or exposed finishes and surfaces. Replace finishes and surfaces that that already show evidence of repair or restoration.
 - a. Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates. Remove paint applied to required labels and identification.
 - 3. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.
 - 4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 01 7700

SECTION 01 7810 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Project record documents consisting of:
 - a. Record drawings.
 - b. Record project manual (specifications).
 - c. Record product data.
 - d. Miscellaneous record submissions.
- B. Refer to other sections of these specifications for further requirements.

1.2 SUBMITTALS

- A. Project Record Documents: Submit after substantial completion, but prior to final completion.
 - Record drawings: Submit in form of opaque prints and pdf electronic forms.
 a. Sets shall include all drawings, whether changed or not.
 - 2. Other record documents: Submit originals or good quality photocopies.
 - 3. Each prime/sub contractor is responsible for their respective trade, record documents and record drawings. Combine with General Contractor record drawing documents for a complete set.
- B. Closeout Submittals:
 - 1. Record Drawings: Submit PDF electronic files of scanned record prints and one set of prints
 - 2. Record Specifications: Submit annotated PDF electronic files of Project's Specifications, including addenda and contract modifications.
 - 3. Record Product Data: Submit annotated PDF electronic files and directories of each submittal
 - a. Where record Product Data are required as part of operation and maintenance manuals, submit duplicate marked-up Product Data as a component of manual
 - 4. Miscellaneous Record Submittals: See other Specification Sections for miscellaneous record-keeping requirements and submittals in connection with various construction activities. Submit annotated PDF electronic files and directories of each submittal.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 MAINTENANCE OF PROJECT RECORD DOCUMENTS

- A. Do not use record documents of any type for construction purposes.
- B. Maintain record documents in a secure location at the site while providing for access by the contractor and the architect during normal working hours; store in a fire-resistive room or container outside of normal working hours.
- C. Record information as soon as possible after it is obtained.
- D. Assign a person or persons responsible for maintaining record documents.
- E. Record the following types of information on all applicable record documents:
 - 1. Dimensional changes.
 - 2. New and revised details.
 - 3. Revisions to electrical circuits.
 - 4. Locations of utilities concealed in construction.
 - 5. Particulars on concealed products which will not be easy to identify later.
 - 6. Changes made by modifications to the contract; note identification numbers if applicable.
 - 7. New information which may be useful to the owner, but which was not shown in either the contract documents or submittals.

3.2 RECORD DRAWINGS

- A. Maintain a complete set of opaque prints of the contract drawings, marked to show changes.
- B. Where the actual work differs from that shown on the drawings, mark this set to show the actual work.
 - 1. Mark location of concealed items before they are covered by other work.
 - 2. Mark either record contract drawings or shop drawings, whichever are best suited to show the change.
- C. When the contractor is required by a provision of a modification to prepare a new drawing, rather than to revise existing drawings, obtain instructions from the architect as to the drawing scale and information required.
- D. Keep drawings in labeled, bound sets.
 - 1. Mark with red pencil.
 - 2. Mark work of separate contracts with different colors of pencils.
 - 3. Incorporate new drawings into existing sets, as they are issued.
- E. Where record drawings are also required as part of operation and maintenance data submittals, copy marks to another opaque print obtained from the architect.

- F. Format: Submit PDF electronic files of scanned record prints and one set of prints.
 - 1. Record Prints: Organize record prints and newly prepared record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
 - 2. Record Digital Data Files: Organize digital data information into separate electronic files that correspond to each sheet of the Contract Drawings. Name each file with the sheet identification. Include identification in each digital data file.
- G. Record Coordination Drawing Digital Data Files: Immediately after receiving Certificate of Substantial Completion and prior to final completion, submit the comprehensive model integrating all trade models for the project.
 - 1. Format: Same digital data software program, version, and operating system as the original Contract Drawings

3.3 RECORD PROJECT MANUAL

- A. Maintain a complete copy of the project manual, marked to show changes.
- B. Where the actual work differs from that shown in the project manual, mark the record copy to show the actual work.
 - 1. Include a copy of each addendum and modification to the contract.
 - 2. In addition to the types of information required on all record documents, record the following types of information:
 - a. Product options taken, when the specification allows more than one.
 - b. Proprietary name and model number of actual products furnished, for each product, material, and item of equipment specified.
 - c. Name of the supplier and installer, for each product for which neither a product data submittal nor a maintenance data submittal was specified.
- C. Format: Submit record Specifications as scanned PDF electronic file(s) of marked-up paper copy of Specifications

3.4 RECORD PRODUCT DATA

- A. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
 - 1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
 - 2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
 - 3. Note related Change Orders, record Specifications, and record Drawings where applicable.
- B. Format: Submit record Product Data as annotated PDF electronic file or scanned PDF electronic file(s) of marked-up paper copy of Product Data.

- 3.5 Include record Product Data directory organized by Specification Section number and title, electronically linked to each item of record Product Data
- 3.6 MISCELLANEOUS RECORD SUBMITTALS
 - A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.
 - B. Format: Submit miscellaneous record submittals as PDF electronic file or scanned PDF electronic file(s) of marked-up miscellaneous record submittals.
 - 1. Include miscellaneous record submittals directory organized by Specification Section number and title, electronically linked to each item of miscellaneous record submittals.
- 3.7 TRANSMITTAL TO OWNER (through the Architect)
 - A. Collect, organize, label, and package ready for reference.
 - 1. Bind print sets with durable paper covers.
 - Label each document (and each sheet of drawings) with "PROJECT RECORD DOCUMENTS - This document has been prepared using information furnished by _____" [insert the Contractor's name], and the date of preparation.
 - B. Submit to the Architect, unless otherwise indicated.

END OF SECTION 01 7389
SECTION 01 7820 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
 - 1. Operation and maintenance documentation directory.
 - 2. Emergency manuals.
 - 3. Operation manuals for systems, subsystems, and equipment.
 - 4. Product maintenance manuals.
 - 5. Systems and equipment maintenance manuals.
- B. Related Requirements:
 - 1. Division 01 "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.

1.2 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.
- 1.3 CLOSEOUT SUBMITTALS
 - A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
 - 1. Architect and Commissioning Authority will comment on whether content of operations and maintenance submittals are acceptable.
 - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
 - B. Format: Submit operations and maintenance manuals in the following format:
 - 1. PDF electronic file. Assemble each manual into a composite electronically indexed file complete with Table of Contents and book marked by equipment. Submit on digital media acceptable to Architect.
 - a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
 - b. Enable inserted reviewer comments on draft submittals.
 - 2. Four paper copies. Include a complete operation and maintenance directory. Enclose title pages and directories in clear plastic sleeves.

- C. Initial Manual Submittal: Submit draft copy of each manual at least 60 days before commencing demonstration and training. Architect and Commissioning Authority will comment on whether general scope and content of manual are acceptable.
- D. Final Manual Submittal: Submit each manual in final form prior to requesting inspection for Substantial Completion and at least 30 days before commencing demonstration and training. Architect and Commissioning Authority will return copy with comments.
 - 1. Correct or revise each manual to comply with Architect's and Commissioning Authority's comments. Submit copies of each corrected manual within 15 days of receipt of Architect's and Commissioning Authority's comments and prior to commencing demonstration and training.
 - 2. Upon completion and approval, 3 copies will be forwarded to the Owner and one copy retained by the Architect

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information. Include a section in the directory for each of the following:
 - 1. List of documents.
 - 2. List of systems.
 - 3. List of equipment.
 - 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

- 1. Title page.
- 2. Table of contents.
- 3. Manual contents.
- B. Title Page: Include the following information:
 - 1. Subject matter included in manual.
 - 2. Name and address of Project.
 - 3. Name and address of Owner.
 - 4. Date of submittal.
 - 5. Name and contact information for Contractor.
 - 6. Name and contact information for Architect.
 - 7. Name and contact information for Commissioning Authority.
 - 8. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
 - 9. Cross-reference to related systems in other operation and maintenance manuals.
- C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.
 - 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder. Include the following, as a minimum:
 - 1. Catalog cuts and shop drawings:
 - a. Catalog cuts shall clearly indicate the exact model and type of each piece of equipment installed in the Project, including all options provided.
 - b. Catalog cuts shall fully describe equipment including physical, electrical, mechanical and other characteristics, performance characteristics and installation or erection diagrams.
 - c. Catalog cuts shall indicate spare part numbers and name, address and telephone number of local representative or service department.
 - 2. Typewritten list of all subcontractors on the Project including name, address, telephone number and responsibility on the Project.
 - 3. Warranties, permits, inspection stickers/approvals and Certificate of Occupancy are to be included.
- E. Manuals, Electronic Files: Submit manuals in the form of a multiple file composite electronic PDF file for each manual type required.
 - 1. Electronic Files: Use electronic files prepared by manufacturer where available. Where scanning of paper documents is required, configure scanned file for minimum readable file size.
 - 2. File Names and Bookmarks: Enable bookmarking of individual documents based on file names. Name document files to correspond to system, subsystem, and equipment names used in manual directory and table of contents. Group

documents for each system and subsystem into individual composite bookmarked files, then create composite manual, so that resulting bookmarks reflect the system, subsystem, and equipment names in a readily navigated file tree. Configure electronic manual to display bookmark panel on opening file.

- F. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
 - 1. Binders: Heavy-duty, three-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch (215-by-280-mm) paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
 - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
 - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents, and indicate Specification Section number on bottom of spine. Indicate volume number for multiple-volume sets.
 - 2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section of the manual. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.
 - 3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
 - 4. Supplementary Text: Prepared on 8-1/2-by-11-inch (215-by-280-mm) white bond paper.
 - 5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
 - a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
 - b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY MANUALS

- A. Content: Organize manual into a separate section for each of the following:
 - 1. Type of emergency.
 - 2. Emergency instructions.
 - 3. Emergency procedures.
- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:

- 1. Fire.
- 2. Flood.
- 3. Gas leak.
- 4. Water leak.
- 5. Power failure.
- 6. Water outage.
- 7. System, subsystem, or equipment failure.
- 8. Chemical release or spill.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:
 - 1. Instructions on stopping.
 - 2. Shutdown instructions for each type of emergency.
 - 3. Operating instructions for conditions outside normal operating limits.
 - 4. Required sequences for electric or electronic systems.
 - 5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

- A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:
 - 1. System, subsystem, and equipment descriptions. Use designations for systems and equipment indicated on Contract Documents.
 - 2. Performance and design criteria if Contractor has delegated design responsibility.
 - 3. Operating standards.
 - 4. Operating procedures.
 - 5. Operating logs.
 - 6. Wiring diagrams.
 - 7. Control diagrams.
 - 8. Piped system diagrams.
 - 9. Precautions against improper use.
 - 10. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
 - 1. Product name and model number. Use designations for products indicated on Contract Documents.
 - 2. Manufacturer's name.
 - 3. Equipment identification with serial number of each component.
 - 4. Equipment function.
 - 5. Operating characteristics.
 - 6. Limiting conditions.
 - 7. Performance curves.
 - 8. Engineering data and tests.
 - 9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include the following, as applicable:
 - 1. Startup procedures.
 - 2. Equipment or system break-in procedures.

- 3. Routine and normal operating instructions.
- 4. Regulation and control procedures.
- 5. Instructions on stopping.
- 6. Normal shutdown instructions.
- 7. Seasonal and weekend operating instructions.
- 8. Required sequences for electric or electronic systems.
- 9. Special operating instructions and procedures.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUALS

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Product Information: Include the following, as applicable:
 - 1. Product name and model number.
 - 2. Manufacturer's name.
 - 3. Color, pattern, and texture.
 - 4. Material and chemical composition.
 - 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
 - 1. Inspection procedures.
 - 2. Types of cleaning agents to be used and methods of cleaning.
 - 3. List of cleaning agents and methods of cleaning detrimental to product.
 - 4. Schedule for routine cleaning and maintenance.
 - 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source

information, maintenance service contracts, and warranty and bond information, as described below.

- B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual and drawing or schedule designation or identifier where applicable.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
 - 1. Standard maintenance instructions and bulletins.
 - 2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
 - 3. Identification and nomenclature of parts and components.
 - 4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
 - 1. Test and inspection instructions.
 - 2. Troubleshooting guide.
 - 3. Precautions against improper maintenance.
 - 4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - 5. Aligning, adjusting, and checking instructions.
 - 6. Demonstration and training video recording, if available.
- E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.
 - 1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
 - 2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.
- F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
 - 1. Include procedures to follow and required notifications for warranty claims.

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.
 - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
 - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
 - 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in record Drawings to ensure correct illustration of completed installation.
 - 1. Do not use original project record documents as part of operation and maintenance manuals.
 - 2. Comply with requirements of newly prepared record Drawings in Section 017839 "Project Record Documents."
- G. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 01 7820

SECTION 01 7836 - WARRANTIES

PART 1 - GENERAL

1.1 DEFINITIONS

- A. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
- B. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner
- 1.2 GUARANTEES AND WARRANTIES
 - A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of obligations under requirements of the Contract Documents.
 - B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.
 - 1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 - 2. Refer to Divisions 2 through 33 Sections for specific content requirements and particular requirements for submitting special warranties.
 - C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."
 - D. Period for all guarantees and warranties shall commence at date of substantial completion for the entire project, as determined by the Architect and Owner.
 - E. Each contractor's guarantee on all work, covered by Maintenance Bond shall be One (1) year
 - F. Submittal Time: Submit written warranties on request of Owner for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.
 - G. Partial Occupancy: Submit properly executed warranties within 15 days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
 - H. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.
 - 1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2 by 11-inch paper.

- 2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
- 3. Identify each binder on the front and spine with the typed title, "Warranties," Project Name, and name of Contractor.
- I. Submit three copies of warranty manual to the Architect. Provide additional copies of each warranty to include in operation and maintenance manuals.
- J. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document

1.3 STANDARD MANUFACTURER WARRANTIES/GUARANTEES

A. Unless otherwise noted in specifications, contractor shall provide standard of the industry and acceptable warranties/guarantees provided by all manufacturers of products used on this project. Warranties/guarantees shall commence at date of substantial completion for entire project as determined by the Architect. Review each Technical Section for other warranty requirements.

END OF SECTION 01 7836

SECTION 01 7900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
 - 1. Demonstration of operation of systems, subsystems, and equipment.
 - 2. Training in operation and maintenance of systems, subsystems, and equipment.
 - 3. Demonstration and training video recordings.

1.2 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
 - 1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.
- B. Attendance Record: For each training module, submit list of participants and length of instruction time.
- C. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.3 CLOSEOUT SUBMITTALS

- A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.
 - 1. Identification: On each copy, provide an applied label with the following information:
 - a. Name of Project.
 - b. Name and address of videographer.
 - c. Name of Architect.
 - d. Name of Contractor.
 - e. Date of video recording.

1.4 QUALITY ASSURANCE

- A. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Section 014000 "Quality Requirements," experienced in operation and maintenance procedures and training.
- B. Videographer Qualifications: A professional videographer who is experienced photographing demonstration and training events similar to those required.

- C. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
 - 1. Inspect and discuss locations and other facilities required for instruction.
 - 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
 - 3. Review required content of instruction.
 - 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.5 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:
 - 1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
 - a. System, subsystem, and equipment descriptions.
 - b. Performance and design criteria if Contractor is delegated design responsibility.
 - c. Operating standards.
 - d. Regulatory requirements.
 - e. Equipment function.
 - f. Operating characteristics.
 - g. Limiting conditions.
 - h. Performance curves.

- 2. Documentation: Review the following items in detail:
 - a. Emergency manuals.
 - b. Operations manuals.
 - c. Maintenance manuals.
 - d. Project record documents.
 - e. Identification systems.
 - f. Warranties and bonds.
 - g. Maintenance service agreements and similar continuing commitments.
- 3. Emergencies: Include the following, as applicable:
 - a. Instructions on meaning of warnings, trouble indications, and error messages.
 - b. Instructions on stopping.
 - c. Shutdown instructions for each type of emergency.
 - d. Operating instructions for conditions outside of normal operating limits.
 - e. Sequences for electric or electronic systems.
 - f. Special operating instructions and procedures.
- 4. Operations: Include the following, as applicable:
 - a. Startup procedures.
 - b. Equipment or system break-in procedures.
 - c. Routine and normal operating instructions.
 - d. Regulation and control procedures.
 - e. Control sequences.
 - f. Safety procedures.
 - g. Instructions on stopping.
 - h. Normal shutdown instructions.
 - i. Operating procedures for emergencies.
 - j. Operating procedures for system, subsystem, or equipment failure.
 - k. Seasonal and weekend operating instructions.
 - I. Required sequences for electric or electronic systems.
 - m. Special operating instructions and procedures.
- 5. Adjustments: Include the following:
 - a. Alignments.
 - b. Checking adjustments.
 - c. Noise and vibration adjustments.
 - d. Economy and efficiency adjustments.
- 6. Troubleshooting: Include the following:
 - a. Diagnostic instructions.
 - b. Test and inspection procedures.
- 7. Maintenance: Include the following:
 - a. Inspection procedures.
 - b. Types of cleaning agents to be used and methods of cleaning.
 - c. List of cleaning agents and methods of cleaning detrimental to product.
 - d. Procedures for routine cleaning

- e. Procedures for preventive maintenance.
- f. Procedures for routine maintenance.
- g. Instruction on use of special tools.
- 8. Repairs: Include the following:
 - a. Diagnosis instructions.
 - b. Repair instructions.
 - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
 - d. Instructions for identifying parts and components.
 - e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."
- B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

- A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
 - 1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
 - 2. Owner will furnish Contractor with names and positions of participants.
- B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
 - 1. Schedule training with Owner, through Architect, with at least seven days' advance notice.
- C. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.
- D. Provide operating and maintenance instruction to Owner's personnel for systems and components as indicated in individual Specification Sections. Provide instruction periods, comprised of approximately 50 percent classroom instruction and 50 percent "hands-on" instruction.

3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Engage a qualified videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids.

- B. Video: Provide minimum 640 x 480 video resolution converted to .mp4 format file type, on electronic media.
 - 1. Electronic Media: Read-only format compact disc acceptable to Owner, with computer made label.
 - 2. File Hierarchy: Organize folder structure and file locations according to project manual table of contents. Provide complete screen-based menu.
 - 3. File Names: Utilize file names based upon name of equipment generally described in video segment, as identified in Project specifications.
 - 4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the Equipment Demonstration and Training DVD that describes the following for each Contractor involved on the Project, arranged according to Project table of contents:
 - a. Name of Contractor/Installer.
 - b. Business address.
 - c. Business phone number.
 - d. Point of contact.
 - e. E-mail address.
- C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.
 - 1. Film training session(s) in segments not to exceed 15 minutes.
 - a. Produce segments to present a single significant piece of equipment per segment.
 - b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
 - c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.
- D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.
 - 1. Furnish additional portable lighting as required.
- E. Narration: Describe scenes on video recording by audio narration by microphone while or dubbing audio narration off-site after video recording is recorded. Include description of items being viewed.
- F. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

END OF SECTION 01 7900

SECTION 024100

DEMOLITION AND DEBRIS REMOVAL

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Overall work under this Contract shall include all labor, materials, equipment, supervision, coordination efforts, certificate costs, services, filing fees, security, insurance and all other associated or related items specified herein that are necessary and are required to complete the work. Work elements shall include, but not be limited to the following:
 - 1. Installation and maintenance of a temporary 6 ft high post driven chain link fence with screening and lockable entrance gates at locations indicated on the construction documents and as required to properly and safely secure the demolition operation in accordance with Local and State requirements.
 - 2. Installation and maintenance of pedestrian construction signage and associated pedestrian-protection measures.
 - 3. Installation and maintenance of soil erosion and sediment control measures.
 - 4. Implementation of specified and any other measures deemed necessary or required by governing authorities to protect adjacent and on-site persons, property, buildings, facilities and utilities.
 - 6. Removal and off-site disposal of all existing site features, including but not limited to all pavement, walls, and free-standing items (e.g. bollards, signs, sign posts, light poles, light pole bases, walls, etc.) within site areas.
 - 7. Backfill of all utility excavations with structural, compacted fill.
 - 8. Construction of site grades outside of building footprint to proposed grades indicated on the final grading plan and building area grades to proposed elevations shown on the final grading plan and architectural and structural plans.
 - 10. Placement of topsoil and stabilization of exposed earth with temporary and / or permanent seeding.
 - 11. Providing of required inspection, testing and progress reports to the College.

1.02 RELATED SECTIONS AND DOCUMENTS

- A. Section 312500 Soil Erosion and Sediment Control
- B. Section 330100 Protection of Existing Utilities

C. Construction Drawings

1.03 REFERENCE STANDARDS

- A. National Association of Demolition Contractors (NADC) Demolition Safety Manual, latest edition
- B. N.J.A.C. 12:116 Maintenance, Construction and Demolition manual, Department of Labor and Industry, latest version
- C. All applicable OSHA requirements and other Federal, State, and Local codes, laws, ordinances, regulations, and guidelines for demolition and related work
- D. Section 3303 of the International Building Code, latest edition

1.04 QUALITY ASSURANCE

- A. Contractor shall prepare field reports documenting the progress of the demolition operations and submit said reports to the College on a weekly basis.
- B. The College reserves the right to direct any inspection that is deemed necessary. Provide free access to the site for inspection activities.

1.05 SUBMITTALS

- A. Utility Schedule
 - 1. Submit to the College, the College's Design Team, and all affected utility/service companies, a proposed schedule of coordination for all necessary utility/service shut-offs, capping and continuation of utility services as required no later than 20 days after its notice to proceed. Provide the College with written confirmation from <u>all</u> utility or service companies serving the site that service has been terminated prior to capping, abandoning or removal of any such utility and prior to commencement of demolition work.
 - 2. During work, accurately locate and mark on a set of Contract Drawings the location of all underground utilities and services that have been capped and those that are to remain within the Demolition Limit Line.
- B. Demolition Schedule/Plan
 - 1. Submit for review and approval a detailed schedule for all proposed work to the College and the College's Design Team no later than 20 days after notice to proceed. This submission shall include a calendarized schedule of the proposed work and a step-by-step description of all aspects pertaining to demolition and protection of existing structures and adjacent community, labor forces, demolition rubble management and disposal and other items of work required under this Contract.

- 2. This plan is subject to approval by the College and all governing agencies. Such approval shall in no way relieve Contractor from its responsibility to execute the work in a safe manner and in accordance with the requirement of all governing authorities and agencies and these Specifications.
- C. Permits
 - 1. The College will obtain a Soil Erosion and Sediment Control Permit and a NJDEP Stormwater General Permit.
 - 2. The following permits and certificates may be applicable and if applicable shall be obtained by Contractor prior to applying for and obtaining general demolition permits.
 - a. Plumbing permit for water shut-off.
 - b. Plumbing permit for sewer seal.
 - c. Water shut-off certificate (original).
 - d. Letters from Electric and Gas Utility companies and gas meter shut offs.
 - e. Letters from Cable TV companies for cable disconnections and removals.
 - f. Certificate from Tax Office (taxes paid).
 - g. Certificate from Water Department (water bill paid).
 - h. Letter to adjacent owners of proposed demolition data with proof of receipt.
 - i. Exterminator Certificate.
 - j. Board of Health approval.
 - k. Contractor's license.
 - I. Telephone company aboveground or underground connections removed.
 - m. Approval and receipt of permit for removal and disposal of containerized solid and a liquid wastes including State registration, where required.
- D. Traffic
 - 1. Submit for approval 15 days prior to the start of demolition work a traffic control plan to the College and Engineer. The traffic control plan shall show both pedestrian and vehicular movements.
- E. Pollution Control Measure
 - 1. Submit a pollution and dust control plan to the College not less than 10 days prior to the commencement of demolition work. The plan shall outline proposed methods for dust control, noise control and maintaining the surrounding streets and buildings in a clean condition for both demolition operations and during debris removal. The plan shall be subject to the review and approval by the College and Owner's Engineer (See Section 3.7 of this specification section).
- F. Pre-Conditions Survey
 - 1. Submit a pre-conditions survey of the surrounding properties and structures as described in Section 1.11.

1.06 PROJECT MEETINGS

A. Pre-demolition

1. Attend, along with all designated subcontractors, a pre-demolition meeting scheduled by the College and Owner's Engineer prior to commencement of work to resolve questions pertaining to the work and to establish basic administrative procedures and schedules.

B. Progress

1. Once the demolition work has begun, schedule, administer and attend meetings with the College and Owner's Engineer once a week or as deemed necessary by the College to maintain optimum degree of communications between interested parties. Include selected subcontractors at such times as their interests may be involved.

1.07 OCCUPANCY

A. Take any and all measures necessary to protect persons and properties associated with on-site and adjacent property activities from harm and damage during demolition activities, as well as maintaining vehicle and pedestrian traffic around the demolition area. See Section 1.10 for minimal additional protection requirements.

1.08 CONDITIONS OF STRUCTURES

- A. A pre-bid inspection of the site will be scheduled by the College to familiarize prospective bidders with site conditions. The inspection will include a walkthrough of the entire site.
- B. Conditions existing at the time of inspection for bidding purposes will be maintained by the College insofar as practicable. Contractor's bid affirms the acceptance of the site "as is" unless specifically otherwise stated by the College at the pre-bid inspection.

1.09 TRAFFIC

A. Conduct demolition operations and removal of debris in a manner that ensures the least interference with streets, pedestrian walkways, and other adjacent occupied facilities. Prepare and obtain approval by the College of a traffic control plan for all aspects of the project. (See Section 3.5 for installation of traffic measures).

1.10 PROTECTION AND SAFETY

A. Protection and safety of the surrounding community and property shall take the highest priority during demolition operations. All operations shall be conducted so as to prevent damage to adjacent buildings, structures and other facilities and injury to persons. This shall include but not necessarily be limited to the installation and maintenance of protective structures when necessary such as catch platforms, tarpaulin or plywood barriers, trailer boxes, sidewalk sheds (bridges), and other measures as designated by the Construction Drawings, and/or as required by the College.

- B. Make a careful examination of the structures to be demolished and of the adjoining property and utilities which are to remain and take whatever precautions are necessary to carry on operations so as to prevent any settlement, collapse, damage from falling debris or other impacts to adjacent buildings, structures, sidewalks, paving, utilities and other existing features. During all operations, the Contractor is responsible for the structural integrity of these structures and surrounding structures relative to any problems or damages resulting from the performance of the Contractor's work. Notify the College immediately if the safety of an adjacent structure or facility is endangered or if any change has occurred. Contractor must provide interior and exterior shoring, bracing or support to prevent movement or settlement of the structures to be demolished when safety concerns warrant. Any damage inflicted upon adjacent property, construction or utilities by the Contractor's work must be corrected promptly by the Contractor at no cost to the College.
- C. All work adjacent to occupied buildings which may produce fire hazards or create nuisances or safety and health hazards from noise, vibration, gases, vapors, fumes, dust mists, or odors shall not be performed unless preventive controls or measures including, but not necessarily limited to those shown on the Construction Drawings and/or as specified within this Specification are implemented. Special attention is brought to adjacent building fresh air intakes, air conditioning units, etc., which need protection from dust during demolition. Protective procedures shall not begin until reviewed by the College and the Owner's Design Team. Such review shall in no way relieve the Contractor from its responsibility to execute the work in a safe manner and in accordance with all applicable Federal, State and Local requirements.
- D. Execute the work in a manner that is safe for its workers and persons in and around the job site and shall ensure free and safe passage of persons around the area of demolition. Any possible hazards resulting from demolition activities shall be corrected prior to continuation of work in that specific area. The College reserves the right to stop work at any time in cases where the safety of Contractor's operation is in question or is in conflict with the Contract Specifications. The Owner's Engineer does not reserve the right to stop the Contractor's work at any time.

1.11 PRE-DEMOLITION CONDITIONS SURVEY

A. Survey

1. Photographically document (in color) building faces, roadways, and other adjacent facilities included in the survey for any type of demolition. The photographs shall be dated and noted describing location and elements of the photograph. They shall be placed in a bound notebook and two copies given to the College not less than 5 days prior to the start of demolition.

1.12 EXISTING UTILITIES

- A. General
 - 1. The approximate locations of utilities are shown on the Construction Drawings. Additional utilities may exist that are or may be impacted by the work. It shall be

the Contractor's responsibility to determine the actual location of <u>all</u> utilities, whether shown or not shown on the Construction Drawings. Maintain existing utilities within the public right-of-way. Promptly repair or have repaired by applicable utility company any damage incurred to utilities during demolition work at no cost to the College.

- B. Shut-off Notifications
 - 1. Notify the College Facilities Department and appropriate utility companies to shut off utilities that are to be abandoned as part of the contract. Written confirmation from the College and the applicable utility companies that service has been terminated shall be forwarded to the College prior to the beginning of any abandoning or removal of utilities.
- C. Interruption of Existing Service to Remain
 - 1. Do not interrupt existing utilities serving any off-site or on-site facilities, except when authorized in writing by authorities having jurisdiction and the College. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities and the College.
- D. Disconnections
 - 1. Disconnection and plugging of indicated utilities before starting demolition operations is part of the work of this Contract. Cap the ends of all utilities indicated to be abandoned and removed at the contract limit lines (or as shown on the drawings) as recommended by the utility company, the College or Owner's Engineer. Remove those portions of utilities indicated within contract limit areas.

1.13 WORKING HOURS

A. Campus standard is 8:30 AM to 10:00 PM.

1.14 CONTRACT LIMIT LINE

- A. The contract limit line for demolition work is shown on the Construction Drawings. No equipment, materials, and/or trailers shall be kept or stored outside the contract limit area (project fence).
- B. Other trades and work may be ongoing on-site during demolition operations. Coordinate work so as not to interfere with work of other trades.

1.15 UNACCEPTABLE PERFORMANCE

A. Remove from the project any individual employed by Contractor who is performing work in an unacceptable manner as determined by the College. Do not make claims for delays or down time resulting from the removal of such employees.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Materials are as specified on the Construction Drawings when applicable. See related sections for additional product specifications.

PART 3 – EXECUTION

3.01 GENERAL

- A. Contractor's responsibilities, include, but are not limited to the demolition of existing site features, walks and curb, asphalt pavement, utilities, signs and miscellaneous items encountered within the identified work area and called out on the drawings. All materials shall be disposed of off-site in accordance with all applicable Federal, State, County and Local codes and regulation governing legal transportation and disposal of work.
- B. The general scope of demolition work is shown on the Site Demolition Plan. Include all demolition work necessary to accomplish the construction project.

3.02 SITE VISIT

A. Visit the site and verify the location of all pertinent items prior to submitting a bid so that the difficulties associated with execution of the contract are fully understood. No additional compensation will be allowed for failure to be so informed.

3.03 PROJECT FENCING

A. Construct a 6-ft high post driven chain-link fence screening and locakable swing gates at locations shown and as necessary to properly and safely secure demolition operations in accordance with Local and State requirements. No demolition work shall begin until the project fence is completely installed and secured and approved by the College.

3.04 SOIL EROSION SEDIMENT CONTROL

- A. General
 - 1. Install all soil erosion and sediment control measures in accordance with the requirements indicated on the Construction Drawings and Section 312500 Soil Erosion and Sediment Control.
- B. Sequence of Construction
 - Submit written notification to the Mercer County Soil Conservation District at least 72 hours prior to the start of construction of any soil erosion and sediment control measures.
 - 2. A temporary crushed stone wheel-cleaning pad shall be installed at the construction entrance/exits as shown on the Construction Drawings.

- 3. Filter fabric silt fence shall be installed and maintained at locations shown on the Construction Drawings.
- 4. All soil erosion and sediment control measures shall be maintained until all work under this Contract is completed.
- 5. As necessary, notify the Mercer County Soil Conservation District upon commencement and completion of the project.

3.05 TRAFFIC

- A. Prior to commencement of demolition operations, implement all vehicular and/or pedestrian traffic protection measures and construct temporary roadway indicated or described on the Construction Drawings and in these Specifications and any other measures required by the College before, during, and after the demolition project.
- B. Signs required shall be designed and installed in accordance with the requirements of the NJDOT Standard Specifications for Road and Bridge Construction, latest revision, the Federal Highway Administration's "Manual on Uniform Traffic Control Devices for Streets and Highways" and "Standard Highway Signs," and as indicated on the Contract Drawings.

3.06 UTILITIES

- A. General Existing utility service shall not be interrupted unless authorized in writing by authorities having jurisdiction and the owner of the utility. Any temporary interruption necessary shall be directly coordinated and supervised by the College and/or appropriate utility company personnel. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities and the affected utility companies.
- B. Maintenance Maintain and protect from damage all existing above and below ground utilities that are to remain. Utilities to remain include, but are not necessarily limited to, water lines, stormwater conveyance lines, high temperature hot water lines, electric lines, and fiber optic lines. Immediately repair or have repaired by the appropriate utility purveyor any damage incurred during demolition work at no cost to the College. Notify and coordinate with the appropriate utility purveyor for the shut-off of utilities that are to be abandoned as part of this Contract.
- C. Abandonment/Removal
 - 1. Prior to removal, all utilities and sewers shall be properly purged and evacuated of all residual gases, oils, etc. or de-energized in the case of electric, telephone or other communications services. All purging and testing shall be approved by Local utility or sewer companies and governing authorities having jurisdiction.
 - 2. Contractor or appropriate utility or sewer company (if required) shall cap the ends of all disconnected utilities where indicated on the plan or, if not indicated, at the Contract limit line as recommended and required by the College, utility, or

Owner's Engineer. All caps shall be inspected by the College and the Owner's Engineer prior to backfilling.

- 3. All utility disconnections shall be performed no later than 15 days prior to the scheduled start of demolition and must precede the demolition permit application procedure.
- D. Restoration

1. All underground utility lateral removals shall be properly backfilled and all disturbed pavements within the public right-of-way shall be restored to their predemolition (existing) condition. This includes the restoration of concrete pavement, concrete curbing, and asphalt pavement within the College's lands and public rights of way. All pavement and curbing shall be saw cut prior to excavation in order to produce a clean and neat edge. Replacement pavement and curbing shall be equal in design performance to the existing condition and as directed by the College and/or the Local authority having jurisdiction. All restoration work shall be performed immediately following utility removal and backfill completion.

E. Communications utilities damaged in the course of work shall be replaced in their entirety from cable segment end to cable segment end. Replacement materials and methods shall be in accordance with Owner's then-current specifications. Failure to restore interrupted services in a timely fashion, as determined by nature of interruption and affected service, will require Owner to engage services for service restoration, repair, and/or replacement at the Contractor's expense.

3.07 POLLUTION CONTROLS

- A. Dust
 - 1. During demolition and debris removal operations, continually use water sprinkling and other suitable methods to minimize the amount of dust and dirt, rising and scattering in the air, to the lowest practical level possible. Requests made by the Local authority having jurisdiction, the College, or Owner's Engineer regarding pollution controls shall be promptly implemented by Contractor. Do not use water when dangerous flooding or icing may occur.
 - 2. Comply with all governing regulations pertaining to environmental protection, soil erosion and dust control and install all control measures indicated on the Construction Drawings. Special attention is brought to adjacent building fresh air intakes, air-conditioning units, etc., which need protection from dust during demolition.
- B. Cleaning
 - 1. Maintain the cleanliness of streets and properties of dirt, dust and debris produced by demolition operations at all times. This shall be done on a daily basis. An aggressive program of washing down and cleaning the neighboring buildings and properties from dust fall out shall be implemented on a weekly basis to the satisfaction of the Local agencies, the College and Owner's Engineer. After

demolition and debris removal is complete, return adjacent structures and roadways to the conditions existing prior to the start of work. Power washing or other means deemed necessary by the College shall be implemented by the Contractor to achieve this objective.

- 2. Provide enough refuse containers for collecting construction/demolition debris throughout the duration of all work.
- C. Noise
 - 1. Make all attempts necessary to reduce noise emissions from the site during demolition operations. Noise levels shall be maintained at or below State Standards and/or as required herein. All machinery and equipment shall have mufflers or noise reducing devices installed.

3.08 LINE PURGING

- A. Safely purge all mechanical and plumbing pipe lines and other related systems (including equipment) on-site that may contain residual oils, gases, etc. The collected materials shall be the sole responsibility of the Contractor who shall legally dispose of these materials in accordance with Federal, State and Local regulations (if applicable) including but not necessarily limited to NJDEP requirements. The dumping of these materials on-site shall not be permitted.
- B. Pipe lines shall be drained or evacuated and residual materials collected in proper containers. Equipment shall be drained of oils, lubricants, coolants, (i.e., freon etc.) which shall be properly collected and disposed of prior to removal.

3.09 **DEMOLITION**

- A. General
 - 1. Demolish, remove and dispose of all site structures, including all fencing, gates, stairways, ramps, railings, concrete and bituminous pavements, curbs, walls and free standing items (e.g. bollards, signs, sign posts, lighting poles, lighting pole bases, playground equipment, canopies, etc.) within the contract limits unless otherwise indicated on the Construction Drawings.

END OF SECTION 024100

SECTION 024110 SELECTIVE DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Selective demolition of built site elements.
- B. Selective demolition of building elements for alteration purposes.
- C. Abandonment and removal of existing utilities and utility structures.

1.02 DEFINITIONS

- A. Remove: Detach or dismantle items from existing construction and dispose of them off site, unless items are indicated to be salvaged or reinstalled.
- B. Remove and Salvage: Detach or dismantle items from existing construction in a manner to prevent damage. Clean, package, label and deliver salvaged items to Owner in ready-for-reuse condition.
- C. Existing to Remain: Designation for existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

1.03 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2022, with Errata (2021).

1.04 QUALITY ASSURANCE

A. Demolition Firm Qualifications: Company specializing in the type of work required.
1. Minimum of 3 years of documented experience.

PART 3 EXECUTION

2.01 GENERAL PROCEDURES AND PROJECT CONDITIONS

- A. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - 1. Obtain required permits.
 - 2. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
 - 3. Provide, erect, and maintain temporary barriers and security devices.
 - 4. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
 - 5. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 - 6. Do not close or obstruct roadways or sidewalks without permits from authority having jurisdiction.
 - 7. Conduct operations to minimize obstruction of public and private entrances and exits. Do not obstruct required exits at any time. Protect persons using entrances and exits from removal operations.
 - 8. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon, or limit access to their property.
- B. Do not begin removal until receipt of notification to proceed from Owner.
- C. Protect existing structures and other elements to remain in place and not removed.
 - 1. Provide bracing and shoring.
 - 2. Prevent movement or settlement of adjacent structures.
 - 3. Stop work immediately if adjacent structures appear to be in danger.
- D. Hazardous Materials:
 - 1. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing

materials, lead, PCBs, and mercury.

2.02 EXISTING UTILITIES

- A. Coordinate work with utility companies. Notify utilities before starting work, comply with their requirements, and obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 14 days prior written notification to Owner.
- E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 5 days prior written notification to Owner.
- F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

2.03 SELECTIVE DEMOLITION FOR ALTERATIONS

- A. Existing construction and utilities indicated on drawings are based on casual field observation and existing record documents only.
 - 1. Verify construction and utility arrangements are as indicated.
 - 2. Report discrepancies to Architect before disturbing existing installation.
 - 3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.
- B. Maintain weatherproof exterior building enclosure, except for interruptions required for replacement or modifications; prevent water and humidity damage.
- C. Remove existing work as indicated and required to accomplish new work.
 - 1. Remove rotted wood, corroded metals, and deteriorated masonry and concrete; replace with new construction indicated.
 - 2. Remove items indicated on drawings.
- D. Services including, but not limited to, HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications: Remove existing systems and equipment as indicated.
 - 1. Maintain existing active systems to remain in operation, and maintain access to equipment and operational components.
 - 2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 - 3. Verify that abandoned services serve only abandoned facilities before removal.
 - 4. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings. Remove back to source of supply where possible, otherwise cap stub and tag with identification.
- E. Protect existing work to remain.
 - 1. Prevent movement of structure. Provide shoring and bracing as required.
 - 2. Perform cutting to accomplish removal work neatly and as specified for cutting new work.
 - 3. Repair adjacent construction and finishes damaged during removal work.
 - 4. Patch to match new work.

2.04 DEBRIS AND WASTE REMOVAL

- A. Remove debris, junk, and trash from site.
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

SECTION 029000

LANDSCAPING

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Trees.
 - 2. Shrubs.
 - 3. Ground covers.
 - 4. Plants.
 - 5. Lawns.
 - 6. Topsoil and soil amendments.
 - 7. Fertilizers and mulches.
 - 8. Stakes and guys.
 - 9. Landscape edgings.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 2 Section "Site Clearing" for protection of existing trees and planting, topsoil stripping and stockpiling, and site clearing.
 - 2. Division 2 Section "Earthwork" for excavation, filling, rough grading, and subsurface aggregate drainage and drainage backfill.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product certificates signed by manufacturers certifying that their products comply with specified requirements.
 - 1. Manufacturer's certified analysis for standard products.
 - 2. Analysis for other materials by a recognized laboratory made according to methods established by the Association of Official Analytical Chemists, where applicable.
 - 3. Label data substantiating that plants, trees, shrubs, and planting materials comply with specified requirements.
- C. Certification of grass seed from seed vendor for each grass-seed mixture stating the botanical and common name and percentage by weight of each species and variety, and

percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

- 1. Certification of each seed mixture for sod, identifying sod source, including name and telephone number of supplier.
- D. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and address of architects and owners, and other information specified.
- E. Material test reports from qualified independent testing agency indicating and interpreting test results relative to compliance of the following materials with requirements indicated.
 - 1. Analysis of existing surface soil.
 - 2. Analysis of imported topsoil.
- F. Planting schedule indicating anticipated dates and locations for each type of planting.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed landscaping work similar in material, design, and extent to that indicated for this Project and with a record of successful landscape establishment.
 - 1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on the Project site during times that landscaping is in progress.
- B. Testing Agency Qualifications: To qualify for acceptance, an independent testing agency must demonstrate to Architect's satisfaction, based on evaluation of agency-submitted criteria conforming to ASTM E 699, that it has the experience and capability to satisfactorily conduct the testing indicated without delaying the Work.
- C. Provide quality, size, genus, species, and variety of trees and shrubs indicated, complying with applicable requirements of ANSI Z60.1 "American Standard for Nursery Stock."
 - 1. Selection of trees and shrubs purchased under allowances will be made by Architect, who will tag stock at their place of growth before they are prepared for transplanting.
- D. Topsoil Analysis: Furnish a soil analysis made by a qualified independent soil-testing agency stating percentages of organic matter, inorganic matter (silt, clay, and sand), deleterious material, pH, and mineral and plant-nutrient content of topsoil.
 - 1. Report suitability of topsoil for growth of applicable planting material. State recommended quantities of nitrogen, phosphorus, and potash nutrients and any limestone, aluminum sulfate, or other soil amendments to be added to produce a satisfactory topsoil.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packaged Materials: Deliver packaged materials in containers showing weight, analysis, and name of manufacturer. Protect materials from deterioration during delivery and while stored at site.
- B. Seed: Deliver seed in original sealed, labeled, and undamaged containers.
- C. Sod: Harvest, deliver, store, and handle sod according to the requirements of the American Sod Producers Association's (ASPA) "Specifications for Turfgrass Sod Materials and Transplanting/Installing."
- D. Trees and Shrubs: Deliver freshly dug trees and shrubs. Do not prune before delivery, except as approved by Architect. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy natural shape. Provide protective covering during delivery. Do not drop trees and shrubs during delivery.
 - 1. Immediately after digging bare-root stock, pack root system in wet straw, hay, or other suitable material to keep root system moist until planting.
- E. Handle balled and burlapped stock by the root ball.
- F. Deliver trees, shrubs, ground covers, and plants after preparations for planting have been completed and install immediately. If planting is delayed more than 6 hours after delivery, set planting materials in shade, protect from weather and mechanical damage, and keep roots moist.
 - 1. Heel-in bare-root stock. Soak roots in water for 2 hours if dried out.
 - 2. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
 - 3. Do not remove container-grown stock from containers before time of planting.
 - 4. Water root systems of trees and shrubs stored on site with a fine-mist spray. Water as often as necessary to maintain root systems in a moist condition.

1.6 **PROJECT CONDITIONS**

- A. Utilities: Determine location of above grade and underground utilities and perform work in a manner which will avoid damage. Hand excavate, as required. Maintain grade stakes until removal is mutually agreed upon by parties concerned.
- B. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Architect before planting.

1.7 COORDINATION AND SCHEDULING

A. Coordinate installation of planting materials during normal planting seasons for each type of plant material required.

1.8 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: Warrant the following living planting materials for a period of one year after date of Substantial Completion, against defects including death and unsatisfactory growth, except for defects resulting from lack of adequate maintenance, neglect, or abuse by Owner, abnormal weather conditions unusual for warranty period, or incidents that are beyond Contractor's control.
 - 1. Trees.
 - 2. Shrubs.
 - 3. Ground covers.
 - 4. Plants.
- C. Remove and replace dead planting materials immediately unless required to plant in the succeeding planting season.
- D. Replace planting materials that are more than 25 percent dead or in an unhealthy condition at end of warranty period.
- E. A limit of one replacement of each plant material will be required, except for losses or replacements due to failure to comply with requirements.

1.9 TREE AND SHRUB MAINTENANCE

- A. Maintain trees and shrubs by pruning, cultivating, watering, weeding, fertilizing, restoring planting saucers, tightening and repairing stakes and guy supports, and resetting to proper grades or vertical position, as required to establish healthy, viable plantings. Spray as required to keep trees and shrubs free of insects and disease. Restore or replace damaged tree wrappings. Maintain trees and shrubs for the following period:
 - 1. Maintenance Period: 12 months following Substantial Completion.

1.10 GROUND COVER AND PLANT MAINTENANCE

- A. Maintain ground cover and plants by watering, weeding, fertilizing, and other operations as required to establish healthy, viable plantings for the following period:
 - 1. Maintenance Period: 6 months following Substantial Completion.

1.11 LAWN MAINTENANCE

A. Begin maintenance of lawns immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:

- 1. Seeded Lawns: 60 days after date of Substantial Completion.
 - a. When full maintenance period has not elapsed before end of planting season, or if lawn is not fully established at that time, continue maintenance during next planting season.
- 2. Sodded Lawns: 30 days after date of Substantial Completion.
- B. Maintain and establish lawns by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn.
- C. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep lawns uniformly moist to a depth of 4 inches.
 - 1. Water lawn at the minimum rate of 1 inch per week.
- D. Mow lawns as soon as there is enough top growth to cut with mower set at specified height for principal species planted. Repeat mowing as required to maintain specified height without cutting more than 40 percent of the grass height. Remove no more than 40 percent of grass- leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet.
- E. Postfertilization: Apply fertilizer to lawn after first mowing and when grass is dry.
 - 1. Use fertilizer that will provide actual nitrogen of at least 1 lb per 1000 sq. ft. of lawn area.

PART 2 – PRODUCTS

2.1 TREE AND SHRUB MATERIAL

- A. General: Furnish nursery-grown trees and shrubs conforming to ANSI Z60.1, with healthy root systems developed by transplanting or root pruning. Provide well-shaped, fully-branched, healthy, vigorous stock free of disease, insects, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.
- B. Grade: Provide trees and shrubs of sizes and grades conforming to ANSI Z60.1 for type of trees and shrubs required. Trees and shrubs of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.
- C. Label each tree and shrub with securely attached, waterproof tag bearing legible designation of botanical and common name.
- D. Label at least 1 tree and 1 shrub of each variety and caliper with a securely attached, waterproof tag bearing legible designation of botanical and common name.

2.2 SHADE AND FLOWERING TREES

- A. Shade Trees: Single-stem trees with straight trunk, well-balanced crown, and intact leader, of height and caliper indicated, conforming to ANSI Z60.1 for type of trees required.
 - 1. Branching Height: 1/2 of tree height.
- B. Small Trees: Small upright or spreading type, branched or pruned naturally according to species and type, and with relationship of caliper, height, and branching recommended by ANSI Z60.1, and stem form as follows:
 - 1. Form: Multistem, clump, with 2 or more main stems.
- C. Provide balled and burlapped trees except where bare-root trees are indicated.
 - 1. Container-grown trees will be acceptable in lieu of balled and burlapped trees subject to meeting ANSI Z60.1 limitations for container stock.

2.3 DECIDUOUS SHRUBS

- A. Form and Size: Deciduous shrubs with not less than the minimum number of canes required by and measured according to ANSI Z60.1 for type, shape, and height of shrub.
- B. Provide balled and burlapped deciduous shrubs except where bare-root deciduous shrubs are indicated.
 - 1. Container-grown deciduous shrubs will be acceptable in lieu of balled and burlapped deciduous shrubs subject to meeting ANSI Z60.1 limitations for container stock.

2.4 CONIFEROUS EVERGREENS

- A. Form and Size: Normal-quality, well-balanced, coniferous evergreens, of type, height, spread, and shape required, conforming to ANSI Z60.1.
- B. Provide balled and burlapped coniferous evergreens.
 - 1. Container-grown coniferous evergreens will be acceptable in lieu of balled and burlapped coniferous evergreens subject to meeting ANSI Z60.1 limitations for container stock.

2.5 BROADLEAF EVERGREENS

- A. Form and Size: Normal-quality, well-balanced, broadleaf evergreens, of type, height, spread, and shape required, conforming to ANSI Z60.1.
- B. Provide balled and burlapped broadleaf evergreens.
 - 1. Container-grown broadleaf evergreens will be acceptable in lieu of balled and

burlapped broadleaf evergreens subject to meeting ANSI Z60.1 limitations for container stock.

2.6 GROUND COVERS AND PLANTS

A. Provide ground covers and plants established and well rooted in removable containers or integral peat pots and with not less than the minimum number and length of runners required by ANSI Z60.1 for the pot size indicated.

2.7 GRASS MATERIALS

- A. Grass Seed: Fresh, clean, dry, new-crop seed complying with the Association of Official Seed Analysts' "Rules for Testing Seeds" for purity and germination tolerances.
 - 1. Seed Mixture: Provide seed of grass species and varieties, proportions by weight, and minimum percentages of purity, germination, and maximum percentage of weed seed as indicated on the plans.
- B. Sod: Certified turfgrass sod complying with ASPA specifications for machine-cut thickness, size, strength, moisture content, and mowed height, and free of weeds and undesirable native grasses. Provide viable sod of uniform density, color, and texture of the following turfgrass species, strongly rooted, and capable of vigorous growth and development when planted.
 - 1. Species: Provide sod of grass species and varieties, proportions by weight, and minimum percentages of purity, germination, and maximum percentage of weed seed as indicated on Schedules at the end of this Section.

2.8 TOPSOIL

- A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, 4 percent organic material minimum, free of stones 1/2 inch or larger in any dimension, and other extraneous materials harmful to plant growth.
 - 1. Topsoil Source: Reuse surface soil stockpiled on the site. Verify suitability of surface soil to produce topsoil meeting requirements and amend when necessary. Supplement with imported topsoil when quantities are insufficient. Clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.

2.9 SOIL AMENDMENTS

- A. Lime: ASTM C 602, Class T, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent, with a minimum 99 percent passing a No. 8 sieve and a minimum 75 percent passing a No. 60 sieve.
 - 1. Provide lime in the form of dolomitic limestone.

- B. Aluminum Sulfate: Commercial grade, unadulterated.
- C. Sand: Clean, washed, natural or manufactured sand, free of toxic materials.
- D. Perlite: Horticultural perlite, soil amendment grade.
- E. Peat Humus: Finely divided or granular texture, with a pH range of 6 to 7.5, composed of partially decomposed moss peat (other than sphagnum), peat humus, or reed-sedge peat.
- F. Peat Humus: For acid-tolerant trees and shrubs, provide moss peat, with a pH range of 3.2 to 4.5, coarse fibrous texture, medium-divided sphagnum moss peat or reed-sedge peat.
- G. Sawdust or Ground-Bark Humus: Decomposed, nitrogen-treated, of uniform texture, free of chips, stones, sticks, soil, or toxic materials.
 - 1. When site treated, mix with at least 0.15 lb of ammonium nitrate or 0.25 lb of ammonium sulfate per cu. ft. of loose sawdust or ground bark.
- H. Manure: Well-rotted, unleached stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.
- I. Herbicides: EPA registered and approved, of type recommended by manufacturer.
- J. Water: Potable.

2.10 FERTILIZER

- A. Slow-Release Fertilizer: Granular fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

2.11 MULCHES

- A. Organic Mulch: Organic mulch, free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:
 - 1. Type: Unrotted pine straw, salt hay or threshed straw.
- B. Peat Mulch: Provide peat moss in natural, shredded, or granulated form, of fine texture, with a pH range of 4 to 6 and a water-absorbing capacity of 1100 to 2000 percent.
- C. Asphalt Emulsion Tackifier: Asphalt emulsion, ASTM D 977, Grade SS-1, nontoxic and free of plant growth- or germination-inhibitors.

D. Nonasphaltic Tackifier: Colloidal tackifier recommended by fiber-mulch manufacturer for slurry application, nontoxic and free of plant growth- or germination-inhibitors.

2.12 WEED-CONTROL BARRIERS

A. Sheet Polyethylene: Black, 0.006-inch minimum thickness.

2.13 EROSION-CONTROL MATERIALS

- Blankets: Biodegradable wood excelsior, straw, or coconut-fiber mat enclosed in a photodegradable plastic mesh. Include manufacturer's recommended steel wire staples, 6 inches long.
- B. Fiber Mesh: Biodegradable twisted jute or spun-coir mesh, 0.92 lb per sq. yd. minimum, with 50 to 65 percent open area. Include manufacturer's recommended steel wire staples, 6 inches long.

2.14 STAKES AND GUYS

- A. Upright and Guy Stakes: Rough-sawn, sound, new hardwood, redwood, or pressurepreservative-treated softwood, free of knots, holes, cross grain, and other defects, 2 by 2 inches by length indicated, pointed at one end.
- B. Guy and Tie Wire: ASTM A 641, Class 1, galvanized-steel wire, 2-strand, twisted, 0.106 inch in diameter.
- C. Guy Cable: 5-strand, 3/16-inch diameter, galvanized-steel cable, with zinc-coated turn buckles, 3-inch long minimum, with two 3/8-inch galvanized eyebolts.
- D. Hose Chafing Guard: Reinforced rubber or plastic hose at least 1/2 inch in diameter, black, cut to lengths required to protect tree trunks from damage.
- E. Flags: Standard surveyor's plastic flagging tape, white, 6 inches long.

2.15 MISCELLANEOUS MATERIALS

- A. Antidesiccant: Water-insoluble emulsion, permeable moisture retarder, film forming, for trees and shrubs. Deliver in original, sealed, and fully labeled containers and mix according to manufacturer's instructions.
- B. Trunk-Wrap Tape: Two layers of crinkled paper cemented together with bituminous material, 4 inches wide minimum, with stretch factor of 33 percent.

PART 3 - EXECUTION
3.1 EXAMINATION

A. Examine areas to receive landscaping for compliance with requirements and for conditions affecting performance of work of this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, and secure Architect's acceptance before the start of planting work. Make minor adjustments as may be required.

3.3 PLANTING SOIL PREPARATION

- A. Before mixing, clean topsoil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.
- B. Mix soil amendments and fertilizers with topsoil at rates indicated. Delay mixing fertilizer if planting does not follow placing of planting soil within a few days.
 - 1. A "Planting Soil Amendments Schedule" is included at the end of this Section.
- C. For tree pit or trench backfill, mix planting soil before backfilling and stockpile at site.
- D. For planting beds and lawns, mix planting soil either prior to planting or apply on surface of topsoil and mix thoroughly before planting.
 - 1. Mix lime with dry soil prior to mixing fertilizer. Prevent lime from contacting roots of acid- tolerant plants.

3.4 LAWN PLANTING PREPARATION

- A. Limit subgrade preparation to areas that will be planted in the immediate future.
- B. Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 1-1/2 inches in any dimension and sticks, roots, rubbish, and other extraneous materials.
- C. Spread planting soil mixture to depth required to meet thickness, grades, and elevations shown, after light rolling and natural settlement to a depth not less than 5 inches. Do not spread if planting soil or subgrade is frozen.
 - 1. Place approximately 1/2 the thickness of planting soil mixture required. Work into top of loosened subgrade to create a transition layer and then place remainder of planting soil mixture.
 - 2. Allow for sod thickness in areas to be sodded.

D.Preparation of Unchanged Grades: Where lawns are to be planted in areas unaltered or
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undisturbed by excavating, grading, or surface soil stripping operations, prepare soil as follows:

- 1. Remove and dispose of existing grass, vegetation, and turf. Do not turn over into soil being prepared for lawns.
- 2. Till surface soil to a depth of at least 6 inches. Apply required soil amendments and initial fertilizers and mix thoroughly into top 4 inches of soil. Trim high areas and fill in depressions. Till soil to a homogenous mixture of fine texture.
- 3. Clean surface soil of roots, plants, sods, stones, clay lumps, and other extraneous materials harmful to plant growth.
- 4. Remove waste material, including grass, vegetation, and turf, and legally dispose of it off the Owner's property.
- E. Grade lawn and grass areas to a smooth, even surface with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future. Remove trash, debris, stones larger than 1/2 inches in any dimension, and other objects that may interfere with planting or maintenance operations.
- F. Moisten prepared lawn areas before planting when soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- G. Restore prepared areas if eroded or otherwise disturbed after fine grading and before planting.

3.5 GROUND COVER AND PLANT BED PREPARATION

- A. Loosen subgrade of planting bed areas to a minimum depth of 6 inches. Remove stones larger than 1/2 inches in any dimension and sticks, roots, rubbish, and other extraneous materials.
- B. Spread planting soil mixture to depth required to meet thickness, grades, and elevations shown, after light rolling and natural settlement. Place approximately 1/2 the thickness of planting soil mixture required. Work into top of loosened subgrade to create a transition layer and then place remainder of planting soil mixture.
- C. Till soil in beds to a minimum depth of 8 inches and mix with specified soil amendments and fertilizers.
- D. Remove soil to a minimum depth of 8 inches and replace with prepared planting soil mixture.

3.6 EXCAVATION FOR TREES AND SHRUBS

A. Pits and Trenches: Excavate with vertical sides and with bottom of excavation slightly raised at center to assist drainage. Loosen hard subsoil in bottom of excavation.

- 1. Balled and Burlapped Trees and Shrubs: Excavate approximately 1-1/2 times as wide as ball diameter and equal to ball depth, plus the following setting layer depth:
 - a. Setting Layer: Allow 3 inches of planting soil.
 - b. Setting Layer: Allow 9 inches of planting soil.
- B. Dispose of subsoil removed from landscape excavations. Do not mix with planting soil or use as backfill.
- C. Obstructions: Notify Architect if unexpected rock or obstructions detrimental to trees or shrubs are encountered in excavations.
 - 1. Hardpan Layer: Drill 6-inch diameter holes into free-draining strata or to a depth of 10 feet, whichever is less, and backfill with free-draining material.
- D. Drainage: Notify Architect if subsoil conditions evidence unexpected water seepage or retention in tree or shrub pits.
- E. Fill excavations with water and allow to percolate out, before placing setting layer and positioning trees and shrubs.

3.7 PLANTING TREES AND SHRUBS

- A. Set balled and burlapped stock plumb and in center of pit or trench with top of ball raised above adjacent finish grades as indicated.
 - 1. Place stock on setting layer of compacted planting soil.
 - 2. Remove burlap and wire baskets from tops of balls and partially from sides, but do not remove from under balls. Remove pallets, if any, before setting. Do not use planting stock if ball is cracked or broken before or during planting operation.
 - 3. Place backfill around ball in layers, tamping to settle backfill and eliminate voids and air pockets. When pit is approximately 1/2 backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more is absorbed. Water again after placing and tamping final layer of backfill.
- B. Dish and tamp top of backfill to form a 3-inch high mound around the rim of the pit. Do not cover top of root ball with backfill.
- C. Wrap trees of 2-inch caliper and larger with trunk-wrap tape. Start at base of trunk and spiral cover trunk to height of first branches. Overlap wrap, exposing half the width, and securely attach without causing girdling. Inspect tree trunks for injury, improper pruning, and insect infestation and take corrective measures required before wrapping.

3.8 TREE AND SHRUB PRUNING

- A. Prune, thin, and shape trees and shrubs as directed by Architect.
- C. Prune, thin, and shape trees and shrubs according to standard horticultural practice. Prune trees to retain required height and spread. Unless otherwise directed by Architect, do not cut tree leaders; remove only injured or dead branches from flowering trees. Prune shrubs to retain natural character. Shrub sizes indicated are size after pruning.

3.9 TREE AND SHRUB GUYING AND STAKING

- A. Upright Staking and Tying: Stake trees of 2- through 5-inch caliper. Stake trees of less than 2-inch caliper only as required to prevent wind tip-out. Use a minimum of 2 stakes of length required to penetrate at least 18 inches below bottom of backfilled excavation and to extend at least 72 inches above grade. Set vertical stakes and space to avoid penetrating balls or root masses. Support trees with 2 strands of tie wire encased in hose sections at contact points with tree trunk. Allow enough slack to avoid rigid restraint of tree.
- B. Guying and Staking: Guy and stake trees exceeding 14 feet and more than 3-inch caliper unless otherwise indicated. Securely attach no fewer than 3 guys to stakes 30 inches long, driven to grade. Attach flags to each guy wire, 30 inches above finish grade.

3.10 PLANTING GROUND COVER AND PLANTS

- A. Space ground cover and plants as indicated.
- B. Space ground cover and plants not more than 24 inches apart.
- C. Dig holes large enough to allow spreading of roots, and backfill with planting soil. Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water. Water thoroughly after planting, taking care not to cover plant crowns with wet soil.

3.11 SEEDING NEW LAWNS

- A. Sow seed with a spreader or a seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in 2 directions at right angles to each other.
 - 1. Do not use wet seed or seed that is moldy or otherwise damaged in transit or storage.
- B. Sow seed at the rates indicated on the plans.
- C. Rake seed lightly into top 1/8 inch of topsoil, roll lightly, and water with fine spray.
- D. Protect seeded slopes exceeding 1:4 against erosion with erosion-control blankets installed and stapled according to manufacturer's recommendations.

- E. Protect seeded slopes exceeding 1:6 against erosion with jute or coir-fiber erosioncontrol mesh installed and stapled according to manufacturer's recommendations.
- F. Protect seeded areas with slopes less than 1:6 against erosion by spreading straw mulch after completion of seeding operations. Spread uniformly at a minimum rate of 50 to 90 pounds per 1000 square feet to form a continuous blanket 1-1/2 inches loose depth over seeded areas. Spread by hand, blower, or other suitable equipment.
 - 1. Anchor straw mulch by crimping into topsoil by suitable mechanical equipment.
 - 2. Anchor straw mulch by spraying with asphalt-emulsion tackifier at the rate of 10 to 13 gal. per 1000 sq. ft. Take precautions to prevent damage or staining of structures or other plantings adjacent to mulched areas. Immediately clean damaged or stained areas.
- G. Protect seeded areas against hot, dry weather or drying winds by applying peat mulch within 24 hours after completion of seeding operations. Soak and scatter uniformly to a depth of 3/16 inch thick and roll to a smooth surface.

3.12 HYDROSEEDING NEW LAWNS

- A. Hydroseeding: Mix specified seed, fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogenous slurry suitable for hydraulic application.
 - 1. Mix slurry with nonasphaltic tackifier.
 - 2. Apply slurry uniformly to all areas to be seeded in a 1-step process. Apply mulch at the minimum rate of 1500 lb per acre dry weight but not less than the rate required to obtain specified seed-sowing rate.
 - 3. Apply slurry uniformly to all areas to be seeded in a 2-step process. Apply first slurry application at the minimum rate of 500 lb per acre dry weight but not less than the rate required to obtain specified seed-sowing rate. Apply slurry cover coat of fiber mulch at a rate of 1000 lb per acre.

3.13 SODDING NEW LAWNS

- A. Lay sod within 24 hours of stripping. Do not lay sod if dormant or if ground is frozen.
- B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to subgrade or sod during installation. Tamp and roll lightly to ensure contact with subgrade, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.
 - 1. Lay sod across angle of slopes exceeding 1:3.
 - 2. Anchor sod on slopes exceeding 1:6 with wood pegs spaced as recommended by sod manufacturer but not less than 2 anchors per sod strip to prevent slippage.

C. Saturate sod with fine water spray within 2 hours of planting. During first week, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches below the sod.

3.14 RECONDITIONING LAWNS

- A. Recondition existing lawn areas damaged by Contractor's operations, including storage of materials or equipment and movement of vehicles. Also recondition lawn areas where settlement or washouts occur or where minor regrading is required.
- B. Remove sod and vegetation from diseased or unsatisfactory lawn areas; do not bury into soil. Remove topsoil containing foreign materials resulting from Contractor's operations, including oil drippings, fuel spills, stone, gravel, and other construction materials, and replace with new topsoil.
- C. Where substantial lawn remains, mow, dethatch, core aerate, and rake. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre- emergence herbicides.
- D. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of it off the Owner's property.
- E. Till stripped, bare, and compacted areas thoroughly to a depth of 6 inches.
- F. Apply required soil amendments and initial fertilizers and mix thoroughly into top 4 inches of soil. Provide new planting soil as required to fill low spots and meet new finish grades.
- G. Apply seed and protect with straw mulch as required for new lawns.
- H. Water newly planted areas and keep moist until new grass is established.

3.15 INSTALLATION OF MISCELLANEOUS MATERIALS

- A. Apply antidesiccant using power spray to provide an adequate film over trunks, branches, stems, twigs, and foliage.
 - 1. When deciduous trees or shrubs are moved in full-leaf, spray with antidesiccant at nursery before moving and again 2 weeks after planting.

3.16 CLEANUP AND PROTECTION

- A. During landscaping, keep pavements clean and work area in an orderly condition.
- B. Protect landscaping from damage due to landscape operations, operations by other contractors and trades, and trespassers. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged landscape work as directed.

3.17 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal: Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of it off the Owner's property.

3.18 PLANTING SOIL AMENDMENTS SCHEDULE

A. Lawns: Provide soil amendments based upon recommendations made by qualified professionals and recognized standards, subject to Owner's approval.

3.19 MAINTENANCE OF SEEDED LAWNS

- A. Contractor shall maintain seeded lawns until acceptance by the Landscape Architect and Engineer.
- B. The Contractor's responsibility for maintenance is to be continuous to the time of final acceptance of the work. It is to include, but not be limited to, reseeding of areas that have not rooted properly, watering, mowing, weeding and reworking as follows:
 - 1. Reseeding of any bare areas.
 - 2. Proper and adequate watering.
 - 3. Refilling of rain washed gullies and rutted areas.
 - 4. Refertilization and lime application if recommended by soil tests and weed and pest control.
 - 5. Reworking and reseeding of any areas which fail to show a uniform stand or grass shall be done at the Contractor's expense with the same seed mixture applied at the rate originally used and repeated until all areas are covered with a satisfactory stand of grass.
 - 6. Mowing grass and weeks to a height of 2" to 3" when grass attains height of 4" or when growth tends to smother new seedlings. A minimum of three mowings are to be completed before final inspection and a minimum of three mowings are to be completed after grass has been accepted. Do not cut off more than 1/3 of the plant
 - 7. If seeded in fall and not given 60 days of maintenance, or if not considered acceptable at that time, continue maintenance the following spring until acceptable lawn is established.

END OF SECTION 029000

SECTION 029200

LAWNS AND GRASSES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Seeding.
 - 2. Fertilizing.
 - 3. Mulching.
- B. Related Sections include the following:
 - 1. Division 2 Section "Site Clearing" for topsoil stripping and stockpiling.
 - 2. Division 2 Section "Earthwork" for excavation, filling and backfilling, and rough grading.

1.3 **DEFINITIONS**

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Manufactured Soil: Soil produced off-site by homogeneously blending mineral soils or sand with stabilized organic soil amendments to produce topsoil or planting soil.
- C. Planting Soil: Native or imported topsoil, manufactured topsoil, or surface soil modified to become topsoil; mixed with soil amendments.
- D. Subgrade: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill immediately beneath planting soil.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include

the year of production and date of packaging.

- 1. Certification of each seed mixture for turfgrass, identifying source, including name and telephone number of supplier.
- C. Product Certificates: For soil amendments and fertilizers, signed by product manufacturer.
- D. Qualification Data: For landscape Installer.
- E. Material Test Reports: For existing surface soil and imported topsoil.
- F. Planting Schedule: Indicating anticipated planting dates for each type of planting.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified landscape installer whose work has resulted in successful lawn establishment.
 - 1. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when planting is in progress.
- B. Report suitability of topsoil for lawn growth. State recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to produce a satisfactory topsoil topsoil.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Seed: Deliver seed in original sealed, labeled, and undamaged containers.

1.7 SCHEDULING

- A. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion. These periods may be extended or reduced according to prevailing weather conditions and growers' recommendations.
 - 1. Spring Planting: April 1-May 31.
 - 2. Fall Planting: August 15-October 15
- B. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

1.8 LAWN MAINTENANCE

- A. Begin maintenance immediately after each area is planted and continue until acceptable lawn is established, but for not less than the following periods:
 - 1. Seeded Lawns: 60 days from date of Substantial Completion.
 - a. When full maintenance period has not elapsed before end of planting season, or if lawn is not fully established, continue maintenance during next planting season.
- B. Maintain and establish lawn by watering, fertilizing, weeding, mowing, trimming, replanting, and other operations. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth lawn.
 - 1. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch. Anchor as required to prevent displacement.
- C. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep lawn uniformly moist to a depth of 4 inches.
 - 1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
 - 2. Water lawn at a minimum rate of 1 inch per week.
- D. Mow lawn as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 40 percent of grass height. Remove no more than 40 percent of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:
 - 1. Mow grass to $2\frac{1}{2}$ 3 inches high. Do not cut off more than 1/3 or the plant
- E. Lawn Post-fertilization: Apply fertilizer after initial mowing and when grass is dry.
 - 1. Use fertilizer that will provide actual nitrogen of at least 1 lb/1000 sq. ft. to lawn area.

PART 2 - PRODUCTS

2.1 SEED

A. Grass Seed: Fresh, clean, dry, new-crop seed complying with AOSA's "Journal of

Seed Technology; Rules for Testing Seeds" for purity and germination tolerances.

- B. Seed Species: Seed of grass species as follows, with not less than 95 percent germination, not less than 85 percent pure seed, and not more than 0.3 percent weed seed. Preferred seed is Branch Creek Evolution, proportioned by weight as follows:
 - a. 80 percent tall fescue with three different varieties
 - b. 10 percent Kentucky bluegrass
 - c. 10 percent perennial ryegrass

2.2 TOPSOIL

- A. Topsoil: ASTM D 5268, pH range of 5.5 to 7, a minimum of 5 percent organic material content; free of stones ½ inch or larger in any dimension and other extraneous materials harmful to plant growth.
 - 1. Topsoil Source: Reuse surface soil stockpiled on-site. Verify suitability of stockpiled surface soil to produce topsoil. Clean surface soil of roots, plants, sod, stones, clay lumps, and other extraneous materials harmful to plant growth.
 - a. Supplement with imported or manufactured topsoil from off-site sources when quantities are insufficient. Obtain topsoil displaced from naturally well-drained construction or mining sites where topsoil occurs at least 4 inches deep; do not obtain from bogs or marshes.

2.3 INORGANIC SOIL AMENDMENTS

- A. Lime: ASTM C 602, agricultural limestone containing a minimum 80 percent calcium carbonate equivalent and as follows:
 - 1. Class: Class T, with a minimum 99 percent passing through No. 8 sieve and a minimum 75 percent passing through No. 60 sieve.
- B. Sulfur: Granular, biodegradable, containing a minimum of 90 percent sulfur, with a minimum 99 percent passing through No. 6 sieve and a maximum 10 percent passing through No. 40 sieve.
- C. Aluminum Sulfate: Commercial grade, unadulterated.
- D. Perlite: Horticultural perlite, soil amendment grade. Conforming to the National Bureau of Standards PS23.
- E. Agricultural Gypsum: Finely ground, containing a minimum of 90 percent calcium sulfate.
- F. Sand: Clean, washed, natural or manufactured, free of toxic materials.

- G. Diatomaceous Earth: Calcined, diatomaceous earth, 90 percent silica, with approximately 140 percent water absorption capacity by weight.
- H. Zeolites: Mineral clinoptilolite with at least 60 percent water absorption by weight.

2.4 ORGANIC SOIL AMENDMENTS

- A. Peat: Finely divided or granular texture, with a pH range of 6 to 7.5, containing partially decomposed moss peat, native peat, or reed-sedge peat and having a water-absorbing capacity of 1100 to 2000 percent.
- B. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.

2.5 PLANTING ACCESSORIES

A. Selective Herbicides: EPA registered and approved, of type recommended by manufacturer for application.

2.6 FERTILIZER

- A. All fertilizer shall be granular pills, packets or pellets with 35-80% of the total nitrogen in a slow release form.
- B. All fertilizers shall be uniform in composition, free flowing and suitable for application with approved equipment. Fertilizers shall be delivered to the site fully labeled according to applicable State laws and shall bear the name, trade mark, and warranty of the producer.
- C. Bonemeal: Commercial, raw or steamed, finely ground; a minimum of 4 percent nitrogen and 20 percent phosphoric acid.
- D. Superphosphate: Commercial, phosphate mixture, soluble; a minimum of 20 percent available phosphoric acid.
- E. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.
- F. Slow-Release Fertilizer: Granular or pelleted fertilizer consisting of 50 percent water-insoluble nitrogen, phosphorus, and potassium in the following composition:
 - 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing agency.

2.7 PLANTING SOIL MIX

- A. Planting Soil Mix: Mix topsoil with the following soil amendments and fertilizers in the following quantities:
 - 1. Contractor shall fertilize all lawn areas with a 10-20-10 fertilizer or equivalent at the rate specified by the manufacturer. Amendments shall be added appropriately for the types of soils on site. It is the Contractor's responsibility to have the soil acidity and a soil test conducted to establish the soil's amendments and fertilizer rates.

2.8 MULCHES

A. Straw Mulch: Provide air-dry, clean, free of mildew and noxious weeds, and shall be small grained straw such as wheat or barley.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive lawns and grass for compliance with requirements and other conditions affecting performance. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
- B. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 LAWN PREPARATION

- A. Limit lawn subgrade preparation to areas to be planted.
- B. Newly Graded Subgrades: Loosen subgrade to a minimum depth of 4 inches. Remove stones larger than 1-1/2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.
 - 1. A minimum of 5" of topsoil shall be spread over prepared subgrade.
 - 2. Thoroughly blend planting soil mix off-site before spreading or spread topsoil, apply soil amendments and fertilizer on surface at a rate determined by soil test analysis, and thoroughly blend planting soil mix.

- a. Delay mixing fertilizer with planting soil if planting will not proceed within a few days.
- b. Mix lime with dry soil before mixing fertilizer.
- 3. Spread planting soil mix to a depth required to meet finish grades after light rolling and natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.
- C. Unchanged Subgrades: If lawns are to be planted in areas unaltered or undisturbed by excavating, grading, or surface soil stripping operations, prepare surface soil as follows:
 - 1. Remove existing grass, vegetation, and turf. Do not mix into surface soil.
 - 2. Loosen surface soil to a depth of at least of 6 inches. Apply soil amendments and fertilizers according to planting soil mix proportions and mix thoroughly into top 4 inches(100 mm) of soil. Till soil to a homogeneous mixture of fine texture.
 - 3. Remove stones larger than 1/2 inches in any dimension and sticks, roots, trash, and other extraneous matter.
 - 4. Legally dispose of waste material, including grass, vegetation, and turf, off Owner's property.
- D. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Grade to within plus or minus 1/2 inch of finish elevation. Roll and rake, remove ridges, and fill depressions to meet finish grades. Limit fine grading to areas that can be planted in the immediate future.
- E. Moisten prepared lawn areas before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- F. Restore areas if eroded or otherwise disturbed after finish grading and before planting.

3.4 SEEDING

- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
 - 1. Do not use wet seed or seed that is moldy or otherwise damaged.
- B. Sow seed at the rate of 4 lbs./1000 sq. ft.
- C. Rake seed lightly into top 1/8 inch of topsoil, roll lightly, and water with fine spray.
- D. Protect seeded areas with slopes exceeding 1:4 with erosion-control blankets installed and stapled according to manufacturer's written instructions.

- E. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 50 to 90 pounds per 1000 square feet to form a continuous blanket 1-1/2 inches in loose depth over seeded areas. Spread by hand, blower, or other suitable equipment. Spread mulch uniformly so that 75-95% of the soil surface is covered.
 - 1. Anchor straw mulch by crimping into topsoil with suitable mechanical equipment.
- F. Protect seeded areas from hot, dry weather or drying winds by applying peat mulch within 24 hours after completing seeding operations. Soak and scatter uniformly to a depth of 3/16 inch and roll to a smooth surface.

3.5 LAWN RENOVATION

- A. Renovate existing lawn.
- B. Renovate existing lawn damaged by Contractor's operations, such as storage of materials or equipment and movement of vehicles.
 - 1. Reestablish lawn where settlement or washouts occur or where minor regrading is required.
- C. Remove sod and vegetation from diseased or unsatisfactory lawn areas; do not bury in soil.
- D. Remove topsoil containing foreign materials resulting from Contractor's operations, including oil drippings, fuel spills, stone, gravel, and other construction materials, and replace with new topsoil.
- E. Mow, dethatch, core aerate, and rake existing lawn.
- F. Remove weeds before seeding. Where weeds are extensive, apply selective herbicides as required. Do not use pre-emergence herbicides.
- G. Remove waste and foreign materials, including weeds, soil cores, grass, vegetation, and turf, and legally dispose of them off Owner's property.
- H. Till stripped, bare, and compacted areas thoroughly to a soil depth of 6 inches.
- I. Apply soil amendments and initial fertilizers required for establishing new lawns and mix thoroughly into top 4 inches of existing soil. Provide new planting soil to fill low spots and meet finish grades.
- J. Apply seed and protect with straw mulch as required for new lawns.
- K. Water newly planted areas and keep moist until new lawn is established.

3.6 SATISFACTORY LAWNS

- A. Satisfactory Seeded Lawn: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. (0.92 sq. m) and bare spots not exceeding 5 by 5 inches.
- B. Reestablish lawns that do not comply with requirements and continue maintenance until lawns are satisfactory.

3.7 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by lawn work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Erect barricades and warning signs as required to protect newly planted areas from traffic. Maintain barricades throughout maintenance period and remove after lawn is established.
- C. Remove erosion-control measures after grass establishment period.

END OF SECTION 029200

SECTION 032000 CONCRETE REINFORCING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Reinforcing steel for cast-in-place concrete.
- B. Supports and accessories for steel reinforcement.

1.02 RELATED REQUIREMENTS

- A. Section 031000 Concrete Forming and Accessories.
- B. Section 033000 Cast-in-Place Concrete.
- C. Section 042000 Unit Masonry: Reinforcement for masonry.

1.03 REFERENCE STANDARDS

- ACI CODE-318 Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).
- B. ACI MNL-66 ACI Detailing Manual; 2020.
- C. ACI SPEC-301 Specifications for Concrete Construction; 2020.
- D. ASTM A615/A615M Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.
- E. ASTM A884/A884M Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement; 2019, with Editorial Revision (2020).
- F. ASTM A1064/A1064M Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2022.
- G. CRSI (DA4) Manual of Standard Practice; 2023.

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Comply with requirements of ACI MNL-66 Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.
- C. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.

1.05 QUALITY ASSURANCE

A. Perform work of this section in accordance with ACI SPEC-301.

PART 2 PRODUCTS

2.01 REINFORCEMENT

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi) (420 MPa).
 - 1. Deformed billet-steel bars.
 - 2. Unfinished.
- B. Steel Welded Wire Reinforcement (WWR): Galvanized, deformed type; ASTM A1064/A1064M.
 - 1. Form: Flat Sheets.
 - 2. WWR Style: As indicated on drawings.
- C. Reinforcement Accessories:
 - 1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch (1.29 mm).
 - 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
 - 3. Provide stainless steel, plastic, or plastic coated steel components for placement within 1-1/2 inches (38 mm) of weathering surfaces.

2.02 RE-BAR SPLICING:

- A. Coupler Systems: Mechanical devices for splicing reinforcing bars.
 - 1. Comply with ACI CODE-318 steel reinforcing design strength requirements for splices in tension and compression.
- B. Dowel Bar Splicer with Dowel-Ins: Mechanical devices for splicing reinforcing bars.
 - 1. Comply with ACI CODE-318 steel reinforcing design strength requirements for splices in tension and compression.
- C. Grout: Cementitious, non-metallic, non-shrink grout for use with manufacturer's grout sleeve reinforcing bar coupler system.

2.03 FABRICATION

A. Fabricate concrete reinforcing in accordance with CRSI (DA4) - Manual of Standard Practice.

PART 3 EXECUTION

3.01 PLACEMENT

- A. Place, support and secure reinforcement against displacement. Do not deviate from required position.
- B. Accommodate placement of formed openings.
- C. Maintain concrete cover around reinforcing as indicated on drawings.
- D. Comply with applicable code for concrete cover over reinforcement.

3.02 FIELD QUALITY CONTROL

A. An independent testing agency, as specified in Section 014000 - Quality Requirements, will inspect installed reinforcement for compliance with contract documents before concrete placement.

END OF SECTION

SECTION 033000 CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 1. Concrete toppings.

1.03 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; subject to compliance with requirements.

1.04 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
 - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
 - 1. Location of construction joints is subject to approval of the Architect.

1.05 INFORMATIONAL SUBMITTALS

- A. Qualifications
 - Concrete Contractor assigned to this project will employ apprentices and journey-level workers that are either enrolled in or graduates of a registered apprenticeship program, with curriculum developed by the International Masonry Training and Education Foundation or on-the-job experience at least equivalent to requirements for graduation from a registered apprenticeship program for this occupation as approved by the U.S. Department of Labor or relevant state registration agency. Compliance with this training and experience standard shall be verified by the owner, owner's agent, or qualified professional representing the owner.
- B. Qualification Data: For Installer, manufacturer, and testing agency.
- C. Welding certificates.
- D. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Form materials and form-release agents.
 - 4. Steel reinforcement and accessories.
 - 5. Curing compounds.
 - 6. Floor and slab treatments.
 - 7. Bonding agents.
 - 8. Adhesives.
 - 9. Semi-rigid joint filler.
 - 10. Joint-filler strips.

- 11. Repair materials.
- E. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:
 - 1. Aggregates. Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.
- F. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.
- G. Field quality-control reports.
- H. Minutes of preinstallation conference.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACIcertified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
 - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Testing Agency Qualifications: Owner shall engage an independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.
 - 2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician Grade II.
- D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code Reinforcing Steel."
- F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
 - 1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.
 - 2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."
- G. Concrete Testing Service: Owner shall engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.
- H. Preinstallation Conference: Conduct conference at Project site.
 - 1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete subcontractor.
 - e. Special concrete finish subcontractor.
 - 2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, forms and form removal limitations, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and

levelness measurement, concrete repair procedures, and concrete protection.

I. Mockup: Provide a 24"x24" mockup of concrete sidewalk.

PART 2 PRODUCTS

2.01 STEEL REINFORCEMENT

- A. Galvanized-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from galvanized-steel wire into flat sheets.
- B. Epoxy-Coated Welded Wire Reinforcement: ASTM A 884/A 884M, Class A coated, Type 1, deformed steel.

2.02 REINFORCEMENT ACCESSORIES

- A. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A 775/A 775M.
- B. Zinc Repair Material: ASTM A 780, zinc-based solder, paint containing zinc dust, or sprayed zinc.
- C. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
 - 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
 - 3. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

2.03 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I/II (With Air entreating cement when required), gray. Supplement with the following:
 - a. Fly Ash: ASTM C 618, Class F or C. Not Permitted in Flat Work.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- B. Normal-Weight Aggregates: ASTM C 33, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
 - 1. Maximum Coarse-Aggregate Size: 1 inch nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M and potable.
- D. Non-Shrink Grout: Non-metallic CRD-C-621, Factory pre-mixed grout to be "Masterflow 713" by Master Builders or approved equal. Installation and curing shall conform to manufacturer's requirements. All grout shall experience no shrinkage and have a maximum of 4.0% expansion when tested under ASTM C-827 with a minimum compressive strength of 5000 psi when tested in accordance with ASTM C-109. Grout shall have a minimum initial set time of 60 minutes when tested in accordance with ASTM C-191

2.04 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.

- 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
- 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
- 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
- 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.
- C. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494/C 494M, Type C.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Axim Italcementi Group, Inc.; CATEXOL CN-CI.
 - b. BASF Construction Chemicals Building Systems; Rheocrete CNI.
 - c. Euclid Chemical Company (The), an RPM company; ARRMATECT.
 - d. Grace Construction Products, W. R. Grace & Co.; DCI.
 - e. Sika Corporation; Sika CNI.
- D. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-setaccelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BASF Construction Chemicals Building Systems; Rheocrete 222+.
 - b. Cortec Corporation; MCI- 2000.
 - c. Grace Construction Products, W. R. Grace & Co.; DCI-S.
 - d. Sika Corporation; FerroGard 901.

2.05 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Axim Italcementi Group, Inc.; CATEXOL CimFilm.
 - b. BASF Construction Chemicals Building Systems; Confilm.
 - c. ChemMasters; SprayFilm.
 - d. Conspec by Dayton Superior; Aquafilm.
 - e. Dayton Superior Corporation; Sure Film (J-74).
 - f. Edoco by Dayton Superior; BurkeFilm.
 - g. Euclid Chemical Company (The), an RPM company; Eucobar.
 - h. Kaufman Products, Inc.; Vapor-Aid.
 - i. Lambert Corporation; LAMBCO Skin.
 - j. L&M Construction Chemicals, Inc.; E-CON.
 - k. Meadows, W. R., Inc.; EVAPRE.
 - I. Metalcrete Industries; Waterhold.
 - m. Nox-Crete Products Group; MONOFILM.
 - n. Sika Corporation; SikaFilm.
 - o. SpecChem, LLC; Spec Film.
 - p. Symons by Dayton Superior; Finishing Aid.
 - q. TK Products, Division of Sierra Corporation; TK-2120 TRI-FILM.
 - r. Unitex; PRO-FILM.
 - s. Vexcon Chemicals, Inc.; Certi-Vex Envio Set.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.

- E. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BASF Construction Chemicals Building Systems; Kure 1315.
 - b. ChemMasters; Polyseal WB.
 - c. Conspec by Dayton Superior; Sealcure 1315 WB.
 - d. Edoco by Dayton Superior; Cureseal 1315 WB.
 - e. Euclid Chemical Company (The), an RPM company; Super Diamond Clear VOX; LusterSeal WB 300.
 - f. Kaufman Products, Inc.; Sure Cure 25 Emulsion.
 - g. Lambert Corporation; UV Safe Seal.
 - h. L&M Construction Chemicals, Inc.; Lumiseal WB Plus.
 - i. Meadows, W. R., Inc.; Vocomp-30.
 - j. Metalcrete Industries; Metcure 30.
 - k. Right Pointe; Right Sheen WB30.
 - I. Symons by Dayton Superior; Cure & Seal 31 Percent E.
 - m. Vexcon Chemicals, Inc.; Vexcon Starseal 1315.
 - 2. VOC Content: Curing and sealing compounds shall have a VOC content of 200 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.06 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.
- B. Semi-rigid Joint Filler: Two-component, semi-rigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.
- C. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
 - 1. Types I and II, non-load bearing AND Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.07 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
 - 1. Fly Ash: 25 percent.
 - 2. Ground Granulated Blast-Furnace Slag: 50 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
 - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 - 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
 - 4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

2.08 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Slabs-on-Grade Exterior (Freeze/Thaw): Proportion normal-weight concrete mixture as follows:
 - 1. Minimum Compressive Strength: 4500 psi at 28 days.
 - 2. Minimum Cementitious Materials Content: 520 lb/cu. yd..
 - 3. Slump Limit: 4 inches, plus or minus 1 inch.
 - 4. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
 - 5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch or 3/4-inch nominal maximum aggregate size.
 - 6. Air content in first subparagraph below is maximum recommended by ACI 302.1R for trowel-finished floors.
 - 7. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
- B. Toping Slab Exterior Patio (Freeze/Thaw): Proportion normal-weight concrete mixture as follows:
 - 1. Minimum Compressive Strength: 4500 psi at 28 days.
 - 2. Minimum Cementitious Materials Content: 520 lb/cu. yd..
 - 3. Slump Limit: 4 inches, plus or minus 1 inch.
 - 4. Air Content: 5.5 percent, plus or minus 1.5 percent at point of delivery for 1-1/2-inch nominal maximum aggregate size.
 - 5. Air Content: 6 percent, plus or minus 1.5 percent at point of delivery for 1-inch or 3/4-inch nominal maximum aggregate size.
 - 6. Air content in first subparagraph below is maximum recommended by ACI 302.1R for trowel-finished floors.
 - 7. Medium Grey Concrete Dye.
 - 8. White Aggregate with Cleat Quartz
 - 9. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent
- C. Suspended Slabs: Proportion normal-weight concrete mixture as follows:
 - 1. Minimum Compressive Strength: 3500 psi at 28 days.
 - 2. Minimum Cementitious Materials Content: 520 lb/cu. yd..
 - 3. Slump Limit: 4 inches, plus or minus 1 inch.
 - 4. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.

2.09 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.10 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
 - When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
 - 1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
 - 2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
 - 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 EXECUTION

3.01 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness or 1 in deep as follows:
 - 1. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
- C. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
 - 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 07 Section "Exterior Joint Sealants," are indicated.
 - 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

3.02 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
 - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
 - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

- 1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
- 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
- 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- G. Hot-Weather Placement: Comply with ACI 301 and as follows:
 - 1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.03 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture.
 - 1. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
- C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 1. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 - 2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
- D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.
 - 1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.
- E. Broom Finish: Apply a light broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated. B
 - 1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiberbristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.04 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with inplace construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

3.05 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- D. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 - Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.
 - 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Repeat process 24 hours later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.06 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 1. Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semi-rigid joint filler at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.07 CONCRETE FINISHING

- A. Repair surface defects, including tie holes, immediately after removing formwork.
- B. Unexposed Form Finish: Rub down or chip off fins or other raised areas 1/8 inch or more in height.
 - 1. Exposed Form Finish: Rub down or chip off and smooth fins or other raised areas ¼" or more in height. Provide Finish as Follows.
 - 2. Smooth Rubbed Finish: Wet Concrete and rub with carborundum brick or other abrasive, not more than 24 hours after form removal.

a. Formed Finish per ACI 301-10 As cast finish SF-3.0

3.08 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 - 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 - 2. After concrete has cured at least 14 days, correct high areas by grinding.
 - 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 - 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 - 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
 - 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 - 7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- D. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- E. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.09 FIELD QUALITY CONTROL

- A. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
 - 1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.
 - 2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. or fraction thereof of each concrete mixture placed each day.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

- 3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
- 4. Air Content: ASTM C 231, pressure method, for normal-weight concrete;one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
- 5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F and below and when 80 deg F and above, and one test for each composite sample.
- 6. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
- 7. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
 - b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
- 8. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days, one set of two specimens at 28 days, and one set of at least one specimen at 56 days.
 - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
- 9. When strength of field-cured cylinders is less than 85 percent of companion laboratorycured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
- 10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- 11. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- 12. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- 13. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
- 14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- 15. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- B. Measure floor and slab flatness and levelness according to ASTM E 1155 within 24 hours of finishing.

END OF SECTION

SECTION 040511 MASONRY MORTARING AND GROUTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Mortar for masonry.
- B. Grout for masonry.

1.02 RELATED REQUIREMENTS

A. Section 042000 - Unit Masonry: Installation of mortar and grout.

1.03 REFERENCE STANDARDS

- A. ASTM C94/C94M Standard Specification for Ready-Mixed Concrete; 2024.
- B. ASTM C144 Standard Specification for Aggregate for Masonry Mortar; 2018.
- C. ASTM C270 Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.
- D. ASTM C476 Standard Specification for Grout for Masonry; 2022.
- E. ASTM C780 Standard Test Methods for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2023.
- F. ASTM C1019 Standard Test Method for Sampling and Testing Grout for Masonry; 2020.
- G. ASTM C1714/C1714M Standard Specification for Preblended Dry Mortar Mix for Unit Masonry; 2019a.
- H. TMS 402/602 Building Code Requirements and Specification for Masonry Structures; 2022, with Errata (2024).

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements, for submittal procedures.
- B. Product Data: Include design mix and indicate whether the Proportion or Property specification of ASTM C270 is to be used. Also include required environmental conditions and admixture limitations.
- C. Samples: Submit two samples of mortar, illustrating mortar color and color range.
- D. Reports: Submit reports on mortar indicating compliance of mortar to property requirements of ASTM C270 and test and evaluation reports per ASTM C780.
- E. Reports: Submit reports on grout indicating compliance of component grout materials to requirements of ASTM C476 and test and evaluation reports to requirements of ASTM C1019.
- F. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- G. Manufacturer's Installation Instructions: Submit packaged dry mortar manufacturer's installation instructions.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

1.06 FIELD CONDITIONS

A. Cold and Hot Weather Requirements: Comply with requirements of TMS 402/602 or applicable building code, whichever is more stringent.

PART 2 PRODUCTS

2.01 MORTAR AND GROUT APPLICATIONS

- A. Mortar Mix Designs: ASTM C270, Property Specification.
 - 1. Masonry below grade and in contact with earth: Type S.
 - 2. Exterior Masonry Veneer: Type N.

- 3. Exterior, Loadbearing Masonry: Type N.
- 4. Exterior, Non-loadbearing Masonry: Type N.

2.02 MATERIALS

- A. Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
 1. Color: Match existing mortar color. Submit samples for approval.
- B. Mortar Aggregate: ASTM C144.
- C. Water: Clean and potable.

2.03 MORTAR MIXING

- A. Thoroughly mix mortar ingredients using mechanical batch mixer, in accordance with ASTM C270 and in quantities needed for immediate use.
- B. Maintain sand uniformly damp immediately before the mixing process.
- C. Do not use anti-freeze compounds to lower the freezing point of mortar.
- D. If water is lost by evaporation, re-temper only within two hours of mixing.

2.04 GROUT MIXING

- A. Mix grout in accordance with ASTM C94/C94M.
- B. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476 for fine and coarse grout.

PART 3 EXECUTION

3.01 PREPARATION

A. Plug clean-out holes for grouted masonry with brick masonry units. Brace masonry to resist wet grout pressure.

3.02 INSTALLATION

- A. Install mortar and grout to requirements of section(s) in which masonry is specified.
- B. Work grout into masonry cores and cavities to eliminate voids.
- C. Do not displace reinforcement while placing grout.

3.03 GROUTING

- A. Use either high-lift or low-lift grouting techniques, at Contractor's option, subject to other limitations of Contract Documents.
- B. Low-Lift Grouting:
 - 1. Limit height of pours to 12 inches (300 mm).
 - 2. Limit height of masonry to 16 inches (400 mm) above each pour.
 - 3. Pour grout only after vertical reinforcing is in place; place horizontal reinforcing as grout is poured. Prevent displacement of bars as grout is poured.
 - 4. Place grout for each pour continuously and consolidate immediately; do not interrupt pours for more than 1-1/2 hours.
- C. High-Lift Grouting:
 - 1. Verify that horizontal and vertical reinforcement is in proper position and adequately secured before beginning pours.
 - 2. Hollow Masonry: Limit lifts to maximum 4 feet (1.2 m) and pours to maximum height of 24 feet (7.3 m).
 - 3. Place grout for spanning elements in single, continuous pour.

3.04 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field tests, in accordance with provisions of Section 014000 Quality Requirements.
- B. Test and evaluate mortar in accordance with ASTM C780 procedures.

C. Test and evaluate grout in accordance with ASTM C1019 procedures.

END OF SECTION

SECTION 042000 UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Concrete block.
- B. Mortar and grout.
- C. Reinforcement and anchorage.
- D. Flashings.
- E. Lintels.
- F. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 040511 Masonry Mortaring and Grouting.
- B. Section 055000 Metal Fabrications: Loose steel lintels.
- C. Section 079200 Joint Sealants: Sealing control and expansion joints.

1.03 REFERENCE STANDARDS

- A. ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- B. ASTM A240/A240M Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications; 2023a.
- C. ASTM A480/A480M Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip; 2023b.
- D. ASTM A580/A580M Standard Specification for Stainless Steel Wire; 2023.
- E. ASTM A615/A615M Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2022.
- F. ASTM A641/A641M Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2019.
- G. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2022.
- H. ASTM A666 Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2015.
- I. ASTM A951/A951M Standard Specification for Steel Wire for Masonry Joint Reinforcement; 2022.
- J. ASTM A1008/A1008M Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2021a.
- K. ASTM A1064/A1064M Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2022.
- L. ASTM B370 Standard Specification for Copper Sheet and Strip for Building Construction; 2022.
- M. ASTM C27 Standard Classification of Fireclay and High-Alumina Refractory Brick; 1998 (Reapproved 2022).
- N. ASTM C34 Standard Specification for Structural Clay Loadbearing Wall Tile; 2023.
- O. ASTM C55 Standard Specification for Concrete Building Brick; 2023.
- P. ASTM C56 Standard Specification for Structural Clay Nonloadbearing Tile; 2022.
- Q. ASTM C62 Standard Specification for Building Brick (Solid Masonry Units Made from Clay or Shale); 2023.

- R. ASTM C67/C67M Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2023.
- S. ASTM C73 Standard Specification for Calcium Silicate Brick (Sand-Lime Brick); 2023.
- T. ASTM C90 Standard Specification for Loadbearing Concrete Masonry Units; 2023.
- U. ASTM C91/C91M Standard Specification for Masonry Cement; 2023.
- V. ASTM C126 Standard Specification for Ceramic Glazed Structural Clay Facing Tile, Facing Brick, and Solid Masonry Units; 2022.
- W. ASTM C129 Standard Specification for Nonloadbearing Concrete Masonry Units; 2023.
- X. ASTM C144 Standard Specification for Aggregate for Masonry Mortar; 2018.
- Y. ASTM C150/C150M Standard Specification for Portland Cement; 2022.
- Z. ASTM C207 Standard Specification for Hydrated Lime for Masonry Purposes; 2018.
- AA. ASTM C270 Standard Specification for Mortar for Unit Masonry; 2019a, with Editorial Revision.
- BB. ASTM C404 Standard Specification for Aggregates for Masonry Grout; 2024.
- CC. ASTM C476 Standard Specification for Grout for Masonry; 2022.
- DD. ASTM C979/C979M Standard Specification for Pigments for Integrally Colored Concrete; 2016.
- EE. ASTM C1714/C1714M Standard Specification for Preblended Dry Mortar Mix for Unit Masonry; 2019a.
- FF. BIA Technical Notes No. 7 Water Penetration Resistance Design and Detailing; 2017.
- GG. BIA Technical Notes No. 13 Ceramic Glazed Brick Exterior Walls; 2017.
- HH. TMS 402/602 Building Code Requirements and Specification for Masonry Structures; 2022, with Errata (2024).
- II. UL (FRD) Fire Resistance Directory; Current Edition.

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Qualifications
- C. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.
- D. Shop Drawings: Indicate pertinent dimensions, materials, anchorage, size and type of fasteners, and accessories for brickwork support system.
- E. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.
- F. Manufacturer's Certificate: Certify that water repellent admixture manufacturer has certified masonry unit manufacturer as an approved user of water repellent admixture in the manufacture of concrete block.
- G. Test Reports: Concrete masonry manufacturer's test reports for units with integral water repellent admixture.

1.05 QUALITY ASSURANCE

- A. Comply with provisions of TMS 402/602, except where exceeded by requirements of Contract Documents.
- B. Fire Rated Assemblies: Comply with applicable code for UL (FRD) Assembly No. U905.
- C. Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section with minimum three years of documented experience.
- D. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

- A. Concrete Block: Comply with referenced standards and as follows:
 - 1. Size: Standard units with nominal face dimensions of 16 by 8 inches (400 by 200 mm) and nominal depth of 8 inches (200 mm).
 - 2. Load-Bearing Units: ASTM C90, normal weight.
 - a. Exposed Faces: Manufacturer's standard color and texture.
 - 3. Nonloadbearing Units: ASTM C129.
 - a. Hollow block, as indicated.

2.02 BRICK UNITS

A. Existing brick to be carefully salvaged and re-used to greatest extent possible for new work as indicated on drawings.

2.03 MORTAR AND GROUT MATERIALS

- A. Mortar and Grout: As specified in Section 040511.
- B. Masonry Cement: ASTM C91/C91M, Type N.
 - 1. Colored Mortar: Premixed cement as required to match Architect's color sample.
- C. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.
 - 1. Not more than 0.10 percent alkali.
- D. Hydrated Lime: ASTM C207, Type S.
- E. Mortar Aggregate: ASTM C144.
- F. Grout Aggregate: ASTM C404.
- G. Pigments for Colored Mortar: Pure, concentrated mineral pigments specifically intended for mixing into mortar and complying with ASTM C979/C979M.
 - 1. Color(s): Match existing.
- H. Water: Clean and potable.
- Packaged Dry Material for Mortar for Unit Masonry: Premixed Portland cement, hydrated lime, and sand; complying with ASTM C1714/C1714M and capable of producing mortar of the specified strength in accordance with ASTM C270 with the addition of water only.
 Color: Color to match existing. Submit samples for approval.

2.04 REINFORCEMENT AND ANCHORAGE

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi) (420 MPa), deformed billet bars; uncoated.
- B. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated.
- C. Masonry Veneer Anchors: 2-piece anchors that permit differential movement between masonry veneer and structural backup, hot dip galvanized to ASTM A 153/A 153M, Class B.
 - 1. Anchor plates: Not less than 0.075 inch (1.91 mm) thick, designed for fastening to structural backup through sheathing by two fasteners; provide design with legs that penetrate sheathing and insulation to provide positive anchorage.
 - 2. Wire ties: Manufacturer's standard shape, 0.1875 inch (4.75 mm) thick.
 - 3. Vertical adjustment: Not less than 3-1/2 inches (89 mm).

2.05 FLASHINGS

A. Combination Non-Asphaltic Flashing Materials - Stainless Steel:

- 1. Stainless Steel Flashing Self-adhering: ASTM A240/A240M; 2 mil (0.05 mm) type 304 stainless steel sheet with 8 mil (0.20 mm) of butyl adhesive and a removable release liner.
- B. Termination Bars: Stainless steel; compatible with membrane and adhesives.
 - 1. Manufacturers:
 - a. Hohmann & Barnard, Inc: www.h-b.com/#sle.
 - b. Mortar Net Solutions; Termination Bars: www.mortarnet.com/#sle.
 - c. York Manufacturing, Inc; Termination Bar: www.yorkmfg.com/#sle.
- C. Drip Edge: Stainless steel; angled drip with hemmed edge; compatible with membrane and adhesives.
- D. Lap Sealants and Tapes: As recommended by flashing manufacturer; compatible with membrane and adhesives.

2.06 ACCESSORIES

- A. Preformed Control Joints: Rubber material. Provide with corner and tee accessories, fused joints.
 - 1. Manufacturers:
 - a. Blok-Lok Limited: www.blok-lok.com/#sle.
 - b. Hohmann & Barnard, Inc: www.h-b.com/#sle.
 - c. WIRE-BOND: www.wirebond.com/#sle.
- B. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; in maximum lengths available.
 - 1. Manufacturers:
 - a. Hohmann & Barnard, Inc: www.h-b.com/#sle.
 - b. WIRE-BOND: www.wirebond.com/#sle.
- C. Weeps:
 - 1. Type: Polyester mesh.
 - 2. Manufacturers:
 - a. Advanced Building Products, Inc: www.advancedbuildingproducts.com/#sle.
 - b. Blok-Lok Limited: www.blok-lok.com/#sle.
 - c. Hohmann & Barnard, Inc: www.h-b.com/#sle.
- D. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.07 LINTELS

A. As indicated on drawings.

2.08 MORTAR AND GROUT MIXING

- A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
 - 1. Masonry below grade and in contact with earth: Type S.
 - 2. Exterior, loadbearing masonry: Type N.
 - 3. Exterior, non-loadbearing masonry: Type N.
 - 4. Interior, non-loadbearing masonry: Type O.
- B. New Mortar for Old Brick: Proportion by volume only; no more than 20 percent of the total volume of Portland cement and lime combined to be Portland cement.
 - 1. Sand: Match original mortar as closely as possible in color, size, and texture, without use of other additives.
 - 2. Repointing Mortar: Use proportions from 1 part lime to 2 parts sand with no Portland cement, up to 2 parts Portland cement to 3 parts lime to 6 parts sand.
 - 3. Use mortar within 30 minutes after final mixing; do not add more water after the initial mix is prepared.
- C. Grout: ASTM C476; consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches (50 mm) or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches (50 mm).
- D. Mixing: Use mechanical batch mixer and comply with referenced standards.
PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive masonry.

3.02 COLD AND HOT WEATHER REQUIREMENTS

- A. Maintain materials and surrounding air temperature to minimum 40 degrees F (5 degrees C) prior to, during, and 48 hours after completion of masonry work.
- B. Maintain materials and surrounding air temperature to maximum 90 degrees F (32 degrees C) prior to, during, and 48 hours after completion of masonry work.

3.03 COURSING

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.
- C. Concrete Masonry Units:
 - 1. Bond: Running.
 - 2. Mortar Joints: Concave.
- D. Brick Units:
 - 1. Bond: Running.Match existing
 - 2. Coursing: Three units and three mortar joints to equal 8 inches (200 mm).
 - 3. Mortar Joints: Concave. Match existing

3.04 WEEPS/CAVITY VENTS

A. Install weeps in veneer and cavity walls at 24 inches (600 mm) on center horizontally on top of through-wall flashing above shelf angles and lintels and at bottom of walls.

3.05 MASONRY FLASHINGS

- A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
 - 1. Seal lapped ends and penetrations of flashing before covering with mortar.
- B. Install flashing in accordance with manufacturer's instructions and BIA Technical Notes No. 7.
- C. Extend metal flashings to within 1/2 inch (12 mm) of exterior face of masonry and adhere to top of stainless steel angled drip with hemmed edge.

3.06 LINTELS

- A. Install loose steel lintels over openings.
- B. Maintain minimum 8 inch (203 mm) bearing on each side of opening.

3.07 GROUTED COMPONENTS

- A. Reinforce bond beams with 1, #5 bar, 1 inch (25 mm) from bottom web.
- B. Lap splices minimum 24 bar diameters.
- C. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch (13 mm) of dimensioned position.
- D. Place and consolidate grout fill without displacing reinforcing.

3.08 CONTROL AND EXPANSION JOINTS

- A. Do not continue horizontal joint reinforcement through control or expansion joints.
- B. Form control joint with a sheet building paper bond breaker fitted to one side of the hollow contour end of the block unit. Fill the resultant core with grout fill. Rake joint at exposed unit faces for placement of backer rod and sealant.
- C. Install preformed control joint device in continuous lengths. Seal butt and corner joints in accordance with manufacturer's instructions.
- D. Size control joints as indicated on drawings; if not indicated, 3/4 inch (19 mm) wide and deep.

E. Form expansion joint as detailed on drawings.

3.09 BUILT-IN WORK

- A. Install built-in items plumb, level, and true to line.
- Bed anchors of metal door frames in adjacent mortar joints. Fill frame voids solid with grout.
 Fill adjacent masonry cores with grout minimum 12 inches (300 mm) from framed openings.

3.10 TOLERANCES

- A. Install masonry within the site tolerances found in TMS 402/602.
- B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch (1.6 mm).
- C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft (6 mm/3 m) and 1/2 inch in 20 ft (13 mm/6 m) or more.
- D. Maximum Variation from Plumb: 1/4 inch (6 mm) per story non-cumulative; 1/2 inch (13 mm) in two stories or more.
- E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft (3 mm/m) and 1/4 inch in 10 ft (6 mm/3 m); 1/2 inch in 30 ft (13 mm/9 m).
- F. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch (minus 6.4 mm, plus 9.5 mm).

3.11 PARGING

- A. Dampen masonry walls prior to parging.
- B. Scarify each parging coat to ensure full bond to subsequent coat.
- C. Parge new concrete walls in two uniform coats of mortar to a total thickness of 3/4 inch (19 mm).

3.12 CLEANING

- A. Remove excess mortar and mortar droppings.
- B. Replace defective mortar. Match adjacent work.
- C. Clean soiled surfaces with cleaning solution.
- D. Use non-metallic tools in cleaning operations.

3.13 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

SECTION 051200 STRUCTURAL STEEL FRAMING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. Section Includes:
 - 1. Structural steel.
 - 2. Grout.

1.03 DEFINITIONS

- A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- B. Heavy Sections: Rolled and built-up sections as follows:
 - 1. Shapes included in ASTM A 6/A 6M with flanges thicker than 1-1/2 inches.
 - 2. Cold-Formed Structural Tubing: ASTM A500/A500M, Grade B.
 - 3. Column base plates.

1.04 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.05 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.06 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show fabrication of structural-steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Include embedment Drawings.
 - 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
 - 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
- C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing, including the following:
 - 1. Power source (constant current or constant voltage).
 - 2. Electrode manufacturer and trade name, for demand critical welds.
- D. Delegated-Design Submittal: For structural-steel connections indicated to comply with design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.07 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer fabricator shop-painting applicators and testing agency.
- B. Welding certificates.

- C. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.
- D. Mill test reports for structural steel, including chemical and physical properties.
- E. Product Test Reports: For the following:
 - 1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 - 2. Direct-tension indicators.
 - 3. Tension-control, high-strength, bolt-nut-washer assemblies.
 - 4. Shop primers.
 - 5. Nonshrink grout.
- F. Survey of existing conditions.
- G. Source quality-control reports.
- H. Field quality-control and special inspection reports.

1.08 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD, or is accredited by the IAS Fabricator Inspection Program for Structural Steel (AC 172).
- B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category ACSE.
- C. Shop-Painting Applicators: Qualified according to AISC's Sophisticated Paint Endorsement P1 Endorsement P2 Endorsement P3 or to SSPC-QP 3, "Standard Procedure for Evaluating Qualifications of Shop Painting Applicators."
- D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code Steel."
 - Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8/D1.8M. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.
- E. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC 303.
 - 2. AISC 341 and AISC 341s1.
 - 3. AISC 360.
 - 4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

1.09 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
 - 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
 - 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
 - 2. Clean and relubricate bolts and nuts that become dry or rusty before use.
 - 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Connections: Provide details of double angle shear connections required by the Contract Documents to be selected or completed by structural-steel fabricator, including comprehensive engineering analysis by a qualified professional engineer, to withstand loads indicated and

comply with other information and restrictions indicated.

- 1. Select and complete connections using schematic details indicated and AISC 360.
- 2. Use Load and Resistance Factor Design; data are given at factored-load level.
- B. Moment Connections: Type FR, fully restrained.

2.02 STRUCTURAL-STEEL MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 50 percent.
- B. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of preconsumer recycled content is not less than the following:
 - 1. W-Shapes: 60 percent.
 - 2. Channels, Angles-Shapes: 60 percent.
 - 3. Plate and Bar: 25 percent.
 - 4. Cold-Formed Hollow Structural Sections: 25 percent.
 - 5. Steel Pipe: 25 percent.
 - 6. All Other Steel Materials: 25 percent.
- C. W-Shapes: ASTM A 992/A 992M.
- D. Channels, Angles-Shapes: ASTM A 36/A 36M.
- E. Plate and Bar: ASTM A 36/A 36M or ASTM A 572/A 572M, Grade 50.
- F. Corrosion-Resisting Structural-Steel Shapes, Plates, and Bars: ASTM A 588/A 588M, Grade 50.
- G. Cold-Formed Hollow Structural Sections: ASTM A 500/A 500M, Grade C, structural tubing.
- H. Corrosion-Resisting, Cold-Formed Hollow Structural Sections: ASTM A 847/A 847M, structural tubing.
- I. Steel Pipe: ASTM A 53/A 53M, Type E or Type S, Grade B.
 - 1. Weight Class: Standard unless noted otherwise.
 - 2. Finish: Black except where indicated to be galvanized.
- J. Steel Castings: ASTM A 216/A 216M, Grade WCB with supplementary requirement S11.
- K. Steel Forgings: ASTM A 668/A 668M.
- L. Welding Electrodes: Comply with AWS requirements.

2.03 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers; all with plain finish.
 - 1. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with plain finish.
- B. High-Strength Bolts, Nuts, and Washers: ASTM A 490, Type 1, heavy-hex steel structural bolts or tension-control, bolt-nut-washer assemblies with splined ends; ASTM A 563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers with plain finish.
 - 1. Direct-Tension Indicators: ASTM F 959, Type 490, compressible-washer type with plain finish.
- C. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH heavy-hex carbon-steel nuts; and ASTM F 436, Type 1, hardened carbon-steel washers.
 - 1. Finish: Mechanically deposited zinc coating.
 - 2. Direct-Tension Indicators: ASTM F 959, Type 325, compressible-washer type with mechanically deposited zinc coating, baked epoxy-coated finish.

- D. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.
- E. Unheaded and Headed Anchor Rods: ASTM F 1554, Grade as indicated.
 - 1. Configuration: Straight or Hooked as indicated.
 - 2. Nuts: ASTM A 563 heavy-hex carbon steel.
 - 3. Plate Washers: ASTM A 36/A 36M carbon steel.
 - 4. Washers: ASTM F 436, Type 1, hardened carbon steel.
 - 5. Finish: Plain unless otherwise noted
- F. Threaded Rods: ASTM A 36/A 36M, ASTM A 449, or ASTM A 572/A 572M, Grade 50.
 - 1. Nuts: ASTM A 563 heavy-hex carbon steel.
 - 2. Washers: ASTM A 36/A 36M carbon steel.
 - 3. Finish: Plain unless otherwise noted.
- G. Eye Bolts and Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1030.
- H. Sleeve Nuts: Made from cold-finished carbon steel bars, ASTM A 108, Grade 1018.

2.04 PRIMER

- A. Primer: Comply with Section 09 91 13 "Exterior Painting" and Section 09 91 23 "Interior Painting."
- B. Primer: SSPC-Paint 25, Type I, zinc oxide, alkyd, linseed oil primer.
- C. Primer: SSPC-Paint 23, latex primer.
- D. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.
- E. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20 ASTM A 780/A 780M.

2.05 GROUT

- A. Metallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, metallic aggregate grout, mixed with water to consistency suitable for application and a 30-minute working time.
- B. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107/C 1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.06 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," and to AISC 360.
 - 1. Camber structural-steel members where indicated.
 - 2. Fabricate beams with rolling camber up.
 - 3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
 - 4. Mark and match-mark materials for field assembly.
 - 5. Complete structural-steel assemblies, including welding of units, before starting shoppriming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.
- C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 2, "Hand Tool Cleaning."
- F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to

AWS D1.1/D1.1M and manufacturer's written instructions.

- G. Steel Wall-Opening Framing: Select true and straight members for fabricating steel wallopening framing to be attached to structural-steel frame. Straighten as required to provide uniform, square, and true members in completed wall framing. Build up welded framing, weld exposed joints continuously, and grind smooth.
- H. Welded Door Frames: Build up welded door frames attached to structural-steel frame. Weld exposed joints continuously and grind smooth. Plug-weld fixed steel bar stops to frames. Secure removable stops to frames with countersunk machine screws, uniformly spaced not more than 10 inches o.c. unless otherwise indicated.
- I. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.
 - 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
 - 2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.07 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.08 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
 - 1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
 - 2. Surfaces to be field welded.
 - 3. Surfaces of high-strength bolted, slip-critical connections.
 - 4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
 - 5. Galvanized surfaces.
 - 6. Surfaces enclosed in interior construction.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
 - 1. SSPC-SP 2, "Hand Tool Cleaning."
 - 2. SSPC-SP 3, "Power Tool Cleaning."
 - 3. SSPC-SP 7/NACE No. 4, "Brush-off Blast Cleaning."
 - 4. SSPC-SP 11, "Power Tool Cleaning to Bare Metal."
 - 5. SSPC-SP 14/NACE No. 8, "Industrial Blast Cleaning."
 - 6. SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 7. SSPC-SP 10/NACE No. 2, "Near-White Blast Cleaning."
 - 8. SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
 - 2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

D. Painting: Prepare steel and apply a one-coat, nonasphaltic primer complying with SSPC-PS Guide 7.00, "Painting System Guide 7.00: Guide for Selecting One-Coat Shop Painting Systems," to provide a dry film thickness of not less than 1.5 mils.

2.09 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.
 - 1. Fill vent and drain holes that are exposed in the finished Work unless they function as weep holes, by plugging with zinc solder and filing off smooth.
 - 2. Galvanize lintels shelf angles and welded door frames attached to structural-steel frame and located in exterior walls.

2.10 SOURCE QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform shop tests and inspections.
 - 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Bolted Connections: Inspect and test shop-bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Visually inspect shop-welded connections according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - 1. Liquid Penetrant Inspection: ASTM E 165.
 - 2. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - 3. Ultrasonic Inspection: ASTM E 164.
 - 4. Radiographic Inspection: ASTM E 94.
- D. In addition to visual inspection, test and inspect shop-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
 - 1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
 - 2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.
- E. Prepare test and inspection reports.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
 - 1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.
 - 1. Do not remove temporary shoring supporting composite deck construction until cast-inplace concrete has attained its design compressive strength.

3.03 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.

- B. Baseplates Bearing Plates and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Weld plate washers to top of baseplate.
 - 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 - 4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
 - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.
- F. Do not use thermal cutting during erection unless approved in advanced and in writing by the engineer of record. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
- H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

3.04 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened.
- B. Weld Connections: Comply with AWS D1.1/D1.1M and AWS D1.8/D1.8M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
 - 2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
 - 3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in AISC 303, "Code of Standard Practice for Steel Buildings and Bridges," for mill material.

3.05 FIELD QUALITY CONTROL

- A. Special Inspections: Engage a qualified special inspector to perform the following special inspections:
 - 1. Verify structural-steel materials and inspect steel frame joint details.
 - 2. Verify weld materials and inspect welds.
 - 3. Verify connection materials and inspect high-strength bolted connections.
- B. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- C. Bolted Connections: Inspect and test bolted connections according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Welded Connections: Visually inspect field welds according to AWS D1.1/D1.1M.

- 1. In addition to visual inspection, test and inspect field welds according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.
- E. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
 - 1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
 - 2. Conduct tests according to requirements in AWS D1.1/D1.1M on additional shear connectors if weld fracture occurs on shear connectors already tested.

3.06 REPAIRS AND PROTECTION

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780/A 780M.
- B. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
- C. Touchup Painting: Cleaning and touchup painting are specified in Section 09 91 13 "Exterior Painting" and Section 09 91 23 "Interior Painting."
- D. Touchup Priming: Cleaning and touchup priming are specified in Section 09 96 00 "High-Performance Coatings."

SECTION 053100 STEEL DECKING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Roof deck.
- B. Metal form deck.
- C. Bearing plates and angles.

1.02 REFERENCE STANDARDS

- A. ASTM A36/A36M Standard Specification for Carbon Structural Steel; 2019.
- B. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2022.
- C. AWS D1.3/D1.3M Structural Welding Code Sheet Steel; 2018, with Errata (2022).
- D. SDI (DM) Publication No.30, Design Manual for Composite Decks, Form Decks, and Roof Decks; 2007.

1.03 SUBMITTALS

- A. See Section 013000 Administrative Requirements, for submittals procedures.
- B. Product Data: Provide deck profile characteristics, dimensions, structural properties, and finishes.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Steel Deck:
 - 1. Canam Steel Corporation: www.canam-steeljoists.ws.
 - 2. Cordeck, Inc; ____: www.cordeck.com/#sle.
 - 3. New Millennium Building Systems; : www.newmill.com/#sle.
 - 4. Nucor-Vulcraft Group; ____: www.vulcraft.com/#sle.
 - 5. Substitutions: See Section 016000 Product Requirements.

2.02 STEEL DECK

- A. Roof Deck: Non-composite type, fluted steel sheet:
 - 1. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230, with G90/Z275 galvanized coating.
- B. Metal Form Deck: Corrugated sheet steel:
 - 1. Galvanized Steel Sheet: ASTM A653/A653M, Structural Steel (SS) Grade 33/230, with G90/Z275 galvanized coating.

2.03 ACCESSORY MATERIALS

- A. Bearing Plates and Angles: ASTM A36/A36M steel, galvanized per ASTM A123/A123M.
- B. Fasteners: Galvanized hardened steel, self tapping.

2.04 FABRICATED DECK ACCESSORIES

A. Sheet Metal Deck Accessories: Metal closure strips and cover plates, 22 gauge, 0.0299 inch (0.76 mm) thick sheet steel; of profile and size as indicated; finished same as deck.

2.05 TRADE PRACTICES ACT

A. Refer to Section 016000 Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions prior to beginning work.

3.02 INSTALLATION

- A. Erect metal deck in accordance with SDI Design Manual and manufacturer's instructions. Align and level.
- B. Fasten deck to steel support members at ends and intermediate supports at 12 inches (300 mm) on center maximum, parallel with the deck flute and at each transverse flute using methods specified.
- C. Weld deck in accordance with AWS D1.3/D1.3M.
- D. At floor edges, install concrete stops upturned to top surface of slab, to contain wet concrete. Provide stops of sufficient strength to remain stationary without distortion.
- E. At openings between deck and walls, columns, and openings, provide sheet steel closures and angle flashings to close openings.
- F. Immediately after welding deck and other metal components in position, coat welds, burned areas, and damaged surface coating, with touch-up primer.

SECTION 061000 ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Communications and electrical room mounting boards.
- B. Concealed wood blocking, nailers, and supports.

1.02 REFERENCE STANDARDS

A. PS 20 - American Softwood Lumber Standard; 2021.

1.03 DELIVERY, STORAGE, AND HANDLING

- A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.
- B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, and installation.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
 - 1. If no species is specified, provide species graded by the agency specified; if no grading agency is specified, provide lumber graded by grading agency meeting the specified requirements.
 - 2. Grading Agency: Grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee at www.alsc.org, and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

PART 3 EXECUTION

3.01 INSTALLATION - GENERAL

- A. Select material sizes to minimize waste.
- B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

3.02 BLOCKING, NAILERS, AND SUPPORTS

- A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.
- B. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.
- C. Provide the following specific nonstructural framing and blocking:
 - 1. Cabinets and shelf supports.
 - 2. Wall-mounted door stops.
 - 3. Chalkboards and marker boards.

3.03 INSTALLATION OF CONSTRUCTION PANELS

- A. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches (610 mm) on center on all edges and into studs in field of board.
 - 1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
 - 2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
 - 3. Install adjacent boards without gaps.
 - 4. Size and Location: As indicated on drawings.

SECTION 062000 FINISH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Finish carpentry items.

1.02 RELATED REQUIREMENTS

- A. Section 064100 Architectural Wood Casework: Shop fabricated custom cabinet work.
- B. Section 081416 Flush Wood Doors.

1.03 REFERENCE STANDARDS

- A. AWI/AWMAC/WI (AWS) Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- B. AWMAC/WI (NAAWS) North American Architectural Woodwork Standards; 2021, with Errata.
- C. NEMA LD 3 High-Pressure Decorative Laminates; 2005.

PART 2 PRODUCTS

2.01 FINISH CARPENTRY ITEMS

A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.

2.02 PLASTIC LAMINATE MATERIALS

A. Plastic Laminate: As indicated on drawings.

2.03 FABRICATION

- A. Shop assemble work for delivery to site, permitting passage through building openings.
- B. Cap exposed plastic laminate finish edges with material of same finish and pattern.
- C. When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.
- D. Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs. (Locate counter butt joints minimum 600 mm from sink cut-outs.)

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

3.02 INSTALLATION

- A. Install custom fabrications in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
- B. Set and secure materials and components in place, plumb and level.
- C. Carefully scribe work abutting other components, with maximum gaps of 1/32 inch (0.79 mm). Do not use additional overlay trim to conceal larger gaps.

SECTION 064100 ARCHITECTURAL WOOD CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Specially fabricated cabinet units.
- B. Countertops.
- C. Hardware.

1.02 RELATED REQUIREMENTS

- A. Section 061000 Rough Carpentry: Support framing, grounds, and concealed blocking.
- B. Section 066100 Solid Surfacing Fabrications: Cast plastic countertops.

1.03 REFERENCE STANDARDS

- A. ANSI A208.1 American National Standard for Particleboard; 2022.
- B. AWI/AWMAC/WI (AWS) Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- C. AWMAC/WI (NAAWS) North American Architectural Woodwork Standards; 2021, with Errata.

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories.
- C. Product Data: Provide data for hardware accessories.

1.05 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1.06 FIELD CONDITIONS

A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

PART 2 PRODUCTS

2.01 CABINETS

- A. Quality Standard: Custom Grade, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Plastic Laminate Faced Cabinets: Custom grade, flush overlay.

2.02 WOOD-BASED COMPONENTS

A. Wood fabricated from old growth timber is not permitted.

2.03 PANEL CORE MATERIALS

A. Particleboard: Composite panel composed of cellulosic particles, additives, and bonding system; comply with ANSI A208.1.

2.04 LAMINATE MATERIALS

- A. Manufacturers:
 - 1. Formica Corporation; ____: www.formica.com/#sle.
 - 2. Panolam Industries International, Inc; ____: www.panolam.com/#sle.
 - 3. Wilsonart LLC; ____: www.wilsonart.com/#sle.
- B. Provide specific types as indicated on finish schedule (equivilent products will be considered, pending approval).

2.05 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

2.06 HARDWARE

- A. Adjustable Shelf Supports: Standard side-mounted system using recessed metal shelf standards or multiple holes for pin supports and coordinated self rests, polished chrome finish, for nominal 1 inch (25 mm) spacing adjustments.
- B. Drawer and Door Pulls: "U" shaped wire pull, aluminum with satin finish, 3 1/2 inch centers ().
- C. Drawer Slides:
 - 1. Type: Extension types as indicated.
 - 2. Static Load Capacity: Commercial grade.
 - 3. Mounting: Side mounted.
 - 4. Stops: Integral type.
 - 5. Manufacturers:
 - a. Accuride International, Inc; Light-Duty Drawer Slides: www.accuride.com/#sle.
 - b. Blum, Inc; STANDARD: www.blum.com/#sle.
 - c. Knape & Vogt Manufacturing Company; Light-Duty Drawer Slides: www.knapeandvogt.com/#sle.
- D. Hinges: European style concealed self-closing type, steel with nickel-plated finish.

2.07 FABRICATION

- A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.
- B. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet from sink cut-outs. (Locate counter butt joints minimum 600 mm from sink cut-outs.)

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify adequacy of backing and support framing.
- B. Verify location and sizes of utility rough-in associated with work of this section.

3.02 INSTALLATION

- A. Install work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade indicated.
- B. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.
- C. Use concealed joint fasteners to align and secure adjoining cabinet units.
- D. Secure cabinets to floor using appropriate angles and anchorages.

3.03 ADJUSTING

A. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

SECTION 066100 SOLID SURFACING FABRICATIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Solid surfacing fabrications.

1.02 REFERENCE STANDARDS

A. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.

1.03 SUBMITTALS

- A. See Section 013000 Administrative Requirements, for submittal procedures.
- B. Shop Drawings: For each type of cast polymer, indicate:
 - 1. Plans and Elevations: Include dimensions and thicknesses; indicate location of fabricated units.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with minimum three years of documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Handle products to prevent damage to edges, ends, or surfaces, and in accordance with manufacturer's written instructions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Solid Surface Fabrications: Solid Surface Material: Non-porous, homogeneous material maintaining the same composition throughout the part with a composition of acrylic polymer, aluminum trihydrate filler and pigment; not coated, laminated or of composite construction
 - 1. Basis of Design: Corian by DuPont; www.corian.com.
 - 2. Wilsonart Contract; www.wilsonartcontract.com..
 - 3. Cambria Company LLC
 - 4. Substitutions: See Section 016000 Product Requirements.

2.02 REGULATORY REQUIREMENTS

- A. Surface Burning Requirements:
 - 1. Interior Use: Flame spread index of 75 or less and smoke-development index of 450 or less; Class B interior finish classification when tested in accordance with ASTM E84.

2.03 SOLID SURFACING FABRICATIONS

- A. Solid Surfacing: Densified, homogeneous, nonporous castings fabricated into sheets; composed of acrylic resins, fillers, color chips, and pigment and performance-enhancing additives.
- B. Applications: Countertops
 - 1. Style: As indicated on drawings.

2.04 FABRICATION

- A. Radius corners and edges with 1/8 inch (3.2 mm) minimum radius; polish exposed edges.
- B. Fabrication Tolerances:
 - 1. Maximum Variation from Specified Thicknesses: 1/16 inch (1.59 mm).

2.05 ACCESSORIES

A. Joint Sealants: Type recommended by cast polymer manufacturer for application.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify field measurements are as indicated on shop drawings.
- B. Verify substrates are prepared to receive cast polymer fabrications.
- C. Verify plumbing, electrical, and other building components affecting work of this section are placed and ready to receive work of this section.

3.02 INSTALLATION

- A. Install anchoring devices in accordance with cast polymer manufacturer's setting templates.
- B. Install cast polymer units in accordance with manufacturer's written instructions.
- C. Install cast polymer units in accordance with manufacturer's written instructions.
- D. Align work plumb and level.

3.03 CLEANING

A. Clean exposed surfaces of installed units in accordance with manufacturer's instructions.

SECTION 071326

SELF-ADHERING SHEET WATERPROOFING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: .
 1. Molded sheet drainage panels on below-grade walls.
- B. Related Sections:
 - 1. Division 07 Section "Joint Sealants" for joint-sealant materials and installation.

1.2 SUBMITTALS

- A. Product Data: Include manufacturer's written instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties of waterproofing.
- B. Shop Drawings: Show locations and extent of waterproofing. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions. In addition to typical details published by the manufacturer, provide project specific condition showing exact transitions, lapping requirements and adjacent materials.
- C. Samples: 12-by-12-inch square of each type of product indicated.
- D. Installer Certificates: Signed by manufacturers certifying that installers comply with requirements.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for waterproofing.
- F. Warranties: Special warranties specified in this Section.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain waterproofing materials through one source from a single manufacturer.
- B. Installer Qualifications: Engage experienced waterproofing personnel to perform work of this Section. The Contractor shall have completed work similar in material, design, and extent to that indicated for this Project, with a record of successful in-service performance for a period of at least 5 years.
- C. Coordination:
 - 1. Coordinate the work of trades performing work in and around the waterproofing that precedes, follows, or penetrates the waterproofing including responsibility for installation of penetration seals.
 - 2. Coordinate with applicable concrete sections to ensure concrete surfaces are suitable to receive specified waterproofing.
 - a. Substrates shall be flat and shall have no voids, sharp angular projections, or loose aggregate.

- b. Finish shall be comparable to a darby finish with no fins greater than 1/2 inch, no gaps greater than 1/2 inch, and no ridges or localized depressions greater than 1/2 inch.
- c. Substrate shall be sound and solid to eliminate movement during concrete placement.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver liquid materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storing and mixing with other components.
- B. Store liquid materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by waterproofing manufacturer.
- C. Remove and replace liquid materials that cannot be applied within their stated shelf life.
- D. Store rolls according to manufacturer's written instructions.
- E. Protect stored materials from direct sunlight.

PART 2 - PRODUCTS

2.1 DIRECT-APPLIED SYSTEM: MODIFIED BITUMINOUS SHEET WATERPROOFING

- A. Modified Bituminous Sheet: Not less than 60-mil thick, self-adhering sheet consisting of 56 mils of rubberized asphalt laminated to a 4-mil-thick, polyethylene film with release liner on adhesive side and formulated for application with primer that complies with VOC limits of authorities having jurisdiction.
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide W.R. Grace & Co.; Bituthene 3000, Below Grade. Manufacturers providing comparable products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Protecto Wrap Company; PW-100/60 or Jiffy Seal 140/60.
 - b. Henry Company; Blueskin Wp/100/200.
 - c. Soprema; Colphene 3000.
 - 2. Physical Properties:
 - a. Tensile Strength: 250 psi minimum; ASTM D 412, Die C, modified.
 - b. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.
 - c. Low-Temperature Flexibility: Pass at minus 20 deg F; ASTM D 1970.
 - d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch movement; ASTM C 836.
 - e. Puncture Resistance: 40 lbf minimum; ASTM E 154.
 - f. Hydrostatic-Head Resistance: 200 feet minimum; ASTM D 5385.
 - g. Water Absorption: 0.15 percent weight-gain maximum after 48-hour immersion at 70 deg F; ASTM D 570.
 - h. Vapor Permeance: 0.05 perms; ASTM E 96, Water Method.

2.2 MOLDED-SHEET DRAINAGE PANELS

- A. Nonwoven-Geotextile-Faced, Molded-Sheet Drainage Panel: Composite subsurface drainage panel consisting of a studded, nonbiodegradable, molded-plastic-sheet drainage core; with a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 (0.21-mm) sieve laminated to one side of the core and a polymeric film bonded to the other side; and with a vertical flow rate of 9 to 15 gpm per ft.
 - 1. Basis-of-Design Product: W.R. Grace & Co; Hydroduct 220, or equal.

2.3 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.
- B. Primer: Liquid primer for application of sheet waterproofing material over concrete substrate.
 1. Basis-of-Design Product: W.R. Grace & Co.; B2 LVC, Low VOC Primer, or equal.
- C. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, trowel grade or low viscosity.
 1. Basis-of-Design Product: W.R. Grace & Co.; Bituthene Liquid Membrane, or equal.
- D. Sheet Strips: Self-adhering, rubberized-asphalt sheet strips of same material and thickness as sheet waterproofing.
 - 1. Basis-of-Design Product: W.R. Grace & Co.; Bituthene 3000, or equal.
- E. Self-Adhering Waterproof Tape: Two sided, reinforced, pressure sensitive tape.
 1. Basis-of-Design Product: W.R. Grace & Co.; Preprufe Tape, or equal.
- F. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch thick, predrilled at 6-inch centers.
- G. Fasteners: As recommended by membrane manufacturer.
- H. Sealant: Dow 758 weather barrier sealant, or equal.
- I. Provide additional materials as required and recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance.
 - 1. Verify that concrete is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
 - 2. Proceed with installation only after unsatisfactory conditions have been corrected.
 - 3. Check that pipes, vents, drains, and other penetrations are installed and ready to receive waterproofing.

3.2 SURFACE PREPARATION

- A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.
- B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.
- C. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
- D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.
- E. Prepare, fill, prime, and treat joints and cracks in substrates. Remove dust and dirt from joints and cracks according to ASTM D 4258. Expansion joints shall be sealed and covered in accordance with manufacturer's recommendations.
- F. Corners: Prepare, prime, and treat inside and outside corners according to ASTM D 6135.
 - 1. Install membrane strips centered over vertical inside corners. Install 3/4-inch fillets of liquid membrane on horizontal inside corners and as follows:
 - a. At footing-to-wall intersections, extend liquid membrane each direction from corner or install membrane strip centered over corner.
- G. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to ASTM D 6135.

3.3 MODIFIED BITUMINOUS SHEET WATERPROOFING APPLICATION

- A. Apply primer to concrete substrate at required rate and allow to dry. Also apply primer to existing membranes. Limit priming to areas that will be covered by sheet waterproofing in same day. Re-prime areas exposed for more than 24 hours.
- B. Install sheet strips, centered over treated construction joints and cracks exceeding a width of 1/16 inch. Route and seal cracks larger than 1/4 inch prior to placing membrane strip.
- C. Apply continuous sheets over sheet strips bridging substrate cracks, construction, and contraction joints.
- D. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 6-inch minimum lap widths and end laps. Overlap and seal seams and stagger end laps to ensure watertight installation.
 - 1. When ambient and substrate temperatures range between 25 and 40 deg F, install self-adhering, modified bituminous sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F.
 - 2. All laps, strips, and field membrane shall be hand rolled with a steel or hard neoprene roller to achieve full adhesion.
 - 3. All edges and laps shall be sealed with liquid membrane.
 - 4. Install modular penetration seals in accordance with manufacturer's instructions.
- E. Install sheet waterproofing and auxiliary materials to tie into adjacent waterproofing.

- F. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 inches beyond repaired areas in all directions.
 - 1. Correct deficiencies in or remove sheet waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.
- G. The top edge of the membrane shall be terminated with a metal termination bar, fastened at 6 inches on center with manufacturer approved fasteners. The top edge of the membrane and termination bar shall be sealed with 60-mil application of liquid membrane.
- H. Install drainage composite to fully cover membrane as specified. Manufacturer's recommended adhesive shall be used. Mechanical attachment through the membrane is not permitted.

3.4 MOLDED-SHEET DRAINAGE-PANEL INSTALLATION

A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate, according to manufacturer's written instructions. Use adhesives or other methods that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

3.5 PROTECTION AND CLEANING

- A. Do not permit foot or vehicular traffic on unprotected membrane.
- B. Protect waterproofing from damage and wear during remainder of construction period.
- C. Protect installed drainage panel from UV exposure damage, harmful weather exposure, physical abuse, and other causes. Provide temporary coverings where material will be subject to abuse and cannot be concealed and protected by permanent construction immediately after installation. The drainage panel shall not be left exposed to sunlight for more than two weeks.
- D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

SECTION 074213 - ALUMINUM COMPOSITE MATERIAL (ACM) WALL PANELS

PART 1 - GENERAL

1.01 SUMMARY

- A. Section includes:
 - 1. Aluminum composite material (ACM) wall panels, soffits and projecting panels.
 - 2. ACM column covers.
 - 3. ACM copings.
 - 4. Sheet metal trim and accessories adjacent to or within ACM panel work
 - 5. Cladding sub-support system including zee girts to support the ACM panels.

1.02 ADMINISTRATIVE REQUIREMENTS

- A. Preinstallation Meetings:
 - 1. Preinstallation Conference: Conduct conference at Project site.

1.03 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include fabrication and installation layouts of metal composite material panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment assembly, trim, flashings, closures, and accessories; and special details.
 - 1. Elevations: Minimum 1/4 inch equals 1 foot scale elevation of each area of storefront.
 - 2. Typical Bay Drawings: Minimum 1inch equals 1 foot scale elevation, plan, reflected ceiling plan and wall section of each typical bay of ACM panel types. Extent shall include one story high by one structural bay wide plus space to next vertical and horizontal mullions. Arrange on single drawing (if possible) with elevation in upper right, plan and reflected ceiling plan below and section to the right.
 - 3. Details: Full size details of each assembly including intersections with adjacent heads, sills, and jambs of door, curtain wall and entrance openings, corners, intersection with abutting construction and joints in system.
 - a. Include details cut through the ends and joints of flashing and brake metal or similar sheet fabrications showing returns, attached angles or other methods for support of sealant or connection to adjacent construction.
 - 4. Coordinated Elevations: Exterior elevations, drawn to scale, that have the following items shown and coordinated with each other, using input from installers of these items as follows:
 - a. Wall panels and attachments.
 - b. Wall-mounted items including doors, windows, louvers, and lighting fixtures.
 - c. Penetrations of wall by pipes and utilities.
 - 5. Show cladding sub-support system.
 - 6. Identify every type, size and spacing of anchors and fasteners. Anchors and fasteners are not allowed to be identified as "by others" on drawings.
 - 7. Show adjacent construction in sufficient detail to coordinate work including but not limited to air barrier, flashings, storefront, entrances and doors.
 - 8. Show all items mounted on or passing through the panels.
 - 9. Show sufficient information to trace continuity of inner and outer line of adjacent seals, (rain screen and air barrier), to trace line of thermal barrier and to trace continuity of vapor retarder if location differs from inner seal.
 - 10. Extent of Shop Drawings shall be sufficient to demonstrate compliance with indicated criteria.
- C. Samples: For each type of aluminum composite material panel indicated.

1.04 INFORMATIONAL SUBMITTALS

A. Qualification Data: For the following, demonstrating qualifications specified in this Section and in Division 01 Section "Quality Requirements" and in the form specified in Division 01 Section

"Submittal Procedures."

- 1. Manufacturer
- 2. Fabricator.
- 3. Installer
- B. Product test reports.
- C. Installation Manuals.
- D. Warranties: Samples of special warranties.
- E. Manufacturer Certificates: Signed by manufacturer certifying that ACM wall panel system complies with the following.
 - 1. Compliance with performance requirements.
 - 2. Certify that materials are appropriate for indicated use and substrates and adjacent materials are compatible.
 - 3. Certify Manufacturer qualifications.
 - 4. Certify Manufacturer's approval of Installer qualifications.
 - 5. Certify single source responsibility.
 - 6. Certify acceptability to manufacturer of products specified in or required by this Section that are not produced by the manufacturer who submits this Certification.
 - 7. Certify that system/assembly depicted in Shop Drawings and other submittals, when installed as detailed, will result in performance substantially the same as it did in the tests on which the manufacturer bases their predictions of performance for air and water resistance, thermal performance, condensation resistance, structural capacity and other salient performance criteria in compliance with the Contract Documents. Include the primary products, all accessories, interface and anchorage to adjacent construction and all other work of this Section included in the submittals.
 - 8. Certify that manufacturer has submitted samples demonstrating full variation in color, texture and finish for every element exposed in the finished.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer capable of fabricating ACM Wall Panel Systems that meet or exceed performance requirements indicated and of documenting this performance by certification, labeling, and inclusion in lists.
 - 1. Experience: Minimum five (5) years producing products similar to those required for this Project. Provided products for three (3) projects of scope, schedule and complexity similar to this Project within last two (2) years as acceptable to Architect.
 - a. Include project descriptions with Owner and Design Professional contacts for previous experience and resume for designer.
 - 2. Single Source Requirements: Products shall be supplied by one (1) manufacturer. Accessory products including, for example, fasteners, sealants and anchors may be from other than primary manufacturer if approved in writing by primary manufacturer and Architect.
- B. Installer/Fabricator Qualifications: Manufacturer's authorized representative who is trained and approved for fabrication and installation of ACM wall systems required for this Project.
 - 1. Experience: Minimum five (5) years fabricating and installing products similar to those required for this Project.
 - 2. Completed three (3) projects of scope, schedule and complexity similar to this Project using systems similar to those required for this Project within last two (2) years as acceptable to Architect.
 - 3. Adequately trained by manufacturer and recommended in writing by manufacturer for type of fabrication and installation required for this Project.
 - 4. Certify compliance. Include project descriptions with Owner and Design Professional contacts for previous experience.

1.06 COORDINATION

A. Coordinate ACM wall panel installation with studs, framing, construction of girts, air barrier, insulation, rain drainage work, flashing, trim, construction of soffits, storefront, entrances and

other adjoining work to provide a leak-proof, secure, and noncorrosive installation.

1.07 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal composite material panel systems that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal composite material panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Finish Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 PERFORMACNE REQUIREMENTS

- A. Structural Performance: Provide ACM wall tile wall panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E 330:
 - 1. Dead Load: Weight of panels and support system.
 - 2. Wind Loads: Comply with ASCE 7 requirements for Components and Cladding based on criteria indicated on structural sheet S-001.
 - 3. Maintenance Loads: 300 pounds at any one square foot area more than 45 degrees off vertical.
 - 4. Deflection Limits: For wind loads, no greater than 1/180 of the span.

2.02 ALUMINUM COMPOSITE MATERIAL (ACM) WALL PANELS

- A. Aluminum Composite Material Wall Panel Systems: Provide factory-formed and -assembled, aluminum composite material wall panels fabricated from two metal facings that are bonded to a solid, extruded thermoplastic core; formed into profile for installation method indicated. Include attachment assemblies components, panel stiffeners, and accessories required for weathertight system.
 - 1. System shall have ACM splines, perimeter extruded aluminum frames, no exposed fasteners, concealed clip mounting that allows each panel to move independently and
 - 2. Basis-of-Design Panel System: Subject to compliance with requirements, provide D-500 System by Bamco or equivalent system by the following:
 - a. Fairfield Metals LLC
 - b. Sobotec.
 - c. Metalwerks USA
 - d. EDA Contractors
- B. Aluminum-Faced Composite Wall Panels: Formed with 0.020-inch-thick, coil-coated aluminum sheet facings.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. 3A Composites USA, Inc.; Alucobond Plus.
 - b. Alcoa Inc.; Reynobond FR.
 - 2. Panel Thickness: 0.157 inch.
 - 3. Core: Fire retardant.
 - 4. Exterior Finish: Two-coat custom fluoropolymer, mica finish to match architects sample.
 - a. Field Color:b. Accent Color
- C. Attachment Assembly Components: Formed from extruded aluminum.
- D. Copings: Form from matching materials to the profiles indicated. Provide for wet sealant joints on top surface of ACM copings.

2.03 MISCELLANEOUS MATERIALS

A. Sub-framing System: Provide a complete sub-framing system of girts, channels, angles, clips, and anchors as necessary to support the ACM wall panels off of the structure indicated on structural drawings and from the face of the exterior sheathing outwards to form drained cavity

over insulation.

- 1. Material: Extruded aluminum and galvanized steel system for concealed fastener rainscreen mounting.
- 2. Continuous metal members through the thickness of the continuous thermal insulation are not allowed. Use angles and isolated clips. Maximum area of penetrations through the continuous insulation shall be less than 2% of total area of continuous insulation.
- 3. Girts shall slope to drain and shall have a canted top flange to accept sealant.
- 4. Any girt that will be installed in a manner that traps the downward flow of water shall be punched for drainage.
- B. Panel Accessories: Provide components required for a complete, weathertight panel system including clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal composite material panels unless otherwise indicated.
- C. Flashing and Trim: Provide flashing and trim formed from aluminum sheet as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, bases, drips, sills, jambs, corners, endwalls, framed openings, fasciae, parapet caps, soffits, reveals, and fillers.
 - 1. Aluminum Sheet: Coil-coated sheet, ASTM B 209, alloy as standard with manufacturer, with temper as required to suit forming operations and structural performance required.
 - a. Thickness: 0.060 inch minimum, provide thicker if recommended for application by SMACNA .
 - b. Surface: Smooth, flat finish.
 - c. Exposed Finish: Custom color three-coat mica fluoropolymer to match architect's sample.
 - d. Concealed Finish: White or light-colored acrylic or polyester backer finish.
- D. Panel Fasteners: Provide concealed fixing clips at the top and bottom of each panel as designed by Delegated Design Engineer.
- E. Panel Sealants: Provide sealant types recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish. Sealant shall be silicone as specified in Section 079210.

2.04 FABRICATION

- A. General: Fabricate and finish metal composite material panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. Fabricate metal composite material panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- C. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.
- D. Air Barriers, Underlayment, and Membrane Flashing: Specified elsewhere in Division 7.

PART 3 - EXECUTION

3.01 INSPECTION

- A. Inspect cold formed metal framing to verify compliance with shop drawings and adequacy to support ACM wall panel system.
- B. Inspect for control joints in sheathing and proper flashing of joints.
- C. Inspect to verify that all of the wall penetrations for pipe, conduit, ducts, and other elements have been completed and sealed to the air barrier.
- D. Inspect air barrier, underlayments, waterproofing and roofing for a continuous air and watertight substrate. Verify such materials have been accepted by the manufacturer's representatives.

3.02 PREPARATION

TCNJ Roscoe Hall Lower Level Renovation

- A. Sub-Framing System: Install subframing, girts, furring, clips and other miscellaneous panel support members and anchorages according ACM wall tile wall system manufacturer's written recommendations.
 - 1. Seal the top edge of each horizontal girt where attached to sheathing.
 - 2. Install girts to shed water or use girts with punched holes for drainage.
 - 3. Seal all vertical edges of girts attached to sheathing.
 - 4. Seal over all heads of all fasteners that penetrate sheathing.
 - 5. Fasteners must be driven into framing members. Fasteners that miss framing members shall be removed and air barrier repaired.
 - 6. Sealants and flashing membranes shall be as recommended by the manufacturer of the air barrier.

3.03 ACM WALL PANEL INSTALLATION

- A. General:
 - 1. Comply with manufacturer's written instructions.
 - 2. Do not install damaged components.
 - 3. Fit joints in trim to produce hairline joints free of burrs and distortion.
 - 4. Rigidly secure non-movement joints.
 - 5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
 - 6. Seal perimeter and other joints watertight unless otherwise indicated.
- B. Attachment Assembly, General: Install attachment assembly required to support ACM wall tile wall panels and to provide a complete weathertight wall system, including subgirts, perimeter extrusions, tracks, drainage channels, panel clips, and anchor channels.
 - 1. Include attachment to supports, panel-to-panel joinery, panel-to-dissimilar-material joinery, and panel-system joint seals.
- C. Installation: Attach aluminum composite material wall panels to supports at locations, spacings, and with fasteners recommended by manufacturer to achieve performance requirements specified.
 - 1. Dry Seal Systems: Seal horizontal and vertical joints between adjacent metal composite material wall panels with manufacturer's dry spline system.
 - 2. Wet Seal Systems: Where surfaces are more than 45 degrees off of vertical, wet seal all joints. Install sealant backing and sealant according to requirements specified in Section 079200 "Joint Sealants." Recess sealant in line with dry spline.
- D. Rainscreen-Principle Installation: Install using vertical channel that provides support and secondary drainage assembly, draining at base of wall. Notch vertical channel to receive support pins. Install vertical channels supported by channel brackets or adjuster angles and at locations, spacings, and with fasteners recommended by manufacturer. Attach ACM wall tile wall panels by inserting horizontal support pins into notches in vertical channels and into flanges of panels. Leave horizontal and vertical joints with open reveal.
 - 1. Install wall panels to allow individual panels to be installed and removed without disturbing adjacent panels.
 - 2. Do not apply sealants to joints unless otherwise indicated.
- E. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
- F. Coping, Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that are permanently watertight.
 - 1. Tie metal flashing in to air barrier with membrane flashing.

3.04 FIELD QUALITY CONTROL

A. Installation Tolerances:

- 1. General: Fabricate to tolerances as required to:
 - a. Comply with performance criteria.
 - b. Comply with manufacturer's written instructions.

3.05 CLEANING

A. Remove temporary protective coverings and strippable films, if any, as metal composite material panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal composite material panel installation, clean finished surfaces as recommended by metal composite material panel manufacturer. Maintain in a clean condition during construction.

SECTION 075423 TPO (THERMOPLASTIC POLYOLEFIN) ROOFING

PART 1 - GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Adhered thermoplastic polyolefin (TPO) roofing system.
 - 2. Roof insulation cover board.
 - 3. Roof insulation.
 - 4. Vapor Barrier/Temporary Roofing
- B. Related Sections:
 - 1. Section 061053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.

1.02 REFERENCES

- A. Definitions: Refer to Division 01 Section "Exterior Enclosure General Requirements" for definitions related to Exterior Enclosure.
- B. Roofing Terminology: Definitions in ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" apply to work of this Section.
- C. Roofing System: Components required to maintain building watertight from substrate up to top of base flashing including, but not limited to: substrate primers, insulation, cover board, membrane, base flashing, and accessories.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate work of this section with adjacent components of the exterior enclosure.
 - 1. Coordinate with the work of every trade including but not limited to HVAC, electric, plumbing, security, and tele/data to minimize the number of roof penetrations by grouping penetrations together into Roof Pipe Penetration Boxes.
 - 2. Coordinate the connection of the roof vapor barrier with air and weather barrier in the wall assemblies.
 - 3. Coordinate roof edge facias, copings, and every roof accessory.

1.04 SUBMITTALS REQUIREMENTS

- A. Submit per the requirements of Section 013300 Submittal Procedures and as indicated herein.
- B. Submit the following in a single complete package, Partial submittal packages shall be rejected without action.
 - 1. Product data
 - 2. Manufacturers Certifications
 - 3. Shop Drawings
 - 4. Coordinate roof plan.
 - 5. Manufacturers Certifications
 - 6. Certifications
 - 7. Product test reports
 - 8. Sample Warranties

1.05 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show locations and extent of roofing and each layer or component by name.
 - 1. Coordinated Roof Plan: Submit plan coordinated with and indicating all other work that penetrates or contacts the roofing membrane. Include the following:
 - a. Submit plan at minimum 1/4 inch equals 1 foot.
 - b. Accurately indicate every piece of rooftop equipment and the pipes, conduits and ducts servicing that equipment.
 - c. Accurately indicate every device or product mounted on or penetrating the roof. Include roof edge fascia, copings and accessories specified elsewhere in Division 7.

- d. Relative elevations and slopes of substrates and finished roof surface.
- e. Drain locations and size of sumps.
- f. Relative elevations and slopes of substrates and finished roof surface.
- g. Cross-references to all details.
- 2. For roofing system. Include, sections, details, and attachments to other work. Indicate joint, penetration and termination conditions and conditions of interface with adjacent walls, parapets, and other materials and as follows: Show all layers of the roof system starting from the substrate. Show continuity with other weather-resistive materials and air barrier/water resistive barrier materials. Include sufficient detail to indicate compliance with conditions unique for this Project. Include the following:
 - a. Submit details at minimum 3 inches equals 1 foot.
 - b. Parapet, edge, and scupper details.
 - c. Roof drains.
 - d. All flashing details.
 - e. Layout of components including all layers of roof assembly.
 - f. Show step-by-step, layer-by-layer instructions for installation of waterproofing system.
- 3. Drawings:
 - a. Details: minimum 3 inches equals 1 foot.

1.06 INFORMATIONAL SUBMITTALS

- A. Research/Evaluation Reports: For components of roofing system, from ICC-ES.
- B. Manufacturer Certificates: Signed by manufacturer certifying that roofing system complies with the following.
 - 1. Certificate shall list all products and materials required for project.
 - 2. Compliance with performance requirements.
 - 3. Certify that materials are appropriate for indicated use and substrates and adjacent materials are compatible.
 - 4. Certify Manufacturer's approval of Installer and Installer's qualifications. Certify approval of Installer as suitable for project and having completed training programs required by the manufacturer.
 - 5. Certify single source responsibility.
 - 6. Certify acceptability to manufacturer of products specified in or required by this Section that are not produced by the manufacturer who submits this Certification.
 - 7. Approval of Submittals: Certify that work indicated in submittals is in compliance with manufacturers written instructions and if installed as indicated in submittals is suitable for indicated warranty.
 - 8. Certify compatibility for all materials, including adjacent waterproofing and air barrier systems that contact the roofing membrane.
 - 9. Provide name of manufacturers testing and inspection agent.
 - 10. Certify intent to warrant based on submittals.
- C. Special Warranty:
 - 1. Sample Warranties: For manufacturer's special warranties.
 - 2. Intent to Warrant letter. Do not commence Work without approval of Intent to Warrant.
 - 3. Executed Warranty after completion of Work.
- D. Samples:
 - 1. Paper sample of "Roofing Identification Sign", with information completed for this Project.

1.07 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

1.08 QUALITY ASSURANCE

- A. Manufacturer's Qualification: Manufacturers shall have ten (10) years documented experience producing roofing membranes of the same type as those required for this Project.
- B. Manufacturer's Technical Representative: Manufacturer shall assign a technical representative to provide quality assurance and to assist in the proper application of the products to suit the

particular project requirements. Manufacturer's Technical Representative shall:

- 1. Review show drawings and certify the indicated detailing complies with manufacturer's written instructions and requirements.
- 2. Interpret modification of manufacturer's standard details and instructions to suit conditions not specifically covered.
- 3. Provide instructions for coordination with waterproof connections to adjacent waterproof materials and air barriers.
- 4. Approve installer in writing.
- 5. Attend pre-construction conferences, workshops, coordination meetings and similar meetings to ensure proper installation of roofing.
- 6. Conduct indicated Field Quality testing and inspection or cause same to be done by qualified individual.
- C. Installer's Qualification: Installer shall have satisfactorily completed minimum three (3) projects of similar system, scope and complexity within last one (1) year. Installer shall currently be licensed and approved by manufacturer and shall have been so for previous three
 - 1. (3) years and that is eligible to receive manufacturer's special warranty.
- D. Single Source Requirements: Primary products and materials required to complete system shall be produced directly by listed manufacturer. Secondary products including insulation, primers, anchors, and adhesives may be produced by a secondary manufacturer approved in writing by primary manufacturer.
- E. Regulatory Requirements: Comply with applicable Volatile Organic Compounds (VOCs) regulations.
- F. Referenced Codes and Standards: Comply with the following in accordance with Division 1.
 1. National Roofing Contractors Association (NRCA): Roofing and Waterproofing Manual
- G. Certifications:
 - 1. Manufacturer's certification that installer is approved for this Project and has been an approved installer as required above.
 - 2. System Certification Letter: Manufacturer's certification as follows:
 - a. List information specific to this project, including Owner, Contractor, Building, and location.
 - b. List each material required for roofing system.
 - c. Certification of single source responsibility.
 - d. Certification of acceptance of secondary products manufactured by others.
 - e. Certification of acceptance of products specified elsewhere which are installed within or in contact with roofing system.
 - f. Certification that products and materials comprising roofing system are compatible with each other and with adjacent materials they may contact.
 - g. Certification that roof systems comply with specified UL and FMG requirements.
 - h. Certification that roof system is eligible for indicated warranty.

1.09 DELIVERY, HANDLING AND STORAGE

- A. Deliver materials in original unopened containers or packaging clearly labeled with manufacturer's name, brand name, instructions for storage, handling and use, all identifying numbers and labels.
- B. Store materials on pallets or other similar raised platform and protected from weather.
- C. Do not overload structure by storing large amounts of material in one (1) area.
- D. Store materials out of direct exposure to the elements. Store roll goods on a clean, flat and dry surface. All material stored overnight shall be stored on pallets. Store materials in a manner so as to preclude overloading of deck and building structure. Store materials such as solvents, adhesives and asphalt cutback products away from open flames, sparks or excessive heat. Cover all material using a breathable cover such as a canvas. Polyethylene or other non-breathable plastic coverings are not acceptable.

- E. Store all pail goods in their original undamaged containers in a clean, dry location, between 60 degrees F and 80 degrees F.
- F. Do not expose materials to moisture in any form before, during, or after delivery to the site. Reject delivery of materials that show evidence of contact with moisture.
- G. Remove manufacturer supplied plastic covers from materials provided with such. Use "breathable" type covers such as canvas tarpaulins to allow venting and protection from weather and moisture. Cover and protect materials at the end of each work day. Do not remove any protective tarpaulins until immediately before the material will be installed.
- H. Any materials that are found to be damaged or stored in any manner other than stated above will be automatically rejected, removed and replaced at the contractor's expense.
- I. Handle all materials in such a manner as to preclude damage and contamination with moisture or foreign matter. Handle rolled goods to prevent damage to edges or ends.

1.10 FIELD CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing to be installed according to manufacturer's written instructions and warranty requirements.
 - 1. Do not apply roofing materials to surfaces where ice or frost is visible. Do not apply roofing materials in areas with standing water.
 - 2. Do not place on damp surfaces unless such practice is approved in writing by manufacturer.

1.11 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period without pro-rating cost with no dollar limit (NDL)
 - 1. Special warranty includes membrane roofing, base flashings, roof insulation, fasteners, cover boards, roofing accessories, roof walkway pads, roof pavers, and other components of roofing system.
 - 2. Warranty shall specifically identify the height of the building.
 - 3. Warranty Period: 20 years from date of Substantial Completion.
- B. The following exclusions are permitted in Warranty:
 - 1. Natural disasters such as lightning, hail, floods, and earthquakes.
 - 2. Damage from traffic or storage of material on roof.
 - 3. Structural failure of roof deck, parapet or coping.
 - 4. Infiltration of moisture in, through or around walls, coping or building structure.
 - 5. Movement or deterioration of metal counterflashing or other metal components adjacent to roof.
 - 6. Damage to building (other than roofing system components) or its contents.
- C. Warranty shall include coverage for failure due to wind velocities up to 90 miles per hour.
- D. Warranty shall include roof coping and fascia.
- E. Warranty shall provide that if upon proper notification Warrantor fails to promptly repair roof, Owner may make temporary repairs to avoid damage to facility. Such action shall not be considered a breach of provisions of Warranty.

1.12 OWNER'S INSTRUCTIONS

A. Care and Maintenance: Provide manufacturer's written Roof Maintenance Plan customized for Project, for maintenance of roof including, for example, inspection schedules, trouble shooting, early signs of a potential problem and temporary emergency repairs.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Manufacturer: Subject to compliance with specifications, products of the following manufacturers are approved, no substitutions.

- 1. Carlisle
- 2. GAF
- 3. Johns Manville
- 4. Versico
- B. Exclusions (Not Allowed):

1. Firestone

C. Source Limitations: Obtain components including roof insulation and fasteners for roofing system from same manufacturer as membrane roofing or manufacturer approved by membrane roofing manufacturer.

2.02 PERFORMANCE REQUIREMENTS

- A. Accelerated Weathering: Roofing system shall withstand 2000 hours of exposure when tested according to ASTM G 152, ASTM G 154, or ASTM G 155.
- B. Exterior Fire-Test Exposure: ASTM E 108 or UL 790, Class A; for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

2.03 TPO ROOFING

- A. Fabric-Reinforced TPO Sheet: ASTM D 6878, internally fabric- or scrim-reinforced, uniform, flexible TPO sheet.
 - 1. Thickness: 4 mils, nominal.
 - 2. Exposed Face Color: Grey

2.04 VAPOR BARRIER/TEMPORARY ROOF

A. Manufacturers recommended minimum 0.160-inch thick modified bituminous torched-down membrane to function as vapor barrier, air barrier and temporary roof membrane. Provide all accessories.

2.05 AUXILIARY ROOFING MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing.
 - 1. Liquid-type auxiliary materials shall comply with VOC limits of authorities having jurisdiction.
 - 2. Adhesives and sealants that are not on the exterior side of weather barrier shall comply with the following limits for VOC content:
 - a. Plastic Foam Adhesives: 50 g/L.
 - b. Gypsum Board and Panel Adhesives: 50 g/L.
 - c. Multipurpose Construction Adhesives: 70 g/L.
 - d. Fiberglass Adhesives: 80 g/L.
 - e. Single-Ply Roof Membrane Adhesives: 250 g/L.
 - f. Single-Ply Roof Membrane Sealants: 450 g/L.
 - g. Nonmembrane Roof Sealants: 300 g/L.
 - h. Sealant Primers for Nonporous Substrates: 250 g/L.
 - i. Sealant Primers for Porous Substrates: 775 g/L.
 - j. Other Adhesives and Sealants: 250 g/L.
- B. Sheet Flashing: Manufacturer's standard unreinforced TPO sheet flashing, 60 mils thick, minimum, of same color as TPO sheet.
- C. Roofing Air Seal Membrane: Sheet membrane recommended by manufacturer.
- D. Pre-molded Flashing Boots: Manufacturer's standard conical elastomeric boots, molded to fit pipe penetrations.
- E. Bonding Adhesive: Manufacturer's standard, water based.
- F. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosionresistance provisions in FM Global 4470, designed for fastening membrane to substrate, and acceptable to roofing system manufacturer.

G. Miscellaneous Accessories: Provide lap sealant, water cutoff mastic, metal termination bars, metal battens, pourable sealers, preformed cone and vent sheet flashings, molded pipe boot flashings, preformed inside and outside corner sheet flashings, reinforced TPO securement strips, T-joint covers, in-seam sealants, termination reglets, cover strips, and other accessories.

2.06 ROOF INSULATION

- A. General: Preformed roof insulation boards manufactured or approved by roofing manufacturer, suitable for application, of thicknesses indicated.
- B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II,.
 - 1. Compressive Strength per ASTM D 1621: Minimum 25 psi.
 - 2. Maximum Face Size: 4 feet by 4 feet.
 - 3. Thickness: As required for combined roof insulation to provide R-30 thermal performance as determined by PIMA LTTR.
 - 4. Coated glass-fiber mat facer or all-glass facer on both major surfaces No organic felt or paper facers or reinforced felt facers.
- C. Composite Insulation/Cover Board: Polyisocyanurate insulation listed above bonded to a layer of 1/2" thick minimum 80 psi polyisocyanurate insulation. Facers as specified above.
- D. Cover Board: ½" thick minimum 80 psi polyisocyanurate insulation, same as in composite insulation. Provide loose cover boards for installation over insulation where composite insulation and cover board is not used.
- E. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches (1:48) except ½" per 12 inches for crickets, unless otherwise indicated.
- F. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.07 INSULATION ACCESSORIES

- A. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosionresistance provisions in FM Global 4470, designed for fastening roof insulation and cover boards to substrate, and acceptable to roofing system manufacturer.
- B. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer.

2.08 WALKWAYS

A. Flexible Walkways: Factory-formed, nonporous, heavy-duty, solid-rubber, slip-resisting, surface-textured walkway pads or rolls, approximately 3/16 inch (5 mm) thick and acceptable to roofing system manufacturer.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate preparations and other conditions affecting performance of bentonite waterproofing.
- B. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work:
 - 1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
 - 2. Verify that wood cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
 - 3. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
 - 4. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
 - 5. Verify that concrete-curing compounds that impair adhesion of roofing components to roof deck have been removed.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean, prepare, and treat substrates according to manufacturer's written instructions.
- B. Coordinate work in the vicinity of roofing to ensure proper conditions for installing the waterproofing system and to prevent damage to roofing after installation.
- C. Formed Concrete Surfaces: Remove fins and projections. Fill voids, rock pockets, form-tie holes, and other defects with cement grout patching material according to manufacturer's written instructions.
- D. Protect adjacent surfaces from staining or soiling caused by roofing application. Prevent liquid materials from entering or clogging drains, pipes, conduits or conductors. Prevent foreign materials from entering or clogging roof drains, stoppers or downspouts.
- E. Apply primer to concrete and masonry substrates per manufacturer's written instructions.
- F. Prime all sheet metal to be embedded in roofing system including, but not limited to, gravel stops, scuppers, edge trim and lead drain flashing with cut-back asphalt.

3.03 ROOFING INSTALLATION, GENERAL

- A. Install roofing system according to roofing system manufacturer's written instructions.
- B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at the end of the workday or sooner when rain is forecast. Remove and discard temporary seals before beginning work on adjoining roofing.

3.04 VAPOR BARRIER/TEMPORARY ROOFING

- A. Install vapor barrier membrane to provide a temporary roof system and to provide vapor protection.
- B. Provide a galvanized steel sheet back-up behind each seam that is not directly and continuously supported by metal decking.
- C. Extend vapor barrier base flashing to the extent necessary to provide an airtight and vapor tight separation of the roof insulation from the interior.
 - 1. Extend to seal to air and weather barrier in the wall assemblies.
- D. Seal every penetration.
- E. Inspect vapor barrier/temporary roof and repair any damage before covering with insulation.

3.05 INSULATION INSTALLATION

- A. Coordinate installing roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
- B. Install insulation under area of roofing to achieve required thickness. Install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches in each direction.
 - 1. Bottom layer: Noncomposite board insulation for bottom layer, Fastened.
 - 2. Top layer: Composite board insulation, fully adhered.
- C. Install 4 by 4 feet sumps (1/2" per 12" slope) at roof drains with tapered insulation.
- D. Install tapered insulation crickets between layers of main roof insulation to direct water to sumps.
- E. Where non-composite insulation or tapered insulation is used, install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together.
 - 1. Set insulation cover board in insulation adhesive, firmly pressing and maintaining insulation in place to resist uplift pressure at corners, perimeter, and field of roof.
- F. Install composite insulation cover board over the backs of parapet walls as indicated. Mechanically fasten to framing as recommended by manufacturer.

G. Install roofing air seal membrane at perimeter of roof between the two layers of insulation.

3.06 ADHERED MEMBRANE ROOFING INSTALLATION

- A. Adhere roofing over area to receive roofing according to membrane roofing system manufacturer's written instructions. Unroll membrane roofing and allow to relax before installing.
- B. Accurately align roofing, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.
- C. Bonding Adhesive: Apply to substrate and underside of roofing at rate required by manufacturer, and allow to partially dry before installing roofing. Do not apply to splice area of roofing.
- D. In addition to adhering, mechanically fasten roofing securely at terminations, penetrations, and perimeters.
- E. Seams: Clean seam areas, overlap roofing, and hot-air weld side and end laps of roofing and sheet flashings according to manufacturer's written instructions, to ensure a watertight seam installation.
 - 1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of sheet.
 - 2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
 - 3. Repair tears, voids, and lapped seams in roofing that do not comply with requirements.
- F. Repair tears, voids, and lapped seams in roofing that do not comply with requirements.
- G. Spread sealant bed over deck-drain flange at roof drains, and securely seal membrane roofing in place with clamping ring.
- H. Protection Sheet: Install protection sheet around kitchen hood exhaust as directed by manufacturer.

3.07 BASE FLASHING INSTALLATION

- A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.
- B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.
- C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.
- D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.
- E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.08 FIELD QUALITY CONTROL

- A. Manufacturer's Representative: Manufacturer's Field Technical Representative shall inspect construction activities, at start of work, minimum two (2) hours per week during work and at completion of each area of work. Representative shall attend meetings concerning roofing when indicated or as scheduled to coordinate work. Representative shall submit a written report after each inspection noting as a minimum weather conditions, condition of stored materials, work in progress, condition of substrates, number of workers and which workers have completed manufacturers' training programs, and all other pertinent data. Services of manufacturer's field representative are not intended to supersede manufacturer's written requirements for inspection and testing to issue warranty.
- B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion and before installation of vegetated roof components.
- C. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.

3.09 PROTECTING AND CLEANING

- A. Protect membrane roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
- B. Correct deficiencies in or remove membrane roofing system that does not comply with requirements, repair substrates, and repair or reinstall membrane roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

SECTION 076200 SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 SUMMARY

- A. Section includes sheet metal flashing and trim not specified elsewhere.
- B. Related Requirements:
 - 1. Section 042000 "Unit Masonry" for stainless steel flashing embedded in masonry.
 - 2. Section 061000 "Rough Carpentry" for wood nailers, curbs, and blocking.
 - 3. Section 079200 "Joint Sealants" for field-applied sealants.

1.2 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" apply to work of this Section.

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate work of this section with adjacent components of the exterior enclosure. Participate in coordination required in Division 01 Section "Exterior Enclosure General Requirements".
- B. Preinstallation Meetings:
 - 1. Preinstallation Conference: Conduct conference at Project site.
 - 2. In addition to requirements specified in Division 01 Section "Project Management and Coordination," include the following:

C. Sequencing / Scheduling: Comply with requirements specified in Division 1 Section "Exterior Enclosure Performance Requirements".

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For sheet metal flashing and trim.
 - 1. Include plans, elevations, sections, and attachment details.
 - 2. Distinguish between shop- and field-assembled work.
 - 3. Include identification of finish for each item.
 - 4. Include pattern of seams and details of termination points, expansion joints and expansion-joint covers, direction of expansion, roof-penetration flashing, and connections to adjoining work.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.
 - 1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

A. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, dead soft, fully annealed; 2D (dull, cold rolled) finish.

2.3 UNDERLAYMENT MATERIALS

- A. Underlayment shall be either roofing membrane, air barrier membrane, air barrier membrane accessory or transition sheets, or self-adhered sheet underlayment specified below and as recommend by manufacturer of the roofing or air barrier as indicated on drawings and as required to suit conditions.
- B. Self-Adhering, High-Temperature Sheet: Minimum 30 mils thick, consisting of a slip-resistant polyethylene- or polypropylene-film top surface laminated to a layer of butyl-or SBS-modified asphalt adhesive, with release-paper backing; specifically designed to withstand high metal temperatures beneath metal roofing. Provide primer according to written recommendations of underlayment manufacturer.
 - 1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F or higher.
 - 2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F or lower.
- C. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. minimum.

2.4 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.
 - 1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
 - b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
 - 2. Material: Series 300 stainless steel.
- C. Solder: ASTM B 32, with acid flux of type recommended by stainless-steel sheet manufacturer.
- D. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
- E. Elastomeric Sealant: ASTM C 920, elastomeric silicone polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

- F. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- G. Bituminous Coating: Cold-applied asphalt emulsion according to ASTM D 1187.
- H. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

2.5 FABRICATION

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible. Fabricate every corner, intersection, transition or other shape to allow for only straight butt seams in the field.
 - 1. Obtain field measurements for accurate fit before shop fabrication.
 - 2. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
 - 3. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
 - 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
- C. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- D. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.
- E. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.
- F. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams, rivet joints and solder.
- G. Running Joints: Form back-up plates for running joints.
- H. Counterflashing and Flashing Receivers: Fabricate for two piece installation.
- I. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch-long, but not exceeding 12-foot-long, sections, under copings, and at shelf angles. Fabricate discontinuous lintel, sill, and similar flashings to extend 6 inches beyond each side of wall openings; and form with 2-inch-high, end dams.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.
- B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage where applicable, and securely anchored.
- C. Examine roofing membrane installation and air barrier installation to ensure that when the underlayment specified in this section is completed, there is a continuous and complete waterproof membrane prior to installation of sheet metal flashing.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

- A. Where air barrier, roofing or related accessory membranes form underlayment, install per manufacturer's instructions for those products.
- B. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6 inches staggered 24 inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller. Cover underlayment within 14 days.
- C. When the underlayment specified in this section is completed, along with the roofing membrane or the air barrier membrane, there shall be a continuous and complete waterproof membrane prior to installation of coping or roof specialties.

3.3 INSTALLATION

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 - 1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 - 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 - 3. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.

- 4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
- 5. Torch cutting of sheet metal flashing and trim is not permitted.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
 - 1. Coat concealed side of stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
 - 2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Running Joints: Provided butt joints with back-up plates and membrane cover. Bed flashing in two rows each side over back-up plate. Cover over butt joint with patch of membrane flashing.
- D. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches of corner or intersection.
 - 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
- E. Fasteners: Use fastener sizes that penetrate wood blocking or sheathing not less than 1-1/4 inches for nails and not less than 3/4 inch for wood screws and not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.
- F. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- G. Seal joints as required for watertight construction. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- H. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets with solder to width of 1-1/2 inches; however, reduce pre-tinning where pre-tinned surface would show in completed Work.
 - 1. Do not use torches for soldering.
 - 2. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
 - 3. Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.
- I. Through-Wall Flashing: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate

installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

1. Coordinate work with Section 042000 "Unit Masonry."

SECTION 076200 SHEET METAL FLASHING AND TRIM

SUMMARY

1.01 SECTION INCLUDES SHEET METAL FLASHING AND TRIM NOT SPECIFIED ELSEWHERE

1.02 RELATED REQUIREMENTS:

- A. Section 061053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.
- B. Preinstallation Meetings:
- C. Preinstallation Conference: Conduct conference at Project site.

ACTION SUBMITTALS

2.01 PRODUCT DATA: FOR EACH TYPE OF PRODUCT.

2.02 SHOP DRAWINGS: FOR SHEET METAL FLASHING AND TRIM.

- A. Include plans, elevations, sections, and attachment details.
- B. Distinguish between shop- and field-assembled work.
- C. Include identification of finish for each item.
- D. Include pattern of seams and details of termination points, expansion joints and expansion-joint covers, direction of expansion, roof-penetration flashing, and connections to adjoining work.

QUALITY ASSURANCE

3.01 FABRICATOR QUALIFICATIONS: EMPLOYS SKILLED WORKERS WHO CUSTOM FABRICATE SHEET METAL FLASHING AND TRIM SIMILAR TO THAT REQUIRED FOR THIS PROJECT AND WHOSE PRODUCTS HAVE A RECORD OF SUCCESSFUL IN-SERVICE PERFORMANCE.

PART 2 - PRODUCTS

PERFORMANCE REQUIREMENTS

- 5.01 GENERAL: SHEET METAL FLASHING AND TRIM ASSEMBLIES SHALL WITHSTAND WIND LOADS, STRUCTURAL MOVEMENT, THERMALLY INDUCED MOVEMENT, AND EXPOSURE TO WEATHER WITHOUT FAILURE DUE TO DEFECTIVE MANUFACTURE, FABRICATION, INSTALLATION, OR OTHER DEFECTS IN CONSTRUCTION. COMPLETED SHEET METAL FLASHING AND TRIM SHALL NOT RATTLE, LEAK, OR LOOSEN, AND SHALL REMAIN WATERTIGHT.
- 5.02 SHEET METAL STANDARD FOR FLASHING AND TRIM: COMPLY WITH SMACNA'S "ARCHITECTURAL SHEET METAL MANUAL" REQUIREMENTS FOR DIMENSIONS AND PROFILES SHOWN UNLESS MORE STRINGENT REQUIREMENTS ARE INDICATED.
- 5.03 THERMAL MOVEMENTS: ALLOW FOR THERMAL MOVEMENTS FROM AMBIENT AND SURFACE TEMPERATURE CHANGES.
 - A. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

SHEET METALS

6.01 ANODIZED ALUMINUM: ASTM B209/B209M, 3005 ALLOY, H12 OR H14 TEMPER; 20 GAUGE, 0.032 INCH (0.81 MM) THICK; FINISH: TO MATCH ALUMINUM STOREFRONT SYSTEM.

UNDERLAYMENT MATERIALS

- 7.01 UNDERLAYMENT SHALL BE EITHER ROOFING MEMBRANE, AIR BARRIER MEMBRANE ACCESSORY OR TRANSITION SHEETS, OR SELF-ADHERED SHEET UNDERLAYMENT AS RECOMMEND BY MANUFACTURER OF THE ROOFING.
- 7.02 SELF-ADHERING, HIGH-TEMPERATURE SHEET: MINIMUM 30 MILS THICK, CONSISTING OF A SLIP-RESISTANT POLYETHYLENE- OR POLYPROPYLENE-FILM TOP SURFACE LAMINATED TO A LAYER OF BUTYL-OR SBS-MODIFIED ASPHALT ADHESIVE, WITH RELEASE-PAPER BACKING; SPECIFICALLY DESIGNED TO WITHSTAND HIGH METAL TEMPERATURES BENEATH METAL ROOFING. PROVIDE PRIMER ACCORDING TO

WRITTEN RECOMMENDATIONS OF UNDERLAYMENT MANUFACTURER.

- A. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F or higher.
- B. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F or lower.

7.03 SLIP SHEET: ROSIN-SIZED BUILDING PAPER, 3 LB/100 SQ. FT. MINIMUM.

MISCELLANEOUS MATERIALS

- 8.01 GENERAL: PROVIDE MATERIALS AND TYPES OF FASTENERS, SOLDER, PROTECTIVE COATINGS, SEALANTS, AND OTHER MISCELLANEOUS ITEMS AS REQUIRED FOR COMPLETE SHEET METAL FLASHING AND TRIM INSTALLATION AND AS RECOMMENDED BY MANUFACTURER OF PRIMARY SHEET METAL UNLESS OTHERWISE INDICATED.
- 8.02 FASTENERS: WOOD SCREWS, ANNULAR THREADED NAILS, SELF-TAPPING SCREWS, SELF-LOCKING RIVETS AND BOLTS, AND OTHER SUITABLE FASTENERS DESIGNED TO WITHSTAND DESIGN LOADS AND RECOMMENDED BY MANUFACTURER OF PRIMARY SHEET METAL.
 - A. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
 - 1. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factoryapplied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
 - 2. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
 - 3. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
 - B. Material: Series 300 stainless steel.
- 8.03 SOLDER: ASTM B 32, WITH ACID FLUX OF TYPE RECOMMENDED BY STAINLESS-STEEL SHEET MANUFACTURER.
- 8.04 SEALANT TAPE: PRESSURE-SENSITIVE, 100 PERCENT SOLIDS, POLYISOBUTYLENE COMPOUND SEALANT TAPE WITH RELEASE-PAPER BACKING. PROVIDE PERMANENTLY ELASTIC, NONSAG, NONTOXIC, NONSTAINING TAPE 1/2 INCH WIDE AND 1/8 INCH THICK.
- 8.05 ELASTOMERIC SEALANT: ASTM C 920, ELASTOMERIC SILICONE POLYMER SEALANT; OF TYPE, GRADE, CLASS, AND USE CLASSIFICATIONS REQUIRED TO SEAL JOINTS IN SHEET METAL FLASHING AND TRIM AND REMAIN WATERTIGHT.
- 8.06 BUTYL SEALANT: ASTM C 1311, SINGLE-COMPONENT, SOLVENT-RELEASE BUTYL RUBBER SEALANT; POLYISOBUTYLENE PLASTICIZED; HEAVY BODIED FOR HOOKED-TYPE EXPANSION JOINTS WITH LIMITED MOVEMENT.
- 8.07 BITUMINOUS COATING: COLD-APPLIED ASPHALT EMULSION ACCORDING TO ASTM D 1187.
- 8.08 ASPHALT ROOFING CEMENT: ASTM D 4586, ASBESTOS FREE, OF CONSISTENCY REQUIRED FOR APPLICATION.

FABRICATION

- 9.01 GENERAL: CUSTOM FABRICATE SHEET METAL FLASHING AND TRIM TO COMPLY WITH DETAILS SHOWN AND RECOMMENDATIONS IN CITED SHEET METAL STANDARD THAT APPLY TO DESIGN, DIMENSIONS, GEOMETRY, METAL THICKNESS, AND OTHER CHARACTERISTICS OF ITEM REQUIRED. FABRICATE SHEET METAL FLASHING AND TRIM IN SHOP TO GREATEST EXTENT POSSIBLE. FABRICATE EVERY CORNER, INTERSECTION, TRANSITION OR OTHER SHAPE TO ALLOW FOR ONLY STRAIGHT BUTT SEAMS IN THE FIELD.
 - A. Obtain field measurements for accurate fit before shop fabrication.
 - B. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
 - C. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

- 9.02 EXPANSION PROVISIONS: FORM METAL FOR THERMAL EXPANSION OF EXPOSED FLASHING AND TRIM.
 - A. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.
- 9.03 SEALANT JOINTS: WHERE MOVABLE, NONEXPANSION-TYPE JOINTS ARE REQUIRED, FORM METAL TO PROVIDE FOR PROPER INSTALLATION OF ELASTOMERIC SEALANT ACCORDING TO CITED SHEET METAL STANDARD.
- 9.04 FABRICATE CLEATS AND ATTACHMENT DEVICES FROM SAME MATERIAL AS ACCESSORY BEING ANCHORED OR FROM COMPATIBLE, NONCORROSIVE METAL.
- 9.05 FABRICATE CLEATS AND ATTACHMENT DEVICES OF SIZES AS RECOMMENDED BY CITED SHEET METAL STANDARD FOR APPLICATION, BUT NOT LESS THAN THICKNESS OF METAL BEING SECURED.
- 9.06 SEAMS: FABRICATE NONMOVING SEAMS WITH FLAT-LOCK SEAMS. FORM SEAMS, RIVET JOINTS AND SOLDER.
- 9.07 RUNNING JOINTS: FORM BACK-UP PLATES FOR RUNNING JOINTS.
- 9.08 COUNTERFLASHING AND FLASHING RECEIVERS: FABRICATE FOR TWO PIECE INSTALLATION.
- **PART 3 EXECUTION**
- **10.01 EXAMINATION**
- 10.02 EXAMINE SUBSTRATES, AREAS, AND CONDITIONS, WITH INSTALLER PRESENT, TO VERIFY ACTUAL LOCATIONS, DIMENSIONS, AND OTHER CONDITIONS AFFECTING PERFORMANCE OF THE WORK.
- 10.03 VERIFY THAT SUBSTRATE IS SOUND, DRY, SMOOTH, CLEAN, SLOPED FOR DRAINAGE WHERE APPLICABLE, AND SECURELY ANCHORED.
- 10.04 EXAMINE ROOFING MEMBRANE INSTALLATION AND AIR BARRIER INSTALLATION TO ENSURE THAT WHEN THE UNDERLAYMENT SPECIFIED IN THIS SECTION IS COMPLETED, THERE IS A CONTINUOUS AND COMPLETE WATERPROOF MEMBRANE PRIOR TO INSTALLATION OF SHEET METAL FLASHING.
- 10.05 PROCEED WITH INSTALLATION ONLY AFTER UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED.
- UNDERLAYMENT INSTALLATION
- 11.01 WHERE AIR BARRIER, ROOFING OR RELATED ACCESSORY MEMBRANES FORM UNDERLAYMENT, INSTALL PER MANUFACTURER'S INSTRUCTIONS FOR THOSE PRODUCTS.
- 11.02 SELF-ADHERING SHEET UNDERLAYMENT: INSTALL SELF-ADHERING SHEET UNDERLAYMENT, WRINKLE FREE. PRIME SUBSTRATE IF RECOMMENDED BY UNDERLAYMENT MANUFACTURER. COMPLY WITH TEMPERATURE RESTRICTIONS OF UNDERLAYMENT MANUFACTURER FOR INSTALLATION; USE PRIMER FOR INSTALLING UNDERLAYMENT AT LOW TEMPERATURES. APPLY IN SHINGLE FASHION TO SHED WATER, WITH END LAPS OF NOT LESS THAN 6 INCHES STAGGERED 24 INCHES BETWEEN COURSES. OVERLAP SIDE EDGES NOT LESS THAN 3-1/2 INCHES. ROLL LAPS AND EDGES WITH ROLLER. COVER UNDERLAYMENT WITHIN 14 DAYS.
- 11.03 WHEN THE UNDERLAYMENT SPECIFIED IN THIS SECTION IS COMPLETED, ALONG WITH THE ROOFING MEMBRANE OR THE AIR BARRIER MEMBRANE, THERE SHALL BE A CONTINUOUS AND COMPLETE WATERPROOF MEMBRANE PRIOR TO INSTALLATION OF COPING OR ROOF SPECIALTIES.

INSTALLATION

12.01 GENERAL: ANCHOR SHEET METAL FLASHING AND TRIM AND OTHER COMPONENTS OF THE WORK SECURELY IN PLACE, WITH PROVISIONS FOR THERMAL AND STRUCTURAL MOVEMENT. USE FASTENERS, SOLDER, PROTECTIVE COATINGS, SEPARATORS,

SEALANTS, AND OTHER MISCELLANEOUS ITEMS AS REQUIRED TO COMPLETE SHEET METAL FLASHING AND TRIM SYSTEM.

- A. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
- B. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
- C. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
- D. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
- E. Torch cutting of sheet metal flashing and trim is not permitted.

12.02 METAL PROTECTION: WHERE DISSIMILAR METALS CONTACT EACH OTHER, OR WHERE METAL CONTACTS PRESSURE-TREATED WOOD OR OTHER CORROSIVE SUBSTRATES, PROTECT AGAINST GALVANIC ACTION OR CORROSION BY PAINTING CONTACT SURFACES WITH BITUMINOUS COATING OR BY OTHER PERMANENT SEPARATION AS RECOMMENDED BY SHEET METAL MANUFACTURER OR CITED SHEET METAL STANDARD.

- A. Coat concealed side of stainless-steel sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
- B. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

12.03 RUNNING JOINTS: PROVIDED BUTT JOINTS WITH BACK-UP PLATES AND MEMBRANE COVER. BED FLASHING IN TWO ROWS EACH SIDE OVER BACK-UP PLATE. COVER OVER BUTT JOINT WITH PATCH OF MEMBRANE FLASHING.

12.04 EXPANSION PROVISIONS: PROVIDE FOR THERMAL EXPANSION OF EXPOSED FLASHING AND TRIM. SPACE MOVEMENT JOINTS AT MAXIMUM OF 10 FEET WITH NO JOINTS WITHIN 24 INCHES OF CORNER OR INTERSECTION.

- A. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
- 12.05 FASTENERS: USE FASTENER SIZES THAT PENETRATE WOOD BLOCKING OR SHEATHING NOT LESS THAN 1-1/4 INCHES FOR NAILS AND NOT LESS THAN 3/4 INCH FOR WOOD SCREWS AND NOT LESS THAN RECOMMENDED BY FASTENER MANUFACTURER TO ACHIEVE MAXIMUM PULL-OUT RESISTANCE.
- 12.06 CONCEAL FASTENERS AND EXPANSION PROVISIONS WHERE POSSIBLE IN EXPOSED WORK AND LOCATE TO MINIMIZE POSSIBILITY OF LEAKAGE. COVER AND SEAL FASTENERS AND ANCHORS AS REQUIRED FOR A TIGHT INSTALLATION.
- 12.07 SEAL JOINTS AS REQUIRED FOR WATERTIGHT CONSTRUCTION. PREPARE JOINTS AND APPLY SEALANTS TO COMPLY WITH REQUIREMENTS IN SECTION 079200 "JOINT SEALANTS."
- 12.08 SOLDERED JOINTS: CLEAN SURFACES TO BE SOLDERED, REMOVING OILS AND FOREIGN MATTER. PRE-TIN EDGES OF SHEETS WITH SOLDER TO WIDTH OF 1-1/2 INCHES; HOWEVER, REDUCE PRE-TINNING WHERE PRE-TINNED SURFACE WOULD SHOW IN COMPLETED WORK.
 - A. Do not use torches for soldering.
 - B. Heat surfaces to receive solder, and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.
 - C. Stainless-Steel Soldering: Tin edges of uncoated sheets, using solder for stainless steel and acid flux. Promptly remove acid flux residue from metal after tinning and soldering. Comply with solder manufacturer's recommended methods for cleaning and neutralization.

12.09 THROUGH-WALL FLASHING: INSTALL SHEET METAL WALL FLASHING TO INTERCEPT AND EXCLUDE PENETRATING MOISTURE ACCORDING TO CITED SHEET METAL STANDARD UNLESS OTHERWISE INDICATED. COORDINATE

- A. installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
 - 1. Coordinate work with Section 042000 "Unit Masonry." END OF SECTION

SECTION 079200 JOINT SEALANTS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Silicone joint sealants.
 - 2. Urethane joint sealants.

1.02 PRECONSTRUCTION TESTING

- A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
 - 1. Use ASTM C 1087 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
 - 2. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.

1.03 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product indicated.
- B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
- C. Samples for Verification: For each kind and color of joint sealant required, provide Samples with joint sealants in 1/2-inch wide joints formed between two 6-inch long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- D. Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.

1.04 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.
- D. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:
 - 1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
 - 2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- E. Warranties: Sample of special warranties.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
- B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.
- C. Product Testing: Owner shall arrange to Test joint sealants using a qualified testing agency.

1.06 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

- 1. When ambient and substrate temperature conditions are outside limits permitted by jointsealant manufacturer or are below 40 deg F.
- 2. When joint substrates are wet.
- 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
- 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.07 WARRANTY

- A. Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: Two years from date of Substantial Completion.
- B. Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
 - 1. Warranty Period: 10 years from date of Substantial Completion.
- C. Warranties specified in this article exclude deterioration or failure of joint sealants from the following:
 - 1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
 - 2. Disintegration of joint substrates from natural causes exceeding design specifications.
 - 3. Mechanical damage caused by individuals, tools, or other outside agents.
 - 4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 PRODUCTS

2.01 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
- B. Stain-Test-Response Characteristics: Sealants shall be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
- C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.02 SILICONE JOINT SEALANTS

- A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, shall be one of the following or an approved equal:
 - a. Dow Corning Corporation; 795.
 - b. Pecora Corporation; 895.
 - c. Sika Corporation, Construction Products Division; SikaSil-C995.

2.03 URETHANE JOINT SEALANTS

- A. Multicomponent, Nonsag, Urethane Joint Sealant: ASTM C 920, Type M, Grade NS, Class 50, for Use NT.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, shall be one of the following or an approved equal:
 - a. Pecora Corporation; Dynatrol II.
 - b. Polymeric Systems, Inc.; PSI-270.
 - c. Tremco Incorporated; Dymeric 240.

2.04 BUTYL-RUBBER-BASED JOINT SEALANT:

A. Single component, Butyl Rubber based Sealant, ASTM C 1311.

- 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, shall be one of the following or an approved equal:
 - a. Pecora Corporation; BC-158.
 - b. Tremco Incorporated; Tremco Butyl Sealant.
 - c. Bostik, Inc.; Chem-Calk 300.

2.05 PREFORMED JOINT SEALANTS

- A. Preformed Silicone Joint Sealants: Manufacturer's standard sealant consisting of precured lowmodulus silicone extrusion, in sizes to fit joint widths indicated, combined with a neutral-curing silicone sealant for bonding extrusions to substrates.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, shall be one of the following or an approved equal:
 - a. Dow Corning Corporation; 123 Silicone Seal.
 - b. Pecora Corporation; Sil-Span.
- B. Preformed Foam Joint Sealant: Manufacturer's standard preformed, precompressed, open-cell foam sealant manufactured from urethane foam with minimum density of 10 lb/cu. ft. and impregnated with a nondrying, water-repellent agent. Factory produce in precompressed sizes in roll or stick form to fit joint widths indicated; coated on one side with a pressure-sensitive adhesive and covered with protective wrapping.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, shall be one of the following or an approved equal:
 - a. EMSEAL Joint Systems, Ltd.; Emseal 25V.
 - b. Sandell Manufacturing Co., Inc.; Polyseal.
 - c. Willseal USA, LLC; Willseal 150.

2.06 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Cylindrical Sealant Backings: ASTM C 1330, Type B (bicellular material with a surface skin, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.07 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.
- C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.
 - 3. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- B. Joint Priming: Prime all joint substrates where existing sealant has been removed and to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.03 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of sealant backings.
 - 2. Do not stretch, twist, puncture, or tear sealant backings.
 - 3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
 - 1. Place sealants so they directly contact and fully wet joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
 - 1. Remove excess sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
 - 3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
- G. Installation of Preformed Silicone-Sealant System: Comply with the following requirements:
 - 1. Apply masking tape to each side of joint, outside of area to be covered by sealant system.
 - 2. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer's written instructions and covering a

bonding area of not less than 3/8 inch. Hold edge of sealant bead 1/4 inch inside masking tape.

- 3. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
- 4. Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.

3.04 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
 - 1. Extent of Testing: Test completed and cured sealant joints as follows:
 - a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
 - b. Perform 1 test for each 1000 feet of joint length thereafter or 1 test per each floor per elevation.
 - 2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
 - a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
 - 3. Inspect tested joints and report on the following:
 - a. Whether sealants filled joint cavities and are free of voids.
 - b. Whether sealant dimensions and configurations comply with specified requirements.
 - c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
 - 4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
 - 5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
- B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.05 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.06 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.07 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
1. Joint Locations:

- a. Construction joints in cast-in-place concrete.
- b. Joints between plant-precast architectural concrete units.
- c. Control and expansion joints in unit masonry.
- d. Joints between metal panels.
- e. Joints between different materials listed above.
- 2. Silicone Joint Sealant: Single component, nonsag, neutral curing, Class 50
- 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- B. Urethane Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
 - 1. Joint Locations:
 - a. Masonry and concrete crack repair, when not in contact with a silicone joint
 - b. Other minor joints not in contact with a sealant joint.
 - 2. Urethane Joint Sealant: Multicomponent, nonsag,, Class 50
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
- Butyl Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces
 Joint Locations:
 - a. Concealed metal to metal joints, in compression.
 - 2. Single component, Butyl Rubber based Sealant, ASTM C 1311
- D. Preformed Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.
 - 1. Joint Locations:
 - a. Not applicable..
 - 2. Preformed Joint Sealant: [Preformed silicone].
 - 3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

SECTION 081116 INTERIOR ALUMINUM DOOR AND GLAZING FRAMES

SUMMARY

1.01 SECTION INCLUDES:

- A. Pre-finished aluminum door frames for interior use.
- B. Pre-finished aluminum window frames for interior use.
- C. Pre-finished aluminum framing systems for interior use.
- D. Pre-finished aluminum and glass doors for interior use.

1.02 RELATED SECTIONS:

- A. Section 081416 Flush wood doors.
- B. Section 087100 Door hardware.
- C. Section 088000 Interior Glazing.

SUBMITTALS

2.01 PRODUCT DATA: MANUFACTURER'S FABRICATION AND INSTALLATION INSTRUCTIONS.

A. Include information on factory finish, glazing gaskets, accessories and other required components.

2.02 SHOP DRAWINGS: SUBMIT SCHEDULE INDICATING OPENING NUMBERS, FRAME TYPES, DIMENSIONS, SWINGS AND HARDWARE REQUIREMENTS.

2.03 INCLUDE ELEVATIONS AND DETAILS INDICATING FRAME TYPES, PROFILES, CONDITIONS AT OPENINGS, METHODS AND LOCATIONS OF ANCHORING, GLAZING REQUIREMENTS, HARDWARE LOCATIONS AND REINFORCEMENTS FOR HARDWARE.

2.04 SAMPLES: SUBMIT THE FOLLOWING:

- A. Full range of manufacturer's standard finishes for the Architect's selection.
- B. Where normal color variations are expected, include additional samples to show range of such variation.

2.05 INSTRUCTIONS: PROVIDE COPIES OF MANUFACTURER'S DATA FOR FABRICATION AND INSTALLATION OF ALUMINUM

A. door frames.

QUALITY ASSURANCE

- 3.01 SINGLE SOURCE RESPONSIBILITY: PROVIDE ALUMINUM FRAMES, ALUMINUM AND GLASS DOORS AND ACCESSORIES PRODUCED BY A SINGLE MANUFACTURER FOR EACH TYPE OF PRODUCT INDICATED.
- 3.02 MANUFACTURER'S QUALIFICATIONS: COMPANY SPECIALIZING IN THE MANUFACTURING OF DOOR FRAME SYSTEMS WITH A MINIMUM OF 10 YEARS OF DOCUMENTED EXPERIENCE ON A COMPARABLE SIZED PROJECT.

3.03 FIRE AND SMOKE RATED ASSEMBLIES:

- A. In locations where fire rated openings are scheduled or required by regulatory agencies, provide fire rated aluminum frames that have been tested and certified for specified exposure by an agency acceptable to governing authorities.
- B. Provide labels permanently fastened on each fire rated frame that are within size limits established by NFPA and the testing authority.
 - 1. Provide 20 minute labels.
 - 2. Provide 90 minute labels.

DELIVERY, STORAGE AND HANDLING

4.01 DELIVER FRAMES AND DOORS CARTONED TO PROVIDE PROTECTION DURING TRANSIT AND STORAGE AT PROJECT SITE.

4.02 INSPECT FRAMES AND DOORS UPON DELIVERY FOR DAMAGE.

- A. Repair minor damage to pre-finished products by means as recommended by the
- B. manufacturer.
- C. Replace frames that cannot be satisfactorily repaired.
- 4.03 STORE FRAMES AT THE PROJECT SITE UNDER COVER AND AS NEAR AS POSSIBLE TO THE FINAL INSTALLATION LOCATION. DO NOT USE COVERING MATERIAL THAT WILL CAUSE DISCOLORATION OF ALUMINUM FINISH.

ENVIRONMENTAL REQUIREMENTS

- 5.01 DO NOT BEGIN INSTALLATION OF THE FRAMES OR DOORS UNTIL THE AREA OF WORK HAS BEEN COMPLETELY
- 5.02 ENCLOSED AND THE INTERIOR IS PROTECTED FROM THE ELEMENTS.
- 5.03 MAINTAIN TEMPERATURE AND HUMIDITY IN AREAS OF INSTALLATION WITHIN REASONABLE LIMITS, AS CLOSE AS POSSIBLE TO FINAL OCCUPANCY. IF NECESSARY, PROVIDE TEMPERATURE CONTROL AND VENTILATION TO MAINTAIN REQUIRED ENVIRONMENTAL CONDITIONS.

WARRANTY

- 6.01 WARRANT AGAINST DEFECTS IN MANUFACTURING OF MATERIALS FOR A PERIOD OF 2 YEARS FROM DATE OF
- 6.02 SUBSTANTIAL COMPLETION.
- 6.03 WARRANT FRAMING FINISH AGAINST DEFECTS, INCLUDING CRACKING, FLAKING, BLISTERING, PEELING AND

EXCESSIVE FADING, CHALKING AND NON-UNIFORMITY IN COLOR FOR A PERIOD OF 5 YEARS. PART 2 PRODUCTS

8.01 ACCEPTABLE MANUFACTURERS AND PRODUCTS

- A. BASIS OF DESIGN: WILSON PARTITIONS OR APPROVED EQUAL.
 - 1. 110 VIADUCT ROAD STAMFORD, CT 06907 (203) 316-8033 WWW.WILSONPART.COM
- B. SUBSTITUTIONS: COMPLY WITH PROVISIONS OF SECTION 01600 FOR SUBSTITUTION REQUESTS.
 - 1. MATERIALS
- 8.02 ALUMINUM: CONTROLLED ALLOY BILLETS MEETING REQUIREMENTS OF ASTM B221, 6063 T5 ALLOY, TO ASSURE COMPLIANCE WITH TIGHT DIMENSIONAL TOLERANCES AND MAINTAIN COLOR UNIFORMITY.
- 8.03 RECYCLED CONTENT OF ALUMINUM PRODUCTS: MINIMUM WEIGHTED AVERAGE SCRAP CONTENT OF THE EXTRUSIONS TO BE 47.9%. THIS INCLUDES A POST CONSUMER SCRAP CONTENT OF 11/1% AND A PRE CONSUMER SCRAP CONTENT OF 36.8%. THE REMAINING 52.1% OF THE EXTRUSIONS TO BE PRIME ALUMINIUM.
 - A. INTERIOR ALUMINUM FRAMES
 - 1. SNAP-ON TRIM PROFILE: PROVIDE FRAMES WITH THE FOLLOWING CHARACTERISTICS:
 - B. RECTILINEAR DESIGN.
 - C. TRIM: 2".
 - D. SERIES 500: 4-7/8" THROAT. ACCEPTS 1/4", 3/8" AND 1/2" GLASS.
 - E. INTERIOR ALUMINUM DOORS
 - 1. PROVIDE 1-3/4" DOORS WITH THE FOLLOWING CHARACTERISTICS: MEDIUM STILE (3-1/2")
 - 2. TOP RAIL (3-1/4") BOTTOM RAIL (9-1/2")

- 3. 1/2" GLASS STOPS FOR 1/4" GLASS
- 4. 3/4" GLASS STOPS FOR 3/8" GLASS
- 5. FABRICATION
- 8.04 PRE-MACHINE JAMBS AND PREPARE FOR HARDWARE, WITH CONCEALED REINFORCEMENT PLATES, DRILLED AND TAPPED AS REQUIRED, AND FASTENED WITHIN THE FRAME.
- 8.05 PROVIDE CORNER REINFORCEMENTS AND ALIGNMENT CLIPS FOR PRECISE BUTT OR MITERED CONNECTIONS.
- 8.06 FABRICATE ALL COMPONENTS TO ALLOW SECURE INSTALLATION WITHOUT EXPOSED FASTENERS.
- 8.07 MANUFACTURER SHALL PRE-CUT AND SHIP ALL FRAME MATERIALS KNOCK-DOWN. 1. FINISHES
 - B. Factory finish extruded frame components so that any part exposed to view upon completion of installation will be uniform in finish and color.
 - 1. FACTORY APPLIED PAINTED FINISH.
 - 2. COLOR COAT: DRY FILM THICKNESS 0.8 +/- 0.05 MIL.
 - 3. COLOR: AS SELECTED BY ARCHITECT.

EXAMINATION

- 9.01 EXAMINE PROJECT CONDITIONS AND VERIFY THAT THE WORK OF THIS SECTION MAY PROPERLY COMMENCE. DO NOT PROCEED WITH THE INSTALLATION UNTIL UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED.
- 9.02 VERIFY THAT THE WALL THICKNESS DOES NOT EXCEED MANUFACTURER'S RECOMMENDED TOLERANCES OF SPECIFIED FRAME THROAT SIZE.

INSTALLATION

10.01 COMPLY WITH FRAME MANUFACTURER'S PRINTED INSTALLATION INSTRUCTIONS AND APPROVED SHOP DRAWINGS. STRICTLY ADHERE TO MAINTAINING SPECIFIED WALL THICKNESS TO INSURE DIMENSION DOES NOT EXCEED FRAME THROAT SIZE SPECIFIED. INSTALLATION NOT TO BE ATTEMPTED IN AREAS WHERE THE WALL THICKNESS EXCEEDS THE TOLERANCE OF THE SPECIFIED THROAT SIZE.

10.02 INSTALL FRAMES PLUMB AND SQUARE, SECURELY ANCHORED TO SUBSTRATES WITH FASTENERS RECOMMENDED BY FRAME MANUFACTURER.

- A. Use concealed installation clips to assure that splices and connections are tightly butted and properly aligned.
- B. Secure clips to main structural extrusion components and not to snap-in or trim members.
- C. Do not use screws or other fasteners that will be exposed to view when installation is complete.

ADJUSTING AND CLEANING

11.01 CLEAN EXPOSED FRAMES PROMPTLY AFTER INSTALLATION, USING CLEANING METHODS RECOMMENDED BY FRAME MANUFACTURER.

11.02 TOUCH UP MARRED AREAS SO THAT TOUCH-UP IS NOT VISIBLE FROM A DISTANCE OF 4 FEET. REMOVE AND REPLACE FRAMES THAT CANNOT BE SATISFACTORILY ADJUSTED.

PROTECTION

12.01 PROVIDE PROTECTION REQUIRED TO ASSURE THAT FRAMES WILL BE WITHOUT DAMAGE OR DETERIORATION UPON SUBSTANTIAL COMPLETION OF THE PROJECT. END OF SECTION

SECTION 081213 HOLLOW METAL FRAMES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Non-fire-rated hollow metal frames for non-hollow metal doors.
- B. Interior glazed borrowed lite frames.

1.02 RELATED REQUIREMENTS

- A. Section 081416 Flush Wood Doors: Non-hollow metal door for hollow metal frames.
- B. Section 087100 Door Hardware: Hardware and silencers.
- C. Section 088000 Glazing: Glazed borrowed lites.
- D. Section 099123 Interior Painting: Field painting.

1.03 REFERENCE STANDARDS

- A. AAMA/WDMA/CSA 101/I.S.2/A440 North American Fenestration Standard/Specification for Windows, Doors, and Skylights; 2017.
- B. ADA Standards 2010 ADA Standards for Accessible Design; 2010.
- C. ANSI/SDI A250.4 Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames and Frame Anchors; 2018.
- D. ANSI/SDI A250.8 Specifications for Standard Steel Doors and Frames (SDI-100); 2017.
- E. ANSI/SDI A250.10 Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames; 2020.
- F. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2022.
- G. ASTM A1008/A1008M Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Required Hardness, Solution Hardened, and Bake Hardenable; 2021a.
- H. ASTM A1011/A1011M Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength; 2018a.
- I. BHMA A156.115 Hardware Preparation in Steel Doors and Steel Frames; 2016.
- J. ICC A117.1 Accessible and Usable Buildings and Facilities; 2017.
- K. NAAMM HMMA 830 Hardware Selection for Hollow Metal Doors and Frames; 2002.
- L. NAAMM HMMA 831 Hardware Locations for Hollow Metal Doors and Frames; 2011.

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Product Data: Materials and details of design and construction, hardware locations, reinforcement type and locations, anchorage and fastening methods, and finishes.
- C. Installation Instructions: Manufacturer's published instructions, including any special installation instructions relating to this project.
- D. Manufacturer's qualification statement.
- E. Installer's qualification statement.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Protect with resilient packaging; avoid humidity build-up under coverings; prevent corrosion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Hollow Metal Frames with Integral Casings:
 - 1. Ceco Door, an Assa Abloy Group company: www.assaabloydss.com/#sle.
 - 2. Curries, an Assa Abloy Group company: www.assaabloydss.com/#sle.
 - 3. Steelcraft, an Allegion brand: www.allegion.com/#sle.

2.02 PERFORMANCE REQUIREMENTS

- A. Hollow Metal Frames: AAMA/WDMA/CSA 101/I.S.2/A440 requirements for specific frame type:
 1. Performance Class (PC): AW.
- B. Door Frame Type: Provide hollow metal door frames with integral casings.
- C. Steel Sheet: Comply with one or more of the following requirements; galvannealed steel complying with ASTM A653/A653M, cold-rolled steel complying with ASTM A1008/A1008M, or hot-rolled pickled and oiled (HRPO) steel complying with ASTM A1011/A1011M, commercial steel (CS) Type B, for each.
- D. Accessibility: Comply with ICC A117.1 and ADA Standards.
- E. Glazed Lights: Stops on non-secure side; sizes and configurations as indicated on drawings. Style: Manufacturers standard.
- F. Combined Requirements: If a particular door and frame unit is indicated to comply with more than one type of requirement, comply with the specified requirements for each type; for instance, an exterior frame that is also indicated as being sound-rated must comply with the requirements specified for exterior frames and for sound-rated frames; where two requirements conflict, comply with the most stringent.
- G. Hardware Preparations, Selections and Locations: Comply with BHMA A156.115, NAAMM HMMA 830, NAAMM HMMA 831 or ANSI/SDI A250.8 (SDI-100) in accordance with specified requirements.
- H. Frames for Interior Glazing or Borrowed Lites: Construction and face dimensions to match door frames, and as indicated on drawings.

2.03 HOLLOW METAL DOOR FRAMES WITH INTEGRAL CASINGS

- A. Interior Door Frames, Non-Fire Rated: Knock-down type.
 - 1. Based on SDI Standards: ANSI/SDI A250.8 (SDI-100).
 - a. Level 1 Standard-duty.
 - b. Physical Performance Level C, 250,000 cycles; in accordance with ANSI/SDI A250.4.
 - c. Frame Metal Thickness: 18 gauge, 0.042 inch (1.0 mm), minimum.

2.04 FINISHES

A. Primer: Rust-inhibiting, complying with ANSI/SDI A250.10, door manufacturer's standard.

2.05 ACCESSORIES

A. Silencers: Resilient rubber, fitted into drilled hole; provide three on strike side of single door, three on center mullion of pairs, and two on head of pairs without center mullions.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.
- C. Verify that finished walls are in plane to ensure proper door alignment.

3.02 INSTALLATION

- A. Install frames in accordance with manufacturer's instructions and related requirements of specified frame standards or custom guidelines indicated.
- B. Coordinate frame anchor placement with wall construction.
- C. Comply with glazing installation requirements of Section 088000.
- D. Install door hardware as specified in Section 087100.

3.03 TOLERANCES

A. Maximum Diagonal Distortion: 1/8 inch (3 mm) measured with straight edges, crossed corner to corner.

3.04 SCHEDULE - SEE DRAWINGS

A. Refer to Door and Frame Schedule on the drawings.

SECTION 081416 FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush wood doors; flush and flush glazed configuration; non-rated.

1.02 RELATED REQUIREMENTS

- A. Section 081213 Hollow Metal Frames.
- B. Section 087100 Door Hardware.
- C. Section 088000 Glazing.
- D. Section 099123 Interior Painting: Field finishing of doors.

1.03 REFERENCE STANDARDS

- A. ASTM C1048 Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2018.
- B. AWI/AWMAC/WI (AWS) Architectural Woodwork Standards, 2nd Edition; 2014, with Errata (2016).
- C. AWMAC/WI (NAAWS) North American Architectural Woodwork Standards; 2021, with Errata.

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Product Data: Indicate door core materials and construction; type and characteristics.
- C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.
- D. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Package, deliver and store doors in accordance with specified quality standard.
- B. Accept doors on site in manufacturer's packaging, and inspect for damage.
- C. Protect doors with resilient packaging sealed with heat shrunk plastic; do not store in damp or wet areas or areas where sunlight might bleach veneer; seal top and bottom edges with tinted sealer if stored more than one week, and break seal on site to permit ventilation.

1.07 WARRANTY

- A. Manufacturer Warranty: Provide manufacturer's warranty on interior doors for the life of the installation. Complete forms in Owner's name and register with manufacturer.
 - 1. Include coverage for warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Medium-Density Overlay (MDO) Faced Doors for Opaque Finish:
 - 1. Masonite Architectural; Aspiro Premium Painted Doors:
 - www.architectural.masonite.com/#sle (or approved equal).

2.02 DOORS AND PANELS

A. Doors: See drawings for locations and additional requirements.

- 1. Quality Standard: Premium Grade, Standard Duty performance, in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), unless noted otherwise.
- B. Interior Doors: 1-3/4 inches (44 mm) thick unless otherwise indicated; flush construction.
 1. Provide solid core doors at each location.

2.03 DOOR AND PANEL CORES

A. Non-Rated Solid Core and 20 Minute Rated Doors: Type particleboard core (PC), plies and faces as indicated.

2.04 DOOR FACINGS

A. Veneer Facing for Opaque Finish: Medium density overlay (MDO), in compliance with indicated quality standard.

2.05 DOOR CONSTRUCTION

- A. Fabricate doors in accordance with door quality standard specified.
- B. Glazed Openings: Non-removable stops on non-secure side; sizes and configurations as indicated on drawings.
- C. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
- D. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
 - 1. Exception: Doors to be field finished.
- E. Provide edge clearances in accordance with the quality standard specified.

2.06 FINISHES - DOORS

- A. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 -Finishing for grade specified and as follows:
 - 1. Opaque:
 - a. System 4, Latex Acrylic, Water-based.
 - b. Color: As indicated on drawings.
 - c. Sheen: Semigloss.
- B. Factory finish doors in accordance with approved sample.

2.07 ACCESSORIES

- A. Glazed Openings:
 - 1. Heat-Strengthened and Fully Tempered Glass: ASTM C1048.
 - 2. Glazing: Single vision units, 1/4 inch (6.4 mm) thick glass.
 - 3. Tint: Clear.
- B. Glazing Stops: Aluminum channel shape, mitered corners; prepared for countersink style tamper proof screws.
- C. Astragals and Edges for Double Doors: Pairs of doors astragals, and door edge sealing and protection devices.
 - 1. Provide surface mounted astragal to cover or fill space for full door height between pair of doors or door and adjacent jamb.
 - 2. Astragal Type: Split, two parts, and with cutouts for other door hardware.
 - 3. Edge Type: Beveled edge
- D. Door Hardware: See Section 087100.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

- A. Install doors in accordance with manufacturer's instructions and specified quality standard.
- B. Field-Finished Doors: Trimming to fit is acceptable.
 - 1. Adjust width of non-rated doors by cutting equally on both jamb edges.
 - 2. Trim maximum of 3/4 inch (19 mm) off bottom edges.
- C. Use machine tools to cut or drill for hardware.
- D. Coordinate installation of doors with installation of frames and hardware.
- E. Coordinate installation of glazing.

3.03 TOLERANCES

- A. Comply with specified quality standard for fit and clearance tolerances.
- B. Comply with specified quality standard for telegraphing, warp, and squareness.

3.04 ADJUSTING

- A. Adjust doors for smooth and balanced door movement.
- B. Adjust closers for full closure.

3.05 SCHEDULE - SEE DRAWINGS

SECTION 084113 ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Aluminum Storefront Framing System.
 - 2. Entry Vestibule doors and door-frame units.
- B. Related Sections:
 - 1. Sealants: Refer to Division 7 Joint Treatment Section for sealant requirements.
 - 2. Glass and Glazing: Refer to Division 8 Glass and Glazing Section for glass and glazing requirements.

1.02 SYSTEM PERFORMANCE DESCRIPTION

- A. Performance Requirements: Provide aluminum storefront systems that comply with performance requirements indicated, as demonstrated by testing manufacturer's assemblies in accordance with test method indicated.
 - 1. Air Infiltration: Completed storefront systems shall have 0.06 CFM/FT² (1.10 m³/h•m²) maximum allowable infiltration when tested in accordance with ASTM E 283 at differential static pressure of 6.24 PSF (299Pa).
 - 2. Water Infiltration: No uncontrolled water when tested in accordance with ASTM E 331 at test pressure differential of: 12 PSF (575 Pa) (or when required, field tested in accordance with AAMA 503). Fastener Heads must be seated and sealed against Sill Flashing on any fasteners that penetrate through the Sill Flashing
 - 3. Wind Loads: Completed storefront system shall withstand wind pressure loads normal to wall plane.
 - 4. Deflection: Maximum allowable deflection in any member when tested in accordance with ASTM E 330 with allowable stress in accordance with AA Specifications for Aluminum Structures.
 - a. Without Horizontals: L/175 or 3/4" (19.1mm) maximum.
 - b. With Horizontals: L/175 or L/240 + 1/4" (6.4mm) for spans greater than 13'-6" (4.1m) but less than 40'-0" (12.2m).
 - 5. Thermal Movement: Provide for thermal movement caused by 180 degrees F. (82.2 degrees C.) surface temperature, without causing buckling stresses on glass, joint seal failure, undue stress on structural elements, damaging loads on fasteners, reduction of performance, or detrimental effects.
 - 6. Thermal Performance: When tested in accordance with AAMA 507, AAMA 1503 and NFRC 100:
 - a. Condensation Resistance Factor (CRFf): A minimum of 68.
 - b. Thermal Transmittance U Value: 0.40 BTU/HR/FT²/°F or less.
 - 7. Acoustical Performance: When tested in accordance with ASTM E 90, AAMA 1801:
 - a. Sound Transmission Class (STC) shall not be less than: 32 Annealed, 36 laminated.
 - b. Outdoor–Indoor Transmission Class (OITC) shall not be less than: 1" IGU; 27, 1" laminated; 30.

1.03 SUBMITTALS

- A. General: Prepare, review, approve, and submit specified submittals in accordance with "Conditions of the Contract" and Division 1 Submittals Sections. Product data, shop drawings, samples, and similar submittals are defined in "Conditions of the Contract."
- B. Product Data: Submit product data for each type storefront series specified.
- C. Substitutions: Whenever substitute products are to be considered, supporting technical data, samples, and test reports must be submitted ten (10) working days prior to bid date in order to make a valid compasison.
- D. Shop Drawings: Submit shop drawings showing layout, profiles, and product components, including anchorage, accessories, finish colors and textures. Door Hardware, submit hardware

schedule and cut sheets for hardware required for entrances.

- E. Samples: Submit verification samples for colors on actual aluminum substrates indicating full color range of manufacturer's standard anodized finishes.
- F. Quality Assurance / Control Submittals:
 - 1. Test Reports: Submit certified test reports showing compliance with specified performance characteristics and physical properties.
 - 2. Installer Qualification Data: Submit installer qualification data.
- G. Closeout Submittals:
 - 1. Warranty: Submit warranty documents specified herein.
- H. Project Record Documents: Submit project record documents for installed materials in accordance with Division 1 Project Closeout (Project Record Documents) Section.

1.04 QUALITY ASSURANCE

1.05 QUALIFICATIONS:

- 1. Installer Qualifications: Installer experienced (as determined by contractor) to perform work of this section who has specialized in the installation of work similar to that required for this project. If requested by Owner, submit reference list of completed projects.
- 2. Manufacturer Qualifications: Manufacturer capable of providing field service representation during construction process.
- B. Pre-Installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.

1.06 PROJECT CONDITIONS / SITE CONDITIONS

A. Field Measurements: Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements, fabrication schedule with construction progress to avoid construction delays.

1.07 WARRANTY

- A. Project Warranty: Refer to "Conditions of the Contract" for project warranty provisions.
- B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document executed by an authorized company official.
 - 1. Warranty Period: Manufacturer's one (1) year standard warranty commencing on the substantial date of completion for the project.

PART 2 PRODUCTS

2.01 MANUFACTURERS (ACCEPTABLE MANUFACTURERS/PRODUCTS)

- A. Acceptable Manufacturers: OR APPROVED EQUAL.
 - 1. YKK AP America Inc.
 - 2. Trulite
 - 3. Oldcastle
- B. Storefront System Basis of Design: YKK AP YES 45 TU Front Set Storefront System.
- C. Storefront Framing System Criteria:
 - 1. Description: Front set, exterior flush glazed; jambs and vertical mullions continuous; head, sill, intermediate horizontal attached by screw spline joinery or shear block attachment.
 - 2. Components: Manufacturer's standard extruded aluminum mullions, 90 degree corner posts, entrance door framing, and indicated shapes.
 - 3. Thermal Barrier: Provide continuous thermal barrier by means of a poured and debridged pocket consisting of a two-part, chemically curing high density polyurethane which is bonded to the aluminum. Systems employing non-structural thermal barriers are not acceptable. (Interior vestibule need not be thermally broken).

2.02 MATERIALS

A. Extrusions: ASTM B 221 (ASTM B 221M), 6063-T5 Aluminum Alloy.

- B. Aluminum Sheet:
 - 1. Anodized Finish: ASTM B 209 (ASTM B 209M), 5005-H14 Aluminum Alloy, 0.050" (1.27 mm) minimum thickness.
- C. Painted Finish: ASTM B 209 (ASTM B 209M), 3003-H14 Aluminum Alloy, 0.080" (1.95 mm) minimum thickness.

2.03 ACCESSORIES

- A. Manufacturer's Standard Accessories:
 - 1. Fasteners: Zinc plated steel concealed fasteners; Hardened aluminum alloys or AISI 300 series stainless steel exposed fasteners. corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration. Reinforce members as required to receive fastener threads.
 - 2. Glazing: Setting blocks, edge blocks, and spacers in accordance with ASTM C 864, shore durometer hardness as recommended by manufacturer; Glazing gaskets in accordance with ASTM C 864.
 - 3. 0.050 Aluminum Sill Flashing End Dams must have 3 point attachment.
 - 4. Entrance Door Sub-Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
 - a. Subframes shall be thermally improved.
 - b. Provide compression weather stripping at fixed stops.
 - 5. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
 - a. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
 - b. At exterior doors, provide weather sweeps applied to door bottoms.
 - 6. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.

2.04 FABRICATION

- A. Shop Assembly: Fabricate and assemble units with joints only at intersection of aluminum members with uniform hairline joints; rigidly secure, and sealed in accordance with manufacturer's recommendations.
 - 1. Hardware: Drill and cut to template for hardware. Reinforce frames and door stiles to receive hardware in accordance with manufacturer's recommendations.
- B. Welding: Conceal welds on aluminum members in accordance with AWS recommendations or methods recommended by manufacturer. Members showing welding bloom or discoloration on finish or material distortion will be rejected.

2.05 FINISHES AND COLORS

- A. Anodized Aluminum Finish to be selected from manufacturer's standard finish options.
- B. Anodized Finishing: Prepare aluminum surfaces for specified finish; apply shop finish in accordance with the following:
 - 1. Anodic Coating: Electrolytic color coating followed by an organic seal applied in accordance with the requirements of AAMA 612. Aluminum extrusions shall be produced from quality controlled billets meeting AA-6063-T5.
 - a. Exposed Surfaces shall be free of scratches and other serious blemishes.
 - b. Extrusions shall be given a caustic etch followed by an anodic oxide treatment and then sealed with an organic coating applied with an electrodeposition process.
 - c. The anodized coating shall comply with all of the requirements of AAMA 612: Voluntary Specifications, Performance Requirements and Test Procedures for Combined Coatings of Anodic Oxide and Transparent Organic Coatings on Architectural Aluminum. Testing shall demonstrate the ability of the finish to resist damage from mortar, salt spray, and chemicals commonly found on construction

sites, and to resist the loss of color and gloss.

- d. Overall coating thickness for finishes shall be a minimum of 0.7 mils.
 - 1) CASS Corrosion Resistance Test, CASS 240/ASTM B368 Test Method.
 - 2) Other AAMA 2605 Performance Tests specified in these specifications, such as: 7.3 Dry Film Hardness; 7.8.2 Salt Spray Resistance; 7.9.1.2 Color Retention, South Florida; 7.9.1.4 Gloss Retention, South Florida.
- C. High Performance Organic Coating Finish:
 - 1. Type Factory applied two-coat 70% Kynar resin by Arkema or 70% Hylar resin by Solvay Solexis, fluoropolymer based coating system, Polyvinylidene Fluoride (PVF-2), applied in accordance with YKK AP procedures and meeting AAMA 2605 specifications.
 - 2. Colors: Selected by Architect from the following:
 - a. Standard coating color charts.
 - b. Custom coating color charts.
 - c. Color Name and Number:
- D. Finishes Testing:
 - 1. Apply 0.5% solution NaOh, sodium hydroxide, to small area of finished sample area; leave in place for sixty minutes; lightly wipe off NaOh; Do not clean area further.
 - 2. Submit samples with test area noted on each sample.

PART 3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS / RECOMMENDATIONS

A. Compliance: Comply with manufacturer's product data, including product technical bulletins, installation instructions, and product carton instructions.

3.02 EXAMINATION

A. Site Verification of Conditions: Verify conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer's instructions.

3.03 PREPARATION

- A. Adjacent Surfaces Protection: Protect adjacent work areas and finish surfaces from damage during product installation.
 - 1. Aluminum Surface Protection: Protect aluminum surfaces from contact with lime, mortar, cement, acids, and other harmful contaminants.

3.04 INSTALLATION

- A. General: Install manufacturer's system in accordance with shop drawings, and within specified tolerances.
- B. Protect aluminum members in contact with masonry, steel, concrete, or dissimilar materials using nylon pads or bituminous coating.
- C. Shim and brace aluminum system before anchoring to structure.
- D. Provide sill flashing at exterior storefront systems. Extend extruded flashing continuous with splice joints; set in continuous beads of sealant.
- E. Verify storefront system allows water entering system to be collected in gutters and wept to exterior. Verify metal joints are sealed in accordance with manufacturers installation instructions.
- F. Locate expansion mullions where indicated on reviewed shop drawings.
- G. Seal metal to metal storefront system joints using sealant recommended by system manufacturer.

3.05 FIELD QUALITY CONTROL

A. Manufacturer's Field Services: Upon request, provide manufacturer's field service consisting of site visit for inspection of product installation in accordance with manufacturer's instructions.

B. Field Test: Conduct field test to determine watertightness of storefront system. Conduct test in accordance with AAMA 501.2.

3.06 ADJUSTING AND CLEANING

- A. Adjusting: Adjust swing doors for operation in accordance with manufacturer's recommendations.
- B. Cleaning: The General Contractor shall clean installed products in accordance with manufacturer's instructions prior to owner's acceptance, and remove construction debris from project site. Legally dispose of debris.
- C. Protection: The General Contractor shall protect the installed product's finish surfaces from damage during construction.

SECTION 087100 DOOR HARDWARE

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Hardware for wood and aluminum doors.
- B. Thresholds.

1.02 RELATED REQUIREMENTS

- A. Section 081116 Aluminum Doors and Frames.
- B. Section 081213 Hollow Metal Frames.
- C. Section 081416 Flush Wood Doors.

1.03 REFERENCE STANDARDS

- A. ADA Standards 2010 ADA Standards for Accessible Design; 2010.
- B. BHMA A156.1 Standard for Butts and Hinges; 2021.
- C. BHMA A156.2 Bored and Preassembled Locks and Latches; 2017.
- D. BHMA A156.3 Exit Devices; 2020.
- E. BHMA A156.4 Door Controls Closers; 2019.
- F. BHMA A156.6 Standard for Architectural Door Trim; 2021.
- G. BHMA A156.7 Template Hinge Dimensions; 2016.
- H. BHMA A156.16 Auxiliary Hardware; 2018.
- I. BHMA A156.18 Materials and Finishes; 2020.
- J. BHMA A156.21 Thresholds; 2019.
- K. BHMA A156.22 Standard for Gasketing; 2021.
- L. BHMA A156.23 Electromagnetic Locks; 2017.
- M. BHMA A156.36 Auxiliary Locks; 2020.
- N. BHMA A156.115W Hardware Preparation in Wood Doors with Wood or Steel Frames; 2006.
- O. DHI (H&S) Sequence and Format for the Hardware Schedule; 2019.
- P. DHI WDHS.3 Recommended Locations for Architectural Hardware for Flush Wood Doors; 1993; also in WDHS-1/WDHS-5 Series, 1996.
- Q. ICC A117.1 Accessible and Usable Buildings and Facilities; 2017.
- R. NFPA 101 Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- S. UL (DIR) Online Certifications Directory; Current Edition.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate the manufacture, fabrication, and installation of products that door hardware is installed on.
- B. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.
- C. Preinstallation Meeting: Convene a preinstallation meeting one week prior to commencing work of this section; attendance is required by affected installers and the following:
 - 1. Contractor.
 - 2. Installer's Architectural Hardware Consultant (AHC).
 - 3. Hardware Installer.
 - 4. Owner's Security Consultant.
- D. Furnish templates for door and frame preparation to manufacturers and fabricators of products requiring internal reinforcement for door hardware.
- E. Keying Requirements Meeting:
 - 1. Attendance Required:
 - a. Contractor.
 - b. Owner.
 - c. Installer's Architectural Hardware Consultant (AHC).
 - d. Owner's Security Consultant.
 - 2. Agenda:
 - a. Verify that keying and programming complies with project requirements.
 - Incorporate "Keying Requirements Meeting" decisions into keying submittal upon review of door hardware keying system including, but not limited to, the following:
 Access control requirements.
 - 4. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.
 - 5. Deliver established keying requirements to manufacturers.

1.05 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Product Data: Manufacturer's catalog literature for each type of hardware, marked to clearly show products to be furnished for this project, and includes construction details, material descriptions, finishes, and dimensions and profiles of individual components.
- C. Shop Drawings Door Hardware Schedule: Submit detailed listing that includes each item of hardware to be installed on each door. Use door numbering scheme as included in Contract Documents.
 - 1. Prepared by or under supervision of Architectural Hardware Consultant (AHC).
 - 2. Comply with DHI (H&S) using door numbers and hardware set numbers as indicated in construction documents.
 - 3. List groups and suffixes in proper sequence.
 - 4. Provide complete description for each door listed.
 - 5. Provide manufacturer name, product names, and catalog numbers; include functions, types, styles, sizes and finishes of each item.
 - 6. Include account of abbreviations and symbols used in schedule.
- D. Manufacturer's Installation Instructions: Indicate special procedures.
- E. Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
- F. Maintenance Materials and Tools: Furnish the following for Owner's use in maintenance of project.
 - 1. Tools: One set of each special wrench or tool applicable for each different or special hardware component, whether supplied by hardware component manufacturer or not.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified for commercial door hardware with at least three years of documented experience.
- C. Supplier Qualifications: Company with certified Architectural Hardware Consultant (AHC) to assist in work of this section.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Package hardware items individually; label and identify each package with door opening code to match door hardware schedule.

1.08 WARRANTY

- A. See Section 017800 Closeout Submittals for additional warranty requirements.
- B. Manufacturer's Warranty: Provide warranty against defects in material and workmanship for period indicated. Complete forms in Owner's name and register with manufacturer.
 - 1. Closers: Five years, minimum.
 - 2. Exit Devices: Three years, minimum.
 - 3. Locksets and Cylinders: Three years, minimum.
 - 4. Other Hardware: Two years, minimum.

PART 2 PRODUCTS

2.01 DESIGN AND PERFORMANCE CRITERIA

- A. Provide specified door hardware as required to make doors fully functional, compliant with applicable codes, and secure to extent indicated.
- B. Provide individual items of single type, of same model, and by same manufacturer.
- C. Provide door hardware products that comply with the following requirements:
 - 1. Applicable provisions of federal, state, and local codes.
 - 2. Accessibility: ADA Standards and ICC A117.1.
 - 3. Applicable provisions of NFPA 101.
 - 4. Hardware Preparation for Wood Doors with Wood or Steel Frames: BHMA A156.115W.
- D. Lock Function: Provide lock and latch function numbers and descriptions of manufacturer's series. See Door Hardware Schedule on drawings.
- E. Fasteners:
 - 1. Provide fasteners of proper type, size, quantity, and finish that comply with commercially recognized standards for proposed applications.
 - a. Aluminum fasteners are not permitted.
 - b. Provide phillips flat-head screws with heads finished to match door surface hardware unless otherwise indicated.
 - 2. Provide machine screws for attachment to reinforced hollow metal and aluminum frames.
 - a. Self-drilling (Tek) type screws are not permitted.

2.02 HINGES

- A. Manufacturers: OR APPROVED EQUAL
 - 1. McKinney; an Assa Abloy Group company
 - 2. Hager Companies;
 - 3. Stanley, dormakaba Group;
- B. Hinges: Comply with BHMA A156.1, Grade 1.
 - Butt Hinges: Comply with BHMA A156.1 and BHMA A156.7 for templated hinges.
 a. Provide hinge width required to clear surrounding trim.
 - 2. Provide hinges on every swinging door.
 - 3. Provide five-knuckle full mortise butt hinges unless otherwise indicated.
 - 4. Provide ball-bearing hinges at each door with closer.
 - 5. Provide non-removable pins on exterior outswinging doors.
 - 6. Provide following quantity of butt hinges for each door:
 - a. Doors From 60 inches (1.5 m) High up to 90 inches (2.3 m) High: Three hinges.
 - b. Doors 90 inches (2.3 m) High up to 120 inches (3 m) High: Four hinges.

2.03 FLUSH BOLTS

- A. Manufacturers: OR APPROVED EQUAL
 - 1. Adams Rite, an Assa Abloy Group company:
 - 2. Hager Companies:
 - 3. Ives, an Allegion brand:
- B. Flush Bolts: Comply with BHMA A156.16, Grade 1.
 - 1. Flush Bolt Throw: 3/4 inch (19 mm), minimum.

- 2. Provides extension bolts in leading edge of door, one bolt into floor, one bolt into top of frame.
 - a. Pairs of Swing Doors: At inactive leaves, provide flush bolts of type as required to comply with code.
- 3. Provide dustproof floor strike for bolt into floor, except at metal thresholds.
- 4. Automatic Flush Bolts: Automatically latch upon closing of door; automatic retraction of bolts when active leaf is opened; located on inactive leaf of pair of doors.

2.04 EXIT DEVICES

- A. Manufacturers: OR APPROVED EQUAL.
 - 1. Corbin Russwin, Sargent, or Yale; an Assa Abloy Group company;
 - 2. Hager Companies;
 - 3. Stanley, dormakaba Group
- B. Exit Devices: Comply with BHMA A156.3, Grade 1.
 - 1. Lever design to match lockset trim.
 - 2. Provide cylinder with cylinder dogging or locking trim.
 - 3. Provide exit devices properly sized for door width and height.
 - 4. Provide strike as recommended by manufacturer for application indicated.
 - 5. Provide UL (DIR) listed exit device assemblies for fire-rated doors and panic device assemblies for non-fire-rated doors.

2.05 ELECTROMAGNETIC LOCKS

- A. Manufacturers: OR APPROVED EQUAL.
 - 1. Securitron; an Assa Abloy Group company:
 - 2. Substitutions: See Section 016000 Product Requirements.
- B. Electromagnetic Locks: Comply with BHMA A156.23, Grade 1.
 - 1. Holding Force: 600 lbs (272 kgs), minimum.
 - 2. Voltage: 12 VDC, and provide power supplies by same manufacturer as locks.
 - 3. Mounting: Surface mounted to door and frame on secure side, with fasteners, brackets, and spacer bars as required for application.

2.06 CYLINDRICAL LOCKS

- A. Manufacturers: OR APPROVED EQUAL.
 - 1. Corbin Russwin. Sargent. or Yale; an Assa Abloy Group company:
 - 2. Hager Companies:
 - 3. Schlage, an Allegion brand:
- B. Cylindrical Locks (Bored): Comply with BHMA A156.2, Grade 1, 4000 Series.
 - 1. Bored Hole: 2-1/8 inch (54 mm) diameter.
 - 2. Latchbolt Throw: 1/2 inch (12.7 mm), minimum.
 - 3. Backset: 2-3/4 inch (70 mm) unless otherwise indicated.
 - Strikes: Provide manufacturer's standard strike for each latchset or lockset with strike box and curved lip extending to protect frame in compliance with indicated requirements.
 a. Finish: To match lock or latch.

2.07 AUXILIARY LOCKS (DEADLOCKS)

- A. Manufacturers: OR APPROVED EQUAL
 - 1. Yale; an Assa Abioy Group company:
 - 2. Hager Companies:
 - 3. Stanley, dormakaba Group:
- B. Auxiliary Locks (Deadlocks): Comply with BHMA A156.36, Grade 1.
 - 1. Backset: 2-3/4 inch (70 mm), unless otherwise indicated.
 - 2. Bolt Throw: 1/2 inch (12.7 mm), with latch made of hardened steel.

2.08 DOOR PULLS AND PUSH BARS

TCNJ Roscoe Hall Lower Level Renovation

- A. Manufacturers: OR APPROVED EQUAL
 - 1. Rockwood; an Assa Abloy Group company;
 - 2. Hager Companies:
 - 3. Hiawatha, Inc, division of Activar Construction Products Group, Inc:
- B. Door Pulls and Push Bars: Comply with BHMA A156.6.
 - 1. Bar Type: Push bar, unless otherwise indicated.
 - 2. Material: Aluminum, unless otherwise indicated.

2.09 CLOSERS

- A. Manufacturers; Surface Mounted: OR APPROVED EQUAL
 - 1. Corbin Russwin, Sargent, or Yale; an Assa Abloy Group company:
 - 2. Hager Companies:
 - 3. LCN, an Allegion brand:
- B. Closers: Comply with BHMA A156.4, Grade 1.
 - 1. Type: Surface mounted to door.
 - 2. At corridor entry doors, mount closer on room side of door.

2.10 KICK PLATES

- A. Manufacturers: OR APPROVED EQUAL
 - 1. Hiawatha. Inc. an Activar Construction Products Group company;
 - 2. Ives, an Allegion brand;
- B. Kick Plates: Provide along bottom edge of push side of every door with closer, except aluminum storefront and glass entry doors, unless otherwise indicated.
 - 1. Size: 8 inch (203 mm) high by 2 inch (51 mm) less door width (LDW) on push side of door.

2.11 FLOOR STOPS

- A. Manufacturers: OR APPROVED EQUAL
 - 1. Rockwood; an Assa Abloy Group company:
 - 2. Hager Companies:
 - 3. Hiawatha, Inc, division of Activar Construction Products Group, Inc:
- B. Floor Stops: Comply with BHMA A156.16, Grade 1 and Resilient Material Retention Test as described in this standard.
 - 1. Type: Manual hold-open, with pencil floor stop.
 - 2. Material: Aluminum housing with rubber insert.

2.12 ASTRAGALS

- A. Manufacturers: OR APPROVED EQUAL
 - 1. Pemko; an Assa Abloy Group company:
 - 2. Hager Companies:
 - 3. Zero International, Inc:
- B. Astragals: Comply with BHMA A156.22.
 - 1. Type: Split, two parts, and with manual locking.
 - 2. Material: Aluminum.
 - 3. Provide non-corroding fasteners at exterior locations.

2.13 THRESHOLDS

- A. Manufacturers: OR APPROVED EQUAL
 - 1. Pemko; an Assa Abloy Group company;
 - 2. Hager Companies;
 - 3. Zero International, Inc

- B. Thresholds: Comply with BHMA A156.21.
 - 1. Provide threshold where indicated.
 - 2. Type: Flat surface.
 - 3. Material: Aluminum.
 - 4. Threshold Surface: Fluted horizontal grooves across full width.
 - 5. Field cut threshold to profile of frame and width of door sill for tight fit.
 - 6. Provide non-corroding fasteners at exterior locations.

2.14 SILENCERS

- A. Manufacturers: OR APPROVED EQUAL
 - 1. Ives, an Allegion brand:
- B. Silencers: Provide at equal locations on door frame to mute sound of door's impact upon closing.
 - 1. Single Door: Provide three on strike jamb of frame.
 - 2. Pair of Doors: Provide two on head of frame, one for each door at latch side.
 - 3. Material: Rubber, gray color.

2.15 FINISHES

- A. Finishes: Provide door hardware of same finish, unless otherwise indicated.
 - 1. Primary Finish: 625; bright chromium plated over nickel, with brass or bronze base material (former US equivalent US26); BHMA A156.18.
 - 2. Secondary Finish: 626; satin chromium plated over nickel, with brass or bronze base material (former US equivalent US26D); BHMA A156.18.
 - a. Use secondary finish in kitchens, bathrooms, and other spaces containing chrome or stainless steel finished appliances, fittings, and equipment; provide primary finish on one side of door and secondary finish on other side if necessary.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that doors and frames are ready to receive this work; labeled, fire-rated doors and frames are properly installed, and dimensions are as indicated on shop drawings.

3.02 INSTALLATION

- A. Install hardware in accordance with manufacturer's instructions and applicable codes.
- B. Use templates provided by hardware item manufacturer.
- C. Do not install surface mounted items until application of finishes to substrate are fully completed.
- D. Door Hardware Mounting Heights: Distance from finished floor to center line of hardware item. As indicated in following list; unless noted otherwise in Door Hardware Schedule or on drawings.
 - 1. For Wood Doors: Install in compliance with DHI WDHS.3 recommendations.
 - 2. Mounting heights in compliance with ADA Standards:
 - a. Locksets: 40-5/16 inch (1024 mm).
 - b. Push Plates/Pull Bars: 42 inch (1067 mm).
 - c. Deadlocks (Deadbolts): 48 inch (1219 mm).
 - d. Exit Devices: 40-5/16 inch (1024 mm).

3.03 ADJUSTING

- A. Adjust work under provisions of Section 017000 Execution and Closeout Requirements.
- B. Adjust hardware for smooth operation.

3.04 CLEANING

- A. Clean finished hardware in accordance with manufacturer's written instructions after final adjustments have been made.
- B. Clean adjacent surfaces soiled by hardware installation.

C. Replace items that cannot be cleaned to manufacturer's level of finish quality at no additional cost.

3.05 PROTECTION

- A. Protect finished Work under provisions of Section 017000 Execution and Closeout Requirements.
- B. Do not permit adjacent work to damage hardware or finish.

END OF SECTION

SECTION 087113 POWER DOOR OPERATORS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Operators for swinging doors.
- B. Maintenance.

1.02 RELATED REQUIREMENTS

A. Section 087100 - Door Hardware: Balance of door hardware.

1.03 DEFINITIONS

- A. Activation Device: Device that sends an electrical signal to door operator to open door when actuated.
- B. Knowing Act: Consciously initiating the opening of a power-operated door using acceptable methods, including wall-mounted switches such as push plates and controlled access devices such as keypads, card readers, and key switches.

1.04 REFERENCE STANDARDS

- A. ADA Standards 2010 ADA Standards for Accessible Design; 2010.
- B. BHMA A156.10 Power Operated Pedestrian Doors; 2017.
- C. ITS (DIR) Directory of Listed Products; Current Edition.
- D. NFPA 70 National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. NFPA 101 Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL (DIR) Online Certifications Directory; Current Edition.
- G. UL 325 Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems; Current Edition, Including All Revisions.

1.05 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Shop Drawings:
- C. Product Data: Provide data on system components, sizes, features, and finishes.
- D. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and manufacturer's hardware and component templates.
- E. Maintenance Data: Include manufacturer's parts list and maintenance instructions for each type of hardware and operating component.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience, and a member of AAADM.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience and approved by manufacturer.

1.07 WARRANTY

- A. See Section 017800 Closeout Submittals for additional warranty requirements.
- B. Manufacturer Warranty: Provide 2-year manufacturer warranty for components of power door operators. Complete forms in Owner's name and register with manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Operators for Swinging Doors: OR APPROVED EQUAL

- 1. ASSA ABLOY Entrance Solutions; Besam SW200i:
- 2. Detex Corporation; AO19 Series
- 3. DORMA USA, Inc; ED100:

2.02 POWER DOOR OPERATORS - GENERAL

- A. Electrically Operated or Controlled Hardware: Provide necessary power supplies, relays, and interfaces as required for proper operation; provide wiring between control components and to building power connection in compliance with NFPA 70.
- B. Comply with ADA Standards for egress requirements.
- C. Comply with NFPA 101 and requirements of authorities having jurisdiction; provide units selected for actual door weight and for light pedestrian traffic unless otherwise indicated.
- D. Exterior and Vestibule Doors: Provide equipment suitable for ambient operating temperature range of minus 20 to plus 140 degrees F (minus 29 to plus 60 degrees C).
- E. Exterior Doors: Provide units capable of operating, closing, and holding doors closed under positive and negative differential pressure; if necessary, provide power closing.

2.03 OPERATORS FOR SWINGING DOORS

A. Door Operator: Hydraulic.

a.

- 1. Applications: Include operators for double doors.
- 2. Hydraulic Operators: Self-contained, electrically driven.
- 3. Speed Control: Variable, field-adjustable opening and closing cycles.
- 4. Functionality: Full-power open, spring close operation.
 - Full-Power Operators: Comply with BHMA A156.10; safeties required.
 - Comply with UL 325; acceptable evidence of compliance includes UL (DIR) or ITS (DIR) listing or test report by testing agency acceptable to authorities having jurisdiction.
 - 2) Signage: Provide signage in accordance with BHMA A156.10.
- 5. Mounting: Surface mounted overhead.
- 6. Power Supply Units: Self-contained, electrically operated, and independent of door operator.
- 7. Actuators: Manufacturer's standard.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify installation conditions including, but not limited to the following: opening sizes, floor conditions, plumb and level mounting surfaces.
- B. Verify that surfaces are ready to receive work and dimensions are as indicated on shop drawings.
- C. Verify that electric power is available, in the correct location, and of the correct characteristics.

3.02 INSTALLATION

A. Install equipment in accordance with manufacturer's instructions.

3.03 ADJUSTING

A. Adjust door equipment for correct function and smooth operation.

3.04 CLEANING

A. Remove temporary protection, clean exposed surfaces.

3.05 CLOSEOUT ACTIVITIES

A. Demonstrate to Owner's representative equipment operation, operating components, adjustment features, and lubrication requirements.

3.06 MAINTENANCE

A. Provide service and maintenance of operating equipment for one year from Date of Substantial Completion, at no extra charge to Owner.

END OF SECTION

SECTION 088000 GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Glazing units.
- B. Glazing compounds.

1.02 RELATED REQUIREMENTS

- A. Section 081213 Hollow Metal Frames: Glazed borrowed lites.
- B. Section 081416 Flush Wood Doors: Glazed lites in doors.
- C. Section 084313 Aluminum-Framed Storefronts: Glazing provided as part of storefront assembly.

1.03 REFERENCE STANDARDS

- A. 16 CFR 1201 Safety Standard for Architectural Glazing Materials; Current Edition.
- B. ANSI Z97.1 American National Standard for Safety Glazing Materials Used in Buildings -Safety Performance Specifications and Methods of Test; 2015 (Reaffirmed 2020).
- C. ASTM C864 Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2019).
- D. ASTM C1036 Standard Specification for Flat Glass; 2021.
- E. ASTM C1193 Standard Guide for Use of Joint Sealants; 2016.
- F. GANA (SM) GANA Sealant Manual; 2008.

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Product Data on Glazing Unit Glazing Types: Provide structural, physical and environmental characteristics, size limitations, special handling and installation requirements.
- C. Product Data on Glazing Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements, and identify available colors.
- D. Manufacturer's qualification statement.
- E. Installer's qualification statement.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years documented experience.

1.06 WARRANTY

- A. See Section 017800 Closeout Submittals for additional warranty requirements.
- B. Heat Soaked Tempered Glass: Provide a five (5) year manufacturer warranty to include coverage for spontaneous breakage of fully tempered glass caused by nickel sulfide (NiS) inclusions.

PART 2 PRODUCTS

2.01 MANUFACTURERS

2.02 GLASS MATERIALS

- A. Float Glass: Provide float glass based glazing unless otherwise indicated.
 - 1. Annealed Type: ASTM C1036, Type I Transparent Flat, Class 1 Clear, Quality Q3.

- 2. Impact Resistant Safety Glass: Complies with ANSI Z97.1 Class B, or 16 CFR 1201 Category I criteria.
- 3. Thicknesses: As indicated.

2.03 ACCESSORIES

- A. Setting Blocks: Silicone, with 80 to 90 Shore A durometer hardness; ASTM C864 Option II. Length of 0.1 inch for each square foot (25 mm for each square meter) of glazing or minimum 4 inch (100 mm) by width of glazing rabbet space minus 1/16 inch (1.5 mm) by height to suit glazing method and pane weight and area.
- B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option II. Minimum 3 inch (75 mm) long by one half the height of the glazing stop by thickness to suit application, self adhesive on one face.
- C. Glazing Splines: Resilient silicone extruded shape to suit glazing channel retaining slot; ASTM C864 Option II; color black.
- D. Glazing Clips: Manufacturer's standard type.

PART 3 EXECUTION

3.01 VERIFICATION OF CONDITIONS

- A. Verify that openings for glazing are correctly sized and within tolerances, including those for size, squareness, and offsets at corners.
- B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and support framing is ready to receive glazing system.
- C. Verify that sealing between joints of glass framing members has been completed effectively.

3.02 INSTALLATION, GENERAL

- A. Install glazing in compliance with written instructions of glass, gaskets, and other glazing material manufacturers, unless more stringent requirements are indicated, including those in glazing referenced standards.
- B. Install glazing sealants in accordance with ASTM C1193, GANA (SM), and manufacturer's instructions.

3.03 INSTALLATION - DRY GLAZING METHOD (GASKET GLAZING)

- A. Application Exterior and/or Interior Glazed: Set glazing infills from either the exterior or the interior of the building.
- B. Place setting blocks at 1/4 points with edge block no more than 6 inch (152 mm) from corners.
- C. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.
- D. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.04 CLEANING

- A. Remove excess glazing materials from finish surfaces immediately after application using solvents or cleaners recommended by manufacturers.
- B. Remove nonpermanent labels immediately after glazing installation is complete.
- C. Clean glass and adjacent surfaces after sealants are fully cured.
- D. Clean glass on both exposed surfaces not more than 4 days prior to Date of Substantial Completion in accordance with glass manufacturer's written recommendations.

3.05 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

B. Remove and replace glass that is damaged during construction period prior to Date of Substantial Completion.

END OF SECTION

SECTION 088010 – EXTERIOR GLAZING

SUMMARY

1.01 SECTION INCLUDES:

- A. Exterior glass for window wall, aluminum entrances, exterior doors, and glass for vestibules and inner vestibule doors.
- B. Glazing sealants and accessories.

1.02 RELATED REQUIREMENTS:

A. Section 08 42 13 "Aluminum Framed Entrances"

DEFINITIONS

- 2.01 GLASS MANUFACTURERS: FIRMS THAT PRODUCE PRIMARY GLASS, FABRICATED GLASS, OR BOTH, AS DEFINED IN REFERENCED GLAZING PUBLICATIONS.
- 2.02 GLASS THICKNESSES: INDICATED BY THICKNESS DESIGNATIONS IN MILLIMETERS ACCORDING TO ASTM C 1036.
- 2.03 GLAZED ASSEMBLY: THE GLASS AND GLAZING MATERIALS SPECIFIED HEREIN AND THE FRAMING SYSTEM SPECIFIED ELSEWHERE, COMPLETE AND COMPLIANT WITH REQUIREMENTS OF BOTH SECTIONS.
- 2.04 INTERSPACE: SPACE BETWEEN LITES OF AN INSULATING-GLASS UNIT.
- 2.05 DEFECTIVE GLASS: DEFECTS THAT ARE ATTRIBUTED TO MANUFACTURING PROCESS, FABRICATION OR INSTALLATION METHODS. DEFECTS INCLUDE (NON-INCLUSIVE) FLATNESS AND OTHER DIMENSIONAL TOLERANCES, DISTORTION, TONG MARKS, ROLLER WAVE, BULLS EYES, EDGE CHIPS, CRACKS, INCOMPLETE EDGE DELETION AND OTHER VISIBLE DEFECTS BEYOND THOSE ALLOWED BY REQUIREMENTS INCLUDED HEREIN OR BY REFERENCE STANDARD, WHICHEVER IS MORE STRINGENT. DEFECTS INCLUDE DETERIORATION DESCRIBED UNDER WARRANTY REQUIREMENTS.
- 2.06 FAILED IGU: FROM SIGMA TB-1205-89 "FAILED IG UNITS: AN INSTALLED UNIT FAILURE EXHIBITS PERMANENT MATERIAL OBSTRUCTION OF VISION THROUGH THE UNIT DUE TO ACCUMULATION OF DUST, MOISTURE OR FILM ON THE INTERNAL SURFACE OF THE GLASS. SURFACE NUMBERS 2 OR 3 IN DUAL-PANE; SURFACE 2, 3, 4 OR 5 ON TRIPLE-PANES." IN ADDITION TO THE ABOVE DEFINITION, THE FOLLOWING CONSTITUTES FAILURE:
 - A. Fogging or condensation on interior surfaces of IGU at any time.
 - B. Visual distortion beyond specified tolerances.
 - C. Change of appearance of the IGU spacer bond line.

ADMINISTRATIVE REQUIREMENTS

- 3.01 COORDINATION: COORDINATE WORK OF THIS SECTION WITH ADJACENT COMPONENTS OF THE EXTERIOR ENCLOSURE. PARTICIPATE IN COORDINATION REQUIRED IN DIVISION 01 SECTION "EXTERIOR ENCLOSURE GENERAL REQUIREMENTS".
 - A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.
- 3.02 SEQUENCING / SCHEDULING: COMPLY WITH REQUIREMENTS SPECIFIED IN DIVISION 1 SECTION "EXTERIOR ENCLOSURE PERFORMANCE REQUIREMENTS".

ACTION SUBMITTALS

- 4.01 PRODUCT DATA: FOR EACH TYPE OF PRODUCT.
- 4.02 GLASS SAMPLES: FOR EACH TYPE OF GLASS PRODUCT OTHER THAN CLEAR MONOLITHIC VISION GLASS; 12 INCHES SQUARE. SUBMIT SAMPLES DEMONSTRATING THE FULL RANGE OF VARIATION OF ANY ITEM OF GLASS, GLAZING ACCESSORY, SEALANT OR GASKET WHICH MAY DEMONSTRATE VARIATION IN COLOR, TEXTURE, AND

FINISH (INCLUDING VARIATIONS IN COLOR OF IGU EDGE SPACERS) WHETHER LISTED HEREIN OR NOT. SUBMISSION OF SINGLE SAMPLES INDICATES THAT MANUFACTURER REPRESENTS NO VARIATION IN COLOR, TEXTURE AND FINISH

4.03 IGU CONTROL SAMPLE: FOR EACH TYPE OF IGU SUBMIT THREE CONTROL SAMPLES REPRESENTING THE FULL RANGE OF VARIATION IN COLOR, TOLERANCES, GLASS DEFECTS, EDGE DELETION, SPACER LOCATION, AND ALL OTHER INDICATED CRITERIA.

- A. Samples shall include certification that sample includes full range of variation in color, fabrication tolerances, and other characteristics.
- B. Sample shall be heat strengthened or fully tempered as indicated for the glass type.
- C. Ship control samples to project site.
- D. Control samples shall match most typical size required for project.
- E. After review and approval, return one control sample to IGU fabricator for use in their quality program and one control sample to curtain wall fabricator for use in their quality program and retain one sample on site.
- F. IGU Control samples may be incorporated into the final work if their location is recorded and the control samples are clearly identified for the duration of the project until Substantial Completion.
- G. Any IGU Control samples not incorporated into the final work will be turned over to Owner as part of indicated attic stock.

4.04 ASSEMBLY SAMPLES: PROVIDE GLAZING FOR ASSEMBLY SAMPLES INDICATED FOR CURTAIN WALL, WINDOW WALL AND OTHER FRAMING ASSEMBLIES.

- 4.05 GLAZING ACCESSORY SAMPLES: FOR SEALANTS AND COLORED SPACERS, IN 12-INCH LENGTHS.
- 4.06 GLAZING SCHEDULE: LIST GLASS TYPES AND THICKNESSES FOR EACH SIZE OPENING AND LOCATION. USE SAME DESIGNATIONS INDICATED ON DRAWINGS.

INFORMATIONAL SUBMITTALS

- 5.01 QUALIFICATION DATA: FOR INSTALLER, MANUFACTURERS OF INSULATING-GLASS UNITS, GLASS TESTING AGENCY AND SEALANT TESTING AGENCY.
 - A. Certification Letter: Submit letter on primary glass manufacturer's letterhead indicating IGU fabricator complies with manufacturer's quality program.

5.02 PRODUCT CERTIFICATES: FOR GLASS.

A. Certify that IGU spacer, sealants and desiccants have been proven through past use to not emit volatile organic compounds (VOC's) or other chemicals that result in a film on glass or any other degradation.

5.03 PRODUCT TEST REPORTS: FOR TINTED GLASS, COATED GLASS, INSULATING GLASS AND GLAZING SEALANTS, FOR TESTS PERFORMED BY A QUALIFIED TESTING AGENCY.

- A. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.
- 5.04 PRECONSTRUCTION ADHESION AND COMPATIBILITY TEST REPORT.

5.05 SAMPLE WARRANTIES: FOR SPECIAL WARRANTIES.

QUALITY ASSURANCE

- 6.01 MANUFACTURER QUALIFICATIONS FOR INSULATING-GLASS UNITS: A QUALIFIED INSULATING-GLASS MANUFACTURER WHO IS APPROVED AND CERTIFIED BY PRIMARY MANUFACTURER.
 - A. Manufacturer shall have produced glass within tolerances indicated for this project on three previous projects of similar scope and complexity.
- 6.02 FABRICATOR QUALIFICATIONS: COMPANY WHO IS TRAINED AND APPROVED FOR FABRICATION OF LAMINATED, COATED, INSULATED OR OTHER GLASS REQUIRED FOR THIS PROJECT.

- A. Experience: Minimum five (5) years fabricating glazing similar to that required for this Project.
- B. Completed three (3) projects of scope, schedule and complexity similar to this Project using systems similar to those required for this Project within last two (2) years as acceptable to Architect.
- C. Adequately trained by primary glass manufacturers for type of fabrication required for this Project.
- D. Glass with Sputter-Coated Low-E Coating: qualified by coated-glass manufacturer
- E. Certify compliance. Include project descriptions with Owner and Design Professional contacts for previous experience and letters from manufacturers certifying approval for fabrication of their products.

6.03 INSTALLER QUALIFICATIONS: COMPANY WHO IS TRAINED AND EXPERIENCED TO INSTALL GLASS REQUIRED FOR THIS PROJECT.

- A. Experience: Minimum five (5) years installing glazing similar to that required for this Project.
- B. Completed three (3) projects of scope, schedule and complexity similar to this Project using systems similar to those required for this Project within last two (2) years as acceptable to Architect.
- C. Adequately trained by primary glass manufacturers for type of installation required for this Project.
- D. Installer shall also be installer of the work of section 084413.
- E. Certify compliance. Include project descriptions with Owner and Design Professional contacts for previous experience.
- 6.04 GLAZING SEALANT MANUFACTURER'S TECHNICAL REPRESENTATIVE SERVICES: AN AUTHORIZED AND APPROVED TECHNICAL REPRESENTATIVE OF THE JOINT SEALANT MANUFACTURER SHALL VISIT THE PROJECT SITE, EVALUATE THE EXISTING SUBSTRATES AND SEALANTS AND MAKE RECOMMENDATIONS FOR THE BEST SEALANT WITHIN THEIR PRODUCT LINE FOR THE CONDITIONS PRESENT.
 - A. Include recommendations for sealant Class.
 - B. Include recommendations for backing and accessories.
 - C. Include recommendation for primer or if no primer is required.
- 6.05 GLASS TESTING AGENCY QUALIFICATIONS: A QUALIFIED INDEPENDENT TESTING AGENCY ACCREDITED ACCORDING TO THE NFRC CAP 1 CERTIFICATION AGENCY PROGRAM.
- 6.06 SEALANT TESTING AGENCY QUALIFICATIONS: AN INDEPENDENT TESTING AGENCY QUALIFIED ACCORDING TO ASTM C 1021 TO CONDUCT THE TESTING INDICATED.

PRECONSTRUCTION TESTING

- 7.01 PRECONSTRUCTION ADHESION AND COMPATIBILITY TESTING: TEST EACH GLASS PRODUCT, TAPE SEALANT, GASKET, GLAZING ACCESSORY, AND GLASS-FRAMING MEMBER FOR ADHESION TO AND COMPATIBILITY WITH ELASTOMERIC GLAZING SEALANTS.
 - A. Testing is not required if data are submitted based on previous testing of current sealant products and glazing materials matching those submitted.
 - B. Use ASTM C 1087 to determine whether priming and other specific joint-preparation techniques are required to obtain rapid, optimum adhesion of glazing sealants to glass, tape sealants, gaskets, and glazing channel substrates.
 - C. Test no fewer than eight Samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
 - D. Schedule enough time for testing and analyzing results to prevent delaying the Work.

E. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

DELIVERY, STORAGE, AND HANDLING

- 8.01 DO NOT HANDLE, SHIP OR OTHERWISE DISTURB FABRICATED GLAZING SUCH AS INSULATED GLAZING UNITS UNTIL SEALS AND SEALANTS OR SIMILAR MATERIALS HAVE ADEQUATELY CURED AS RECOMMENDED BY MANUFACTURER.
- 8.02 PROTECT GLAZING MATERIALS ACCORDING TO MANUFACTURER'S WRITTEN INSTRUCTIONS. PREVENT DAMAGE TO GLASS AND GLAZING MATERIALS FROM CONDENSATION, TEMPERATURE CHANGES, DIRECT EXPOSURE TO SUN, OR OTHER CAUSES.
- 8.03 COMPLY WITH INSULATING-GLASS MANUFACTURER'S WRITTEN INSTRUCTIONS FOR VENTING AND SEALING UNITS TO AVOID HERMETIC SEAL RUPTURES DUE TO ALTITUDE CHANGE.
- 8.04 SHIP AND STORE UNDER CONDITIONS WHICH WILL NOT HAVE A DELETERIOUS EFFECT ON THE FINISHED WORK.
- 8.05 ATTACH STICKER, TAG OR OTHER IDENTIFICATION TO EACH PANEL AS IDENTIFIED ON SHOP DRAWINGS. IDENTIFY EXTERIOR SIDE OF GLASS.

FIELD CONDITIONS

- 9.01 ENVIRONMENTAL LIMITATIONS: DO NOT PROCEED WITH GLAZING WHEN AMBIENT AND SUBSTRATE TEMPERATURE CONDITIONS ARE OUTSIDE LIMITS PERMITTED BY GLAZING MATERIAL MANUFACTURERS AND WHEN GLAZING CHANNEL SUBSTRATES ARE WET FROM RAIN, FROST, CONDENSATION, OR OTHER CAUSES.
 - A. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F.

WARRANTY

- 10.01 MANUFACTURER'S SPECIAL WARRANTY FOR COATED-GLASS PRODUCTS: MANUFACTURER AGREES TO REPLACE COATED-GLASS UNITS THAT DETERIORATE WITHIN SPECIFIED WARRANTY PERIOD. DETERIORATION OF COATED GLASS IS DEFINED AS DEFECTS DEVELOPED FROM NORMAL USE THAT ARE NOT ATTRIBUTED TO GLASS BREAKAGE OR TO MAINTAINING AND CLEANING COATED GLASS CONTRARY TO MANUFACTURER'S WRITTEN INSTRUCTIONS. DEFECTS INCLUDE PEELING, CRACKING, AND OTHER INDICATIONS OF DETERIORATION IN COATING.
 - A. Warranty Period: 10 years from date of Substantial Completion.

10.02 MANUFACTURER'S SPECIAL WARRANTY FOR LAMINATED GLASS: MANUFACTURER AGREES TO REPLACE LAMINATED-GLASS UNITS THAT DETERIORATE WITHIN SPECIFIED WARRANTY PERIOD. DETERIORATION OF LAMINATED GLASS IS DEFINED AS DEFECTS DEVELOPED FROM NORMAL USE THAT ARE NOT ATTRIBUTED TO GLASS BREAKAGE OR TO MAINTAINING AND CLEANING LAMINATED GLASS CONTRARY TO MANUFACTURER'S WRITTEN INSTRUCTIONS. DEFECTS INCLUDE EDGE SEPARATION, DELAMINATION MATERIALLY OBSTRUCTING VISION THROUGH GLASS, AND BLEMISHES EXCEEDING THOSE ALLOWED BY REFERENCED LAMINATED-GLASS STANDARD.

A. Warranty Period: 10 years from date of Substantial Completion.

10.03 MANUFACTURER'S SPECIAL WARRANTY FOR INSULATING GLASS: MANUFACTURER AGREES TO REPLACE FAILED INSULATING-GLASS UNITS AS DEFINED HEREIN THAT DETERIORATE WITHIN SPECIFIED WARRANTY PERIOD.

A. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

11.01 PERFORMANCE REQUIREMENTS

11.02 GENERAL: INSTALLED GLAZING SYSTEMS SHALL WITHSTAND NORMAL THERMAL MOVEMENT AND WIND AND IMPACT LOADS (WHERE APPLICABLE) WITHOUT FAILURE,

INCLUDING LOSS OR GLASS BREAKAGE ATTRIBUTABLE TO THE FOLLOWING: DEFECTIVE MANUFACTURE, FABRICATION, OR INSTALLATION; FAILURE OF SEALANTS OR GASKETS TO REMAIN WATERTIGHT AND AIRTIGHT; DETERIORATION OF GLAZING MATERIALS; OR OTHER DEFECTS IN CONSTRUCTION.

11.03 THERMAL PERFORMANCE: ANALYZE AND SELECT GLASS AND GLASS COATINGS IN COORDINATION WITH THE WINDOW WALL, CURTAIN WALL AND ENTRANCE FRAMING TO PROVIDE THE SYSTEM U-FACTORS AND SHGC INDICATED FOR THOSE FRAMING SYSTEMS.

11.04 STRUCTURAL PERFORMANCE: DESIGN AND SELECT GLASS, INCLUDING COMPREHENSIVE ENGINEERING ANALYSIS TO WITHSTAND THE FOLLOWING DESIGN LOADS WITHIN LIMITS AND UNDER CONDITIONS INDICATED DETERMINED ACCORDING TO THE IBC AND ASTM E 1300.

- A. Probability of Breakage for Sloped Glazing: For glass surfaces sloped more than 15 degrees from vertical, design glass for a probability of breakage not greater than 0.001.
- B. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
- C. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- D. Glass Thicknesses: In order to provide color and optical uniformity any type of glass shall have the same thickness throughout the Project, including glass used to make up insulating units.
 - 1. Base thickness on largest light, highest loading or a combination thereof to determine thickness for that particular type of glass for the entire Project.
 - 2. Thickness: Provide glass lites in thicknesses as needed to comply with requirements indicated.
 - 3. Minimum Glass Thickness: Not less than 6.0 mm.
- E. Strength:
 - 1. Where float glass is indicated, provide annealed float glass, or Kind HS heat-treated float glass as needed to comply with "Performance Requirements" Article.
 - 2. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass as needed to comply with "Performance Requirements" Article. Increase thickness if necessary to carry load. Do not change to Kind FT.
 - 3. Provide Kind FT fully-tempered heat-treated float glass only where indicated, otherwise do not use Kind FT. Kind FT glass will not be allowed in any overhead location.
- F. Probability of Breakage for Sloped Glazing: For glass surfaces sloped more than 15 degrees from vertical, design glass for a probability of breakage not greater than 0.001.
- G. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1 inch, whichever is less.
- H. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.
- I. Thermal and Structural Movements: Allow for movement of structural and for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components. Comply with requirements of Division 01 Section "Exterior Enclosure Performance Requirements" in addition to those specified herein.
- J. Structural Silicone Glazing: Comply with the following:
 - 1. IGU: Design width of spacer to accommodate thermal and mechanical movement and required loading.
 - 2. Glazing to Glazing Joints: Designed to accommodate thermal and mechanical movement, prevent glazing contact with adjacent materials or other glazing, and maintain required edge clearances.
 - 3. Isolation: Thermally and physically isolate glazing from metal framing.

- 4. Tensile and Shear Stresses in Silicone Joints: Maximum design stress of 20 psig.
- 5. Gravity Loads: Structural silicone shall not carry gravity load of glazing.
- 6. Adhesion: Sealant shall fail cohesively before failure to adhere to substrate when tested with each substrate and joint condition.
 - a. Adhesion failure occurs when sealant pulls away from substrate cleanly leaving little or no sealant material behind.
 - b. Cohesion failure occurs when sealant breaks or tears within sealant but remains bonded to substrates.

11.05 GLAZING PUBLICATIONS: COMPLY WITH PUBLISHED RECOMMENDATIONS OF GLASS PRODUCT MANUFACTURERS AND ORGANIZATIONS BELOW UNLESS MORE STRINGENT REQUIREMENTS ARE INDICATED. SEE THESE PUBLICATIONS FOR GLAZING TERMS NOT OTHERWISE DEFINED IN THIS SECTION OR IN REFERENCED STANDARDS.

- A. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
- B. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

11.06 SAFETY GLAZING: WHERE SAFETY GLAZING IS INDICATED, PROVIDE GLAZING THAT COMPLIES WITH 16 CFR 1201, CATEGORY II.

11.07 THERMAL AND OPTICAL PERFORMANCE PROPERTIES: PROVIDE GLASS WITH PERFORMANCE PROPERTIES SPECIFIED, AS INDICATED IN MANUFACTURER'S PUBLISHED TEST DATA, BASED ON PROCEDURES INDICATED BELOW:

- A. For monolithic-glass lites, properties are based on units with lites 6 mm thick.
- B. For laminated-glass lites, properties are based on products of construction indicated.
- C. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
- D. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.
- E. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
- F. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

MANUFACTURERS

12.01 BASIS-OF-DESIGN GLASS PRODUCT: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRIMARY PRODUCTS AND FABRICATORS FOR IGU INDICATED IN GLASS SCHEDULES OR COMPARABLE PRODUCT BY ONE OF THE FOLLOWING OR APPROVED EQUAL

- A. Berkowitz, JE, LP.
- B. Guardian Industries Corp.
- C. Oldcastle BuildingEnvelope.
- D. Pilkington North America Inc.
- E. PPG Industries, Inc.
- F. Saint-Gobain Corporation.
- G. Trulite Glass & Aluminum Solutions.
- H. Viracon, Inc.

12.02 SOURCE LIMITATIONS FOR GLASS:

- A. Obtain from single source from single manufacturer for each type of un-coated or coated glass required for the project.
- B. Obtain from single source from single manufacturer for each type of coating applied to glass.
- C. Obtain from single source from single manufacturer each type of laminated glass interlayer required for the project.

- D. Obtain from single source from single supplier for each type of glazing sealant, gasket and glazing accessory required for the project.
- E. Obtain from single source from single manufacturer for each type of IGU required for the project.

12.03 SOURCE LIMITATIONS FOR GLAZING ACCESSORIES: OBTAIN FROM SINGLE SOURCE FROM SINGLE MANUFACTURER FOR EACH PRODUCT AND INSTALLATION METHOD.

GLASS PRODUCTS, GENERAL

13.01 SAFETY GLAZING LABELING: WHERE SAFETY GLAZING IS INDICATED, PERMANENTLY MARK GLAZING WITH CERTIFICATION LABEL OF THE SGCC OR ANOTHER CERTIFICATION AGENCY ACCEPTABLE TO AUTHORITIES HAVING JURISDICTION. LABEL SHALL INDICATE MANUFACTURER'S NAME, TYPE OF GLASS, THICKNESS, AND SAFETY GLAZING STANDARD WITH WHICH GLASS COMPLIES.

13.02 INSULATING-GLASS CERTIFICATION PROGRAM: PERMANENTLY MARKED EITHER ON SPACERS OR ON AT LEAST ONE COMPONENT LITE OF UNITS WITH APPROPRIATE CERTIFICATION LABEL OF IGCC.

13.03 THICKNESS: WHERE GLASS THICKNESS IS INDICATED, IT IS A MINIMUM. PROVIDE GLASS THAT COMPLIES WITH PERFORMANCE REQUIREMENTS AND IS NOT LESS THAN THE THICKNESS INDICATED.

- A. Minimum Glass Thickness for Exterior Lites: 6 mm.
- B. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.
- 13.04 STRENGTH: WHERE ANNEALED FLOAT GLASS IS INDICATED, PROVIDE ANNEALED FLOAT GLASS OR HEAT- STRENGTHENED FLOAT GLASS, AS NEEDED TO COMPLY WITH "PERFORMANCE REQUIREMENTS" ARTICLE. WHERE HEAT-STRENGTHENED FLOAT GLASS IS INDICATED, PROVIDE HEAT-STRENGTHENED FLOAT GLASS AS NEEDED TO COMPLY WITH "PERFORMANCE REQUIREMENTS" ARTICLE. DO NOT USE FULLY TEMPERED FLOAT GLASS EXCEPT WHERE INDICATED.

GLASS PRODUCTS

14.01 CLEAR ANNEALED FLOAT GLASS: ASTM C 1036, TYPE I, CLASS 1 (CLEAR), QUALITY-Q3.

14.02 HEAT-STRENGTHENED FLOAT GLASS: ASTM C 1048, KIND HS (HEAT STRENGTHENED), TYPE I, CONDITION A (UNCOATED) UNLESS OTHERWISE INDICATED, TYPE I, CLASS 1 (CLEAR) OR CLASS 2 (TINTED) AS INDICATED, QUALITY-Q3.

A. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

LAMINATED GLASS

15.01 LAMINATED GLASS: ASTM C 1172. USE MATERIALS THAT HAVE A PROVEN RECORD OF NO TENDENCY TO BUBBLE, DISCOLOR, OR LOSE PHYSICAL AND MECHANICAL PROPERTIES AFTER FABRICATION AND INSTALLATION.

- A. Construction: Laminate glass with ionomeric polymer interlayer except polyvinyl butyral interlayer where laminated glass if fully captured by framing to comply with interlayer manufacturer's written instructions.
- B. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
- C. Interlayer Color: Clear unless otherwise indicated.

INSULATING GLASS

16.01 INSULATING-GLASS UNITS: FACTORY-ASSEMBLED UNITS CONSISTING OF SEALED LITES OF GLASS SEPARATED BY A DEHYDRATED INTERSPACE, QUALIFIED ACCORDING TO ASTM E 2190.

A. Sealing System: Dual seal, with polyisobutylene primary and silicone secondary sealants.

- 1. Color: Black.
- B. Spacer: Warm edge stainless steel or rigid plastic or composite as selected by delegated design engineer to deliver indicated performance in color indicated.
 1. Color: Black.
- C. Desiccant: Molecular sieve or silica gel, or a blend of both.
- D. Spacer, sealants and desiccants shall be proven to not emit volatile organic compounds (VOC's) or other chemicals that result in a film on glass or any other degradation.

GLAZING SEALANTS

17.01 MANUFACTURER AND PRODUCTS: SUBJECT TO COMPLIANCE WITH REQUIREMENTS, PROVIDE PRODUCTS OF THE FOLLOWING MANUFACTURERS AS RECOMMENDED BY MANUFACTURER'S TECHNICAL REPRESENTATIVE BASED ON SUBSTRATES, INDICATED CRITERIA AND TESTING. MANUFACTURER'S TECHNICAL REPRESENTATIVE SHALL SELECT THE MOST APPROPRIATE SEALANT AND PRIMER COMBINATION FOR THE PROJECT SPECIFIC APPLICATION AND SUBSTRATES FROM MANUFACTURER'S FULL LINE.

- A. Silicone Joint Sealant Manufacturers: OR APPROVED EQUAL
 - 1. Dow
 - 2. Tremco Incorporated.

17.02 GENERAL:

- A. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
- B. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
- C. Field-applied sealants shall have a VOC content of not more than 250 g/L.
- D. Colors of Exposed Glazing Sealants: Black except Gray at SSG.

17.03 GLAZING SEALANT: NEUTRAL-CURING SILICONE GLAZING SEALANT COMPLYING WITH ASTM C 920, TYPE S, GRADE NS, MINIMUM CLASS 50, USE NT.

GLAZING GASKETS AND TAPES

- 18.01 GLAZING GASKETS: SILICONE SEALED-CORNER PRESSURE-GLAZING SYSTEM OF, RESILIENT ELASTOMERIC GLAZING GASKETS, SETTING BLOCKS, AND SHIMS OR SPACERS.
 - A. Color: Black.

18.02 BACK-BEDDING MASTIC GLAZING TAPES: PREFORMED, BUTYL-BASED, 100 PERCENT SOLIDS ELASTOMERIC TAPE; NONSTAINING AND NONMIGRATING IN CONTACT WITH NONPOROUS SURFACES; WITH OR WITHOUT SPACER ROD AS RECOMMENDED IN WRITING BY TAPE AND GLASS MANUFACTURERS FOR APPLICATION INDICATED; AND COMPLYING WITH ASTM C 1281 AND AAMA 800 FOR PRODUCTS INDICATED BELOW:

A. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.

18.03 EXPANDED CELLULAR GLAZING TAPES: CLOSED-CELL, PVC FOAM TAPES; FACTORY COATED WITH ADHESIVE ON BOTH SURFACES; AND COMPLYING WITH AAMA 800 FOR THE FOLLOWING TYPES:

- A. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
- B. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

18.04 COLOR: BLACK FOR ALL GLAZING TAPES, GASKETS AND ACCESSORIES EXPOSED TO VIEW.

MISCELLANEOUS GLAZING MATERIALS

- 19.01 GENERAL: PROVIDE PRODUCTS OF MATERIAL, SIZE, AND SHAPE COMPLYING WITH REFERENCED GLAZING STANDARD, WITH REQUIREMENTS OF MANUFACTURERS OF GLASS AND OTHER GLAZING MATERIALS FOR APPLICATION INDICATED, AND WITH A PROVEN RECORD OF COMPATIBILITY WITH SURFACES CONTACTED IN INSTALLATION.
- 19.02 PRIMERS AND SEALERS APPLIED WITH THE BUILDING INTERIOR: VOC CONTENT NOT TO EXCEED 200G/L.
- 19.03 CLEANERS, PRIMERS, AND SEALERS: TYPES RECOMMENDED BY SEALANT OR GASKET MANUFACTURER.
- 19.04 SETTING BLOCKS: SILICONE, SHORE, TYPE A DUROMETER HARDNESS OF 85, PLUS OR MINUS 5.
- 19.05 SPACERS: SILICONE BLOCKS OR CONTINUOUS EXTRUSIONS OF HARDNESS REQUIRED BY GLASS MANUFACTURER TO MAINTAIN GLASS LITES IN PLACE FOR INSTALLATION INDICATED.
- 19.06 EDGE BLOCKS: ELASTOMERIC MATERIAL OF HARDNESS NEEDED TO LIMIT GLASS LATERAL MOVEMENT (SIDE WALKING).
- 19.07 CYLINDRICAL GLAZING SEALANT BACKING: ASTM C 1330, TYPE O (OPEN-CELL MATERIAL), OF SIZE AND DENSITY TO CONTROL GLAZING SEALANT DEPTH AND OTHERWISE PRODUCE OPTIMUM GLAZING SEALANT PERFORMANCE.
- 19.08 BACKPANS, NON-GLASS VISION PANELS AND OTHER METAL COMPONENTS ARE SPECIFIED IN THE WINDOW WALL, CURTAIN WALL OR OTHER ASSEMBLY FRAMING SECTION.

FABRICATION OF GLAZING UNITS

- 20.01 FABRICATE GLAZING UNITS IN SIZES REQUIRED TO FIT OPENINGS INDICATED FOR PROJECT, WITH EDGE AND FACE CLEARANCES, EDGE AND SURFACE CONDITIONS, AND BITE COMPLYING WITH WRITTEN INSTRUCTIONS OF PRODUCT MANUFACTURER AND REFERENCED GLAZING PUBLICATIONS, TO COMPLY WITH SYSTEM PERFORMANCE REQUIREMENTS.
- 20.02 CLEAN-CUT OR FLAT-GRIND VERTICAL EDGES OF BUTT-GLAZED MONOLITHIC LITES TO PRODUCE SQUARE EDGES WITH SLIGHT CHAMFERS AT JUNCTIONS OF EDGES AND FACES.
- 20.03 GRIND SMOOTH AND POLISH EXPOSED GLASS EDGES AND CORNERS.
- 20.04 COLOR CONSISTENCY: MONOLITHIC GLASS, COATED GLASS AND INSULATING GLASS UNITS COLOR CONSISTENCY SHALL COMPLY WITH ASTM C 1376 AND THE MORE STRINGENT REQUIREMENTS NOTED.
 - A. The ∆Eab color readings shall not exceed 2.0 for any reading. The color target shall be determined by readings from approved control samples, not by an average of all readings.
 - B. Glass units shall also comply with the ΔH measurement defined by ASTM D2244. The color target shall be determined by readings from approved control samples, not by an average of all readings. Readings across each lite of glass shall not exceed +/-1.0 and shall not be more than $\Delta 1.5$ from the color target."

20.05 OPACIFY INSIDE SURFACES OF GLASS WHICH WOULD OTHERWISE ALLOW LIGHT INTO AREAS NOT MEANT TO BE EXPOSED TO VIEW IN THE FINISHED WORK. USE OPAQUE CERAMIC COATING OR APPLY CONTINUOUS SILICONE COATING IN COLOR SELECTED BY ARCHITECT.

A. For glass that is indicated to be opaque and is indicated to be installed without an additional back-up material, the glass shall be opaque when viewed from 3 feet with normal daylight on both sides of the sample.

20.06 INSULATING GLAZING UNITS (IGU) FABRICATION: FABRICATE IGU TO COMPLY WITH INDICATED REQUIREMENTS.

- A. IGU fabricator shall certify that they have tested all possible products used to cut, lubricate, clean, fabricate, handle, store, or process glass are compatible with glass, glass coatings, primary seal and secondary seal.
- B. Target width of primary seal shall be 5/32".
- C. Minimum thickness of secondary seal shall be 1/16".
- D. There shall be no skips in the primary seal.
- E. At units for SSG, flat-grind edges to produce square edges with slight chamfers at junctions of edges and faces.
- F. Edge delete all coated glass products except for ceramic frit coated glass, to provide a clean pure glass surface for adhesion of spacers.
 - Comply with coating manufacturer's written instructions for methods of edge deletion in addition to requirements indicated herein. Edge delete to comply with requirements herein even if not required by coating manufacturer, primary glass manufacturer, sealant manufacturer or IGU fabricator.
 - 2. Edge deletion shall remove 100% of coatings and extend to raw glass surface. Eliminate any residual coating resulting in reduced or potentially reduced bonding or variation in color, texture or reflection at bonded surface.
 - 3. Edge delete shall extend to a line between 50% and 100% of the width of the idealized path of the primary sealant.
 - 4. At offset IGUs, edge delete the entire offset surface area.
 - 5. Test for deletion of Low- E coating and similar metallic conductive coating with ohm-meter and test visually. Visually compare edge deleted glass to a piece of clear
 - a. glass of the same thickness against a white background. No color difference should be detectable.
 - 6. Where edge deletion is of different widths, provide stickers on glass indicating proper orientation and location of edge deletion.
 - 7. Inspect and clean prior to further fabrication.
 - 8. IGU with edge deletion not meeting indicated criteria will be rejected, remove and replaced.
- G. IG Unit Seal/Sealant and Desiccant Testing:
 - 1. Butterfly unit adhesion pull test (from 12"x12" to 24"x24"), test every shift or carton change.
 - 2. Desiccant temperature rise test, test every shift or carton change.
 - 3. Documentation recorded and available upon request
- H. Seal all spacer connections.
- I. Fill interspace with indicated gas and seal. The gas fill tubes shall be located at the top of the IGU.
- J. Secondary seal shall be cleaned and tooled before packing with no seal smear on adjacent edges or surfaces. Clean residual spacer sealant from surface and edges of glass exposed to view.

20.07 MARK EACH LITE OF GLASS WITH STICKERS SHOWING TYPE OF GLASS MATCHING GLASS SCHEDULE, WHICH SURFACE IS TO BE INSTALLED TO EXTERIOR, TOP OF LITE UNIFORM PATTERN, DRAW, BOW, AND SIMILAR CHARACTERISTICS, LOCATIONS OF EDGES DELETED OR SURFACES OTHERWISE PREPARED FOR BONDING.

- A. Mark each individual lite uniquely to identify intended location for field installation or shop glazing to match shop drawings.
- B. Do not remove stickers until cleaning for Substantial Completion.

SOURCE QUALITY CONTROL

21.01 FABRICATION TOLERANCES:

A. General: Fabricate glass to tolerances as required to:

- 1. Match approved Sample.
- 2. Comply with performance criteria.
- 3. Comply with requirements of ASTM C 1036 and C 1048 except where stricter tolerances are indicated.
- 4. Comply with manufacturer's written instructions.
- 5. Achieve tolerances indicated for Final Work.
- 6. Align with other supported or adjacent Work with more stringent tolerances.

21.02 ROLLER WAVE DISTORTION OF HEAT TREATED GLASS:

- A. Tolerance for roller wave is maximum 0.003" from peak to valley in the center of lites, and a maximum of 0.008" within 10.5" of the leading or trailing edge when measured in accordance with ASTM C1651 Standard Test Method for Measurement of Roll Wave Optical Distortion in Heat-Treated Flat Glass
- B. Tolerance for Millidiopter: (90% Surface) Maximum + or 120 A Overall

21.03 LOCALIZED BOW AND WARP: TOLERANCE FOR LOCALIZED WARP FOR RECTANGULAR GLASS IS 1/32" OVER ANY 12" AND ½ OF VALUES IN ASTM C 1048.

21.04 FABRICATION TOLERANCES FOR INSULATING GLAZING UNITS (IGUS): FABRICATE TO COMPLY WITH APPROVED SUBMITTALS AND SAMPLES AND THE FOLLOWING, WHICHEVER IS MORE STRINGENT.

- A. Definitions: Refer to Glass Informational Bulletin GANA ID 02-1011, Guidelines for the Appearance of Insulating Glass Unit Edges in Commercial Applications.
- B. Fabricate to comply with GANA ID 02-1011 as a minimum and the more stringent requirements included herein.
- C. Viewing Conditions: Visual inspections of IGU edges for both coated and uncoated materials shall be made with 20/20 vision (naked eye or corrected) at a distance of 3 feet from the glass surface at any angle from any direction under natural lighting conditions. Measurements for dimensional tolerances shall be made at closer viewing conditions. For glass to be located more than 2 stories above a normally walkable surface, interior or exterior, the viewing distance shall be increased to 10 feet.
- D. Appearance Guidelines for Glass Edge Quality at Silicone Structural Glazed (SSG) IGU:
 - 1. Edge Criteria: Criteria for non-uniformities shall be one half of those allowed for each type of glass per the appropriate standards, including but not limited ASTM C 1036, C 1048, C 1172, and C 1376.
 - 2. Color Variation of Secondary Sealant: Not visible from Viewing Conditions indicated.
 - 3. Color difference Between Primary and Secondary Sealants: Not visible from Viewing Conditions indicated.
 - 4. Separation between primary and secondary sealants: Not visible from Viewing Conditions.
 - 5. Offset Lites: Cover the offset glass edges.
 - 6. Minimum Sightline Dimension at SSG: The minimum sightline width for a contiguous area of adjacent IGU shall be the maximum width required for structural performance as determined by Delegated Design Engineer.
 - 7. Carbon Black: Carbon black discoloration in gray primary or secondary sealant shall not be visible from Viewing Conditions indicated.
 - 8. Coated Glass Edge Deletion in Captured Lites: Not visible from Viewing Conditions indicated and confined to the captured area.
 - 9. Spacers shall be parallel to edge of glass plus or minus 1/8 inch maximum from the glazed daylight opening with maximum variation of 1/8 inch in any 4 feet and shall not extend past outside edge of glass in any case.
 - 10. Primary Sealant Infringement: Shall not exceed 1/8 inch beyond spacer.
 - 11. Spacer and line of primary sealant shall not deviate by more than 1/8" in 36" including at corners. Excess sealant at corners shall not deviate by more than 1/8" in 2" on either side of corner.
- E. IGU overall thickness shall be minus 1/16" and plus 1/32".

21.05 INDEPENDENT INSPECTION AND TESTING: COMPLY WITH REQUIREMENTS OF DIVISION 1 SECTION "EXTERIOR ENCLOSURE INSPECTION AND TESTING SERVICES" FOR INDEPENDENT INSPECTION AND TESTING REQUIRED TO VERIFY PERFORMANCE OF THE WORK OF THIS SECTION.

21.06 COMPLY WITH REQUIREMENTS OF DIVISION 01 SECTION "EXTERIOR ENCLOSURE PERFORMANCE REQUIREMENTS" FOR QUALITY ASSURANCE AND CONTROL PROCEDURES REQUIRED FOR THE WORK OF THE EXTERIOR ENCLOSURE.

PART 3 - EXECUTION

22.01 EXAMINATION

22.02 EXAMINE GLASS AND IGU.

- A. Verify conformance with indicated requirements.
- B. Verify conformance with control sample.
- C. Verify location of low-e coatings using devices recommended by manufacturer and confirm that exterior surface is clearly and properly indicated.
- D. Do not install non-conforming glass or IGU.

22.03 EXAMINE FRAMING, GLAZING CHANNELS, AND STOPS, WITH INSTALLER PRESENT, FOR COMPLIANCE WITH THE FOLLOWING:

- A. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
- B. Presence and functioning of weep systems.
- C. Minimum required face and edge clearances.
- D. Effective sealing between joints of glass-framing members.

22.04 PROCEED WITH INSTALLATION ONLY AFTER UNSATISFACTORY CONDITIONS HAVE BEEN CORRECTED.

PREPARATION

- 23.01 CLEAN GLAZING CHANNELS AND OTHER FRAMING MEMBERS RECEIVING GLASS IMMEDIATELY BEFORE GLAZING. REMOVE COATINGS NOT FIRMLY BONDED TO SUBSTRATES.
- 23.02 EXAMINE GLAZING UNITS TO LOCATE EXTERIOR AND INTERIOR SURFACES. LABEL OR MARK UNITS AS NEEDED SO THAT EXTERIOR AND INTERIOR SURFACES ARE READILY IDENTIFIABLE. DO NOT USE MATERIALS THAT LEAVE VISIBLE MARKS IN THE COMPLETED WORK.

GLAZING, GENERAL

- 24.01 COMPLY WITH COMBINED WRITTEN INSTRUCTIONS OF MANUFACTURERS OF GLASS, SEALANTS, GASKETS, AND OTHER GLAZING MATERIALS, UNLESS MORE STRINGENT REQUIREMENTS ARE INDICATED, INCLUDING THOSE IN REFERENCED GLAZING PUBLICATIONS.
- 24.02 PROTECT GLASS EDGES FROM DAMAGE DURING HANDLING AND INSTALLATION. REMOVE DAMAGED GLASS FROM PROJECT SITE AND LEGALLY DISPOSE OF OFF PROJECT SITE. DAMAGED GLASS INCLUDES GLASS WITH EDGE DAMAGE OR OTHER IMPERFECTIONS THAT, WHEN INSTALLED, COULD WEAKEN GLASS, IMPAIR PERFORMANCE, OR IMPAIR APPEARANCE.
- 24.03 APPLY PRIMERS TO JOINT SURFACES WHERE REQUIRED FOR ADHESION OF SEALANTS, AS DETERMINED BY PRECONSTRUCTION TESTING.
- 24.04 INSTALL SETTING BLOCKS IN SILL RABBETS, SIZED AND LOCATED TO COMPLY WITH REFERENCED GLAZING PUBLICATIONS, UNLESS OTHERWISE REQUIRED BY GLASS MANUFACTURER. SET BLOCKS IN THIN COURSE OF COMPATIBLE SEALANT SUITABLE FOR HEEL BEAD.

24.05 DO NOT EXCEED EDGE PRESSURES STIPULATED BY GLASS MANUFACTURERS FOR INSTALLING GLASS LITES.

24.06 PROVIDE SPACERS FOR GLASS LITES WHERE LENGTH PLUS WIDTH IS LARGER THAN 50 INCHES.

- A. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
- B. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

24.07 PROVIDE EDGE BLOCKING WHERE INDICATED OR NEEDED TO PREVENT GLASS LITES FROM MOVING SIDEWAYS IN GLAZING CHANNEL, AS RECOMMENDED IN WRITING BY GLASS MANUFACTURER AND ACCORDING TO REQUIREMENTS IN REFERENCED GLAZING PUBLICATIONS.

- 24.08 SET GLASS LITES IN EACH SERIES WITH UNIFORM PATTERN, DRAW, BOW, AND SIMILAR CHARACTERISTICS.
- 24.09 SET GLASS LITES WITH PROPER ORIENTATION SO THAT COATINGS FACE EXTERIOR OR INTERIOR AS SPECIFIED.
- 24.10 WHERE WEDGE-SHAPED GASKETS ARE DRIVEN INTO ONE SIDE OF CHANNEL TO PRESSURIZE SEALANT OR GASKET ON OPPOSITE SIDE, PROVIDE ADEQUATE ANCHORAGE SO GASKET CANNOT WALK OUT WHEN INSTALLATION IS SUBJECTED TO MOVEMENT.
- 24.11 SQUARE CUT WEDGE-SHAPED GASKETS AT CORNERS AND INSTALL GASKETS IN A MANNER RECOMMENDED BY GASKET MANUFACTURER TO PREVENT CORNERS FROM PULLING AWAY; SEAL CORNER JOINTS AND BUTT JOINTS WITH SEALANT RECOMMENDED BY GASKET MANUFACTURER.

TAPE GLAZING

- 25.01 POSITION TAPES ON FIXED STOPS SO THAT, WHEN COMPRESSED BY GLASS, THEIR EXPOSED EDGES ARE FLUSH WITH OR PROTRUDE SLIGHTLY ABOVE SIGHTLINE OF STOPS.
- 25.02 INSTALL TAPES CONTINUOUSLY, BUT NOT NECESSARILY IN ONE CONTINUOUS LENGTH. DO NOT STRETCH TAPES TO MAKE THEM FIT OPENING.
- 25.03 COVER VERTICAL FRAMING JOINTS BY APPLYING TAPES TO HEADS AND SILLS FIRST, THEN TO JAMBS. COVER HORIZONTAL FRAMING JOINTS BY APPLYING TAPES TO JAMBS, THEN TO HEADS AND SILLS.
- 25.04 PLACE JOINTS IN TAPES AT CORNERS OF OPENING WITH ADJOINING LENGTHS BUTTED TOGETHER, NOT LAPPED. SEAL JOINTS IN TAPES WITH COMPATIBLE SEALANT APPROVED BY TAPE MANUFACTURER.
- 25.05 DO NOT REMOVE RELEASE PAPER FROM TAPE UNTIL RIGHT BEFORE EACH GLAZING UNIT IS INSTALLED.
- 25.06 APPLY HEEL BEAD OF ELASTOMERIC SEALANT.
- 25.07 CENTER GLASS LITES IN OPENINGS ON SETTING BLOCKS, AND PRESS FIRMLY AGAINST TAPE BY INSERTING DENSE COMPRESSION GASKETS FORMED AND INSTALLED TO LOCK IN PLACE AGAINST FACES OF REMOVABLE STOPS. START GASKET APPLICATIONS AT CORNERS AND WORK TOWARD CENTERS OF OPENINGS.

25.08 APPLY CAP BEAD OF ELASTOMERIC SEALANT OVER EXPOSED EDGE OF TAPE.

GASKET GLAZING (DRY)

26.01 CUT COMPRESSION GASKETS TO LENGTHS RECOMMENDED BY GASKET MANUFACTURER TO FIT OPENINGS EXACTLY, WITH ALLOWANCE FOR STRETCH DURING INSTALLATION.

- 26.02 INSERT SOFT COMPRESSION GASKET BETWEEN GLASS AND FRAME OR FIXED STOP SO IT IS SECURELY IN PLACE WITH JOINTS MITER CUT AND BONDED TOGETHER AT CORNERS.
- 26.03 INSTALLATION WITH DRIVE-IN WEDGE GASKETS: CENTER GLASS LITES IN OPENINGS ON SETTING BLOCKS, AND PRESS FIRMLY AGAINST SOFT COMPRESSION GASKET BY INSERTING DENSE COMPRESSION GASKETS FORMED AND INSTALLED TO LOCK IN PLACE AGAINST FACES OF REMOVABLE STOPS. START GASKET APPLICATIONS AT CORNERS AND WORK TOWARD CENTERS OF OPENINGS. COMPRESS GASKETS TO PRODUCE A WEATHERTIGHT SEAL WITHOUT DEVELOPING BENDING STRESSES IN GLASS. SEAL GASKET JOINTS WITH SEALANT RECOMMENDED BY GASKET MANUFACTURER.

26.04 INSTALL GASKETS SO THEY PROTRUDE PAST FACE OF GLAZING STOPS.

- 26.05 USE TYPICALLY FOR ALL ALUMINUM WINDOW WALL AND ENTRANCE WORK, UNLESS OTHERWISE INDICATED.
- PRESSURE PLATE GASKET GLAZING (DRY)
- 27.01 CUT COMPRESSION GASKETS TO LENGTHS RECOMMENDED BY GASKET MANUFACTURER TO FIT OPENINGS EXACTLY, WITH ALLOWANCE FOR STRETCH DURING INSTALLATION.
- 27.02 INSERT SOFT COMPRESSION GASKET BETWEEN GLASS AND FRAME OR FIXED STOP SO IT IS SECURELY IN PLACE WITH JOINTS MITER CUT AND BONDED TOGETHER AT CORNERS.
- 27.03 APPLY HEEL BEAD OF SEALANT ALONG INTERSECTION OF PERMANENT STOP WITH FRAME ALONG THE BOTTOM MULLION OF EACH LITE AND EXTEND VERTICALLY 6 INCHES TO PROVIDE AIR AND WATER TIGHT SEAL TO GLAZING.
- 27.04 PRESSURE-GLAZING STOPS: CENTER GLASS LITES IN OPENINGS ON SETTING BLOCKS AND PRESS FIRMLY AGAINST SOFT COMPRESSION GASKET AND HEAL BEAD.
- 27.05 INSTALL DENSE COMPRESSION GASKETS AND PRESSURE-GLAZING STOPS, APPLYING PRESSURE UNIFORMLY TO COMPRESSION GASKETS. COMPRESS GASKETS TO PRODUCE A WEATHERTIGHT SEAL WITHOUT DEVELOPING BENDING STRESSES IN GLASS. SEAL GASKET JOINTS WITH SEALANT RECOMMENDED BY GASKET MANUFACTURER.
- 27.06 INSTALL GASKETS SO THEY PROTRUDE PAST FACE OF GLAZING STOPS.
- 27.07 USE TYPICALLY FOR ALL ALUMINUM CURTAIN WALL WORK, UNLESS OTHERWISE INDICATED.

SEALANT GLAZING (WET)

- 28.01 INSTALL CONTINUOUS SPACERS, OR SPACERS COMBINED WITH CYLINDRICAL SEALANT BACKING, BETWEEN GLASS LITES AND GLAZING STOPS TO MAINTAIN GLASS FACE CLEARANCES AND TO PREVENT SEALANT FROM EXTRUDING INTO GLASS CHANNEL AND BLOCKING WEEP SYSTEMS UNTIL SEALANTS CURE. SECURE SPACERS OR SPACERS AND BACKINGS IN PLACE AND IN POSITION TO CONTROL DEPTH OF INSTALLED SEALANT RELATIVE TO EDGE CLEARANCE FOR OPTIMUM SEALANT PERFORMANCE.
- 28.02 FORCE SEALANTS INTO GLAZING CHANNELS TO ELIMINATE VOIDS AND TO ENSURE COMPLETE WETTING OR BOND OF SEALANT TO GLASS AND CHANNEL SURFACES.
- 28.03 TOOL EXPOSED SURFACES OF SEALANTS TO PROVIDE A SUBSTANTIAL WASH AWAY FROM GLASS.

28.04 USE FOR TERRACE DOORS UNLESS OTHERWISE INDICATED.

BUTT-JOINT GLAZING

29.01 SOLVENT CLEAN BOTH EDGES OF GLASS.

29.02 TEMPORARILY BLOCK PANES OF GLASS PARALLEL.

- 29.03 AT JOINTS IN GLASS LESS THAN 1/2 INCH THICK, TEMPORARILY BACK-UP JOINT AND FILL WITH SEALANT. AT JOINTS IN GLASS 1/2 INCH THICK AND OVER, INSTALL BACKER ROD AT CENTER OF PANE AND FILL BOTH SIDES WITH SEALANT. TOOL SEALANT TO A SMOOTH CONCAVE SURFACE.
- 29.04 REMOVE TEMPORARY BLOCKS AND BACK-UP, TOUCH UP SEALANT TO BE SMOOTH, CONCAVE AND WATERTIGHT.
- 29.05 COORDINATE WITH GLAZING METHOD FOR HEAD AND SILL.
- 29.06 USE WHERE BUTT JOINTS ARE INDICATED AND IN ALL-GLASS SIDELIGHTS.
- STRUCTURAL SILICONE GLAZING
- 30.01 GENERAL: COMPLY WITH SEALANT MANUFACTURER'S WRITTEN INSTRUCTIONS.
- 30.02 SHOP FABRICATION: FOUR-SIDED STRUCTURAL SILICONE GLAZING SHALL BE COMPLETED IN SHOP. GLASS SHALL BE GLAZED ONTO METAL SUBFRAMES FOR MECHANICAL ATTACHMENT IN FIELD.
- 30.03 PREPARATION: CLEAN SURFACE OF SUBSTRATE AND GLASS BY POURING SOLVENT ONTO A CLEAN RAG, WIPING VIGOROUSLY AND IMMEDIATELY WIPING EXCESS SOLVENT AWAY WITH A SECOND CLEAN RAG.
- 30.04 PRIMING: PRIME SURFACE OF METAL USING A THIN FILM ADHESION PROMOTER.
- 30.05 INSTALL SPACER TAPE ON METAL FRAME. INSTALL SETTING BLOCKS. APPLY STRUCTURAL SILICONE.
- 30.06 CENTER LITE IN OPENING, REST ON SETTING BLOCKS AND PUSH GLAZING INTO SEALANT TO PROVIDE CONTINUOUS CONTACT. TOOL JOINT SMOOTH AND STRAIGHT. TEMPORARILY SUPPORT GLASS UNTIL SEALANT SETS UP.
- 30.07 USE FOR SSG CORNERS INDICATED AT ALUMINUM CURTAIN WALLS AND WINDOWS WITHIN WINDOW WALL, AND AS OTHERWISE INDICATED.

CLEANING AND PROTECTION

- 31.01 IMMEDIATELY AFTER INSTALLATION REMOVE NONPERMANENT LABELS AND CLEAN SURFACES.
- 31.02 PROTECT GLASS FROM CONTACT WITH CONTAMINATING SUBSTANCES RESULTING FROM CONSTRUCTION OPERATIONS. EXAMINE GLASS SURFACES ADJACENT TO OR BELOW EXTERIOR CONCRETE AND OTHER MASONRY SURFACES AT FREQUENT INTERVALS DURING CONSTRUCTION, BUT NOT LESS THAN ONCE A MONTH, FOR BUILDUP OF DIRT, SCUM, ALKALINE DEPOSITS, OR STAINS.
 - A. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

31.03 REMOVE AND REPLACE GLASS THAT IS DAMAGED DURING CONSTRUCTION PERIOD.

31.04 WASH GLASS ON BOTH EXPOSED SURFACES NOT MORE THAN FOUR DAYS BEFORE DATE SCHEDULED FOR INSPECTIONS THAT ESTABLISH DATE OF SUBSTANTIAL COMPLETION. WASH GLASS AS RECOMMENDED IN WRITING BY GLASS MANUFACTURER.

ERECTION TOLERANCES

32.01 ERECTION TOLERANCES: INSTALL GLAZED ALUMINUM CURTAIN WALLS TO COMPLY WITH DIVISION 01 SECTION "EXTERIOR ENCLOSURE PERFORMANCE REQUIREMENTS" AND AS REQUIRED TO:

- A. Match approved Samples and Mock-up.
- B. Comply with performance criteria.
- C. Comply with manufacturer's written instructions.
- D. Align with other supported or adjacent Work with more stringent tolerances.

FIELD QUALITY CONTROL

33.01 REFER TO SECTION 01 4525-EXTERIOR ENCLOSURE TESTING SERVICES.

GLASS SCHEDULE

- 34.01 FINAL GLASS, COATING TYPES AND NUMBER OF COATINGS IS DEPENDENT ON FINAL ENGINEERING TO COMPLY WITH THERMAL PERFORMANCE FOR COMPLETE GLAZED ASSEMBLY. COORDINATE WITH WINDOW WALL, CURTAIN WALL, ENTRANCES AND OTHER FRAMING SYSTEMS FOR GLAZED ASSEMBLY CRITERIA.
- 34.02 INDICATIONS FOR "USE/LOCATION" IN SCHEDULE ARE PROVIDED FOR CONVENIENCE AND DOES NOT LIMIT THE USE OF THE SCHEDULED GLASS FROM ANY LOCATION IF INDICATED ELSEWHERE.
- 34.03 SAFETY GLASS: PROVIDE FULLY TEMPERED GLASS ONLY WHERE REQUIRED FOR SAFETY GLAZING AT WALKING SURFACES. DO NOT USE FULLY TEMPERED GLASS IN OVERHEAD CONDITIONS.

34.04 GLASS TYPE GL1: "CLEAR VISION GLAZING" LOW-E-COATED, INSULATING GLASS.

- A. Typical Use/Location: Exterior glazing for Storefro.
- B. Overall Unit Thickness: 1 inch.
- C. Outdoor Lite: Clear heat strengthened float glass.
- D. Interspace Content: 90% Argon.
- E. Indoor Lite: Clear heat strengthened float glass.
- F. Low-E Coating: Sputtered coating on second surface, Basis of Design Guardian SNR 43 coating.
- G. Performance is based on the Basis of Design products in configurations listed. Alternate glass must meet or exceed performance of the indicated units
 - 1. Visible Light Transmittance = 43%
 - 2. Center-of-glass Winter U-Value = 0.24
 - 3. SHGC = .23
- H. Provide fully tempered units where indicated or required for safety glazing.

END OF SECTION

SECTION 090561 COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. This section applies to floors identified in Contract Documents that are receiving the following types of floor coverings:
 - 1. Resilient tile and sheet.
 - 2. Carpet tile.
 - 3. Thin-set ceramic tile and stone tile.
- B. Removal of existing floor coverings.
- C. Preparation of existing concrete floor slabs for installation of floor coverings.
- D. Patching compound.

1.02 REFERENCE STANDARDS

- A. ASTM C109/C109M Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50 mm] Cube Specimens); 2021.
- B. ASTM C472 Standard Test Methods for Physical Testing of Gypsum, Gypsum Plasters, and Gypsum Concrete; 2020.
- C. RFCI (RWP) Recommended Work Practices for Removal of Resilient Floor Coverings; 2011.

1.03 SUBMITTALS

- A. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
 - 1. Moisture and alkalinity (pH) limits and test methods.
 - 2. Manufacturer's required bond/compatibility test procedure.
- B. Adhesive Bond and Compatibility Test Report.

1.04 QUALITY ASSURANCE

A. Contractor may perform adhesive and bond test with Contractor's own personnel or hire a testing agency.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, handle, and protect products in accordance with manufacturer's instructions and recommendations.
- B. Deliver materials in manufacturer's packaging; include installation instructions.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
 - 1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
 - 2. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.
 - 3. Products:
 - a. ARDEX Engineered Cements; ARDEX Feather Finish: www.ardexamericas.com/#sle.
 - b. H.B. Fuller Construction Products, Inc; TEC Feather Edge Skim Coat: www.tecspecialty.com/#sle.

- c. USG Corporation; Durock Brand Advanced Skim Coat Floor Patch: www.usg.com/#sle.
- B. Alternate Flooring Adhesive: Floor covering manufacturer's recommended product, suitable for the moisture and pH conditions present; low-VOC. In the absence of any recommendation from flooring manufacturer, provide a product recommended by adhesive manufacturer as suitable for substrate and floor covering and for conditions present.

PART 3 EXECUTION

3.01 CONCRETE SLAB PREPARATION

- A. Perform following operations in the order indicated:
 - 1. Preliminary cleaning.
 - 2. Specified remediation, if required.
 - 3. Patching, smoothing, and leveling, as required.
 - 4. Other preparation specified.
 - 5. Adhesive bond and compatibility test.
 - 6. Protection.

3.02 REMOVAL OF EXISTING FLOOR COVERINGS

- A. Comply with local, State, and federal regulations and recommendations of RFCI (RWP), as applicable to floor covering being removed.
- B. Dispose of removed materials in accordance with local, State, and federal regulations and as specified.

3.03 PREPARATION

- A. See individual floor covering section(s) for additional requirements.
- B. Comply with requirements and recommendations of floor covering manufacturer.
- C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.
- D. Do not fill expansion joints, isolation joints, or other moving joints.

3.04 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

3.05 APPLICATION OF REMEDIAL FLOOR COATING

A. Comply with requirements and recommendations of coating manufacturer.

END OF SECTION

SECTION 092116 GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Performance criteria for gypsum board assemblies.
- B. Metal stud wall framing.
- C. Metal channel ceiling framing.
- D. Acoustic insulation.
- E. Cementitious backing board.
- F. Gypsum wallboard.
- G. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

- A. Section 061000 Rough Carpentry: Wood blocking product and execution requirements.
- B. Section 092216 Non-Structural Metal Framing.

1.03 REFERENCE STANDARDS

- A. AISI S100 North American Specification for the Design of Cold-Formed Steel Structural Members; 2016, with Supplement (2020).
- B. AISI S220 North American Standard for Cold-Formed Steel Nonstructural Framing; 2020.
- C. AISI S240 North American Standard for Cold-Formed Steel Structural Framing; 2015, with Errata (2020).
- D. ANSI A108.11 American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2018.
- E. ANSI A118.9 American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 2019.
- F. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2022.
- G. ASTM A1003/A1003M Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members; 2015.
- H. ASTM C665 Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2017.
- I. ASTM C754 Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2020.
- J. ASTM C840 Standard Specification for Application and Finishing of Gypsum Board; 2020.
- K. ASTM C954 Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2022.
- L. ASTM C1047 Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base; 2019.
- M. ASTM C1325 Standard Specification for Fiber-Mat Reinforced Cementitious Backer Units; 2022.
- N. ASTM C1396/C1396M Standard Specification for Gypsum Board; 2017.
- O. GA-216 Application and Finishing of Gypsum Panel Products; 2021.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the installation of gypsum board assemblies with size, location, and installation of service utilities.

1.05 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Product Data:
 - 1. Provide data on metal framing, gypsum board, and accessories.
 - 2. Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.

2.02 METAL FRAMING MATERIALS

- A. Steel Sheet: ASTM A1003/A1003M, subject to the ductility limitations indicated in AISI S240.
- B. Manufacturers Metal Framing, Connectors, and Accessories:
 - 1. ClarkDietrich: www.clarkdietrich.com/#sle.
 - 2. MarinoWARE: www.marinoware.com/#sle.
 - 3. SCAFCO Corporation: www.scafco.com/#sle.
- C. Nonstructural Framing System Components: AISI S220; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf (L/120 at 240 Pa).
 - 1. Studs: C-shaped with knurled or embossed faces.
 - 2. Runners: U shaped, sized to match studs.
- D. Partition Head to Structure Connections: Provide mechanical anchorage devices that accommodate deflection and prevent rotation of studs while maintaining structural performance of partition.
 - 1. Structural Performance: Maintain lateral load resistance and vertical movement capacity required by applicable code, when evaluated in accordance with AISI S100.
 - 2. Material: ASTM A653/A653M steel sheet, SS Grade 50/340, with G60/Z180 hot-dipped galvanized coating.

2.03 BOARD MATERIALS

- A. Manufacturers Gypsum-Based Board:
 - 1. American Gypsum Company: www.americangypsum.com/#sle.
 - 2. CertainTeed Corporation: www.certainteed.com/#sle.
 - 3. Georgia-Pacific Gypsum: www.gpgypsum.com/#sle.
 - 4. USG Corporation: www.usg.com/#sle.
- B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut.
 - 1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
 - 2. Thickness:
 - a. Vertical Surfaces: 5/8 inch (16 mm).
 - b. Ceilings: 1/2 inch (13 mm).
- C. Backing Board For Wet Areas: One of the following products:
 - 1. Application: Horizontal surfaces behind tile in wet areas including countertops.
 - 2. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
 - a. Thickness: 5/8 inch (16 mm).
 - b. Products:
 - 1) Custom Building Products: www.custombuildingproducts.com/#sle.

- 2) PermaBASE Building Products, LLC provided by National Gypsum Company; PermaBase Cement Board: www.goldbondbuilding.com/#sle.
- 3) USG Corporation; Fiberock Brand Aqua-Tough AR Interior Panels Regular 1/4 in. (6.4 mm): www.usg.com/#sle.

2.04 GYPSUM BOARD ACCESSORIES

- A. Acoustic Insulation: ASTM C665; preformed mineral-fiber, friction fit type, unfaced; 3 1/2" thickness .
- B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.
- C. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.
 - 1. Corner Beads: Low profile, for 90 degree outside corners.
- D. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch (0.84 to 2.84 mm) in Thickness: ASTM C954; steel drill screws, corrosion-resistant.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION

- A. Metal Framing: Install in accordance with AISI S220 and manufacturer's instructions.
- B. Suspended Ceilings and Soffits: Space framing and furring members as indicated.
- C. Studs: Space studs at 16 inches on center (at 406 mm on center).
 - 1. Extend partition framing to structure where indicated and to ceiling in other locations.
 - 2. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
 - 3. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.
- D. Blocking: Install FRT wood blocking for support of:
 - 1. Wall-mounted cabinets.
 - 2. Wall-mounted door hardware.
 - 3. Digital displays (coordinate with AV vendor).

3.03 ACOUSTIC ACCESSORIES INSTALLATION

- A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
- B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
 - 1. Place one bead continuously on substrate before installation of perimeter framing members.
 - 2. Place continuous bead at perimeter of each layer of gypsum board.
 - 3. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

3.04 BOARD INSTALLATION

- A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.
- B. Cementitious Backing Board: Install over steel framing members and plywood substrate where indicated, in accordance with ANSI A108.11 and manufacturer's instructions.

3.05 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.

- 1. Not more than 30 feet (10 meters) apart on walls and ceilings over 50 feet (16 meters) long.
- B. Corner Beads: Install at external corners, using longest practical lengths.
- C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.06 JOINT TREATMENT

- A. Paper Faced Gypsum Board: Use paper joint tape, embed with drying type joint compound and finish with drying type joint compound.
- B. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
 - 1. Level 4: Walls and ceilings to receive paint finish or wall coverings, unless otherwise indicated.
- C. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
 - 1. Feather coats of joint compound so that camber is maximum 1/32 inch (0.8 mm).

3.07 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.

3.08 PROTECTION

A. Protect installed gypsum board assemblies from subsequent construction operations.

END OF SECTION

SECTION 092216 NON-STRUCTURAL METAL FRAMING

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

- A. Section 061000 Rough Carpentry: Wood blocking within stud framing.
- B. Section 092116 Gypsum Board Assemblies: Metal studs for gypsum board partition framing.

1.02 REFERENCE STANDARDS

A. AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing; 2020.

1.03 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Product Data: Provide data describing framing member materials and finish, product criteria, load charts, and limitations.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience and approved by manufacturer.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Metal Framing, Connectors, and Accessories: OR APPROVED EQUAL
 - 1. ClarkDietrich:
 - 2. MarinoWARE:
 - 3. The Steel Network, Inc:
 - 4. Substitutions: See Section 016000 Product Requirements.

2.02 FRAMING MATERIALS

- A. Non-Loadbearing Framing System Components: AISI S220; sheet steel, of size and properties necessary for the spacing indicated, with maximum deflection of wall framing of L/240 at 5 psf (L/240 at 240 Pa).
 - 1. Studs: C-shaped with flat faces.
 - 2. Runners: U-shaped, sized to match studs.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that rough-in utilities are in proper location.

3.02 INSTALLATION OF STUD FRAMING

- A. Extend partition framing to six inches above ceiling and to structure where indicated.
- B. Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
- C. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs as indicated.
- D. Align and secure top and bottom runners at 24 inches (600 mm) on center.
- E. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.
- F. Align stud web openings horizontally.
- G. Secure studs to tracks using crimping method. Do not weld.
- H. Fabricate corners using a minimum of three studs.

- I. Install double studs at wall openings, door and window jambs, not more than 2 inches (50 mm) from each side of openings.
- J. Coordinate installation of bucks, anchors, and blocking with electrical, mechanical, and other work to be placed within or behind stud framing.
- K. Blocking: Use wood blocking secured to studs. Provide blocking for support of wall cabinets, hardware, and opening frames.

3.03 TOLERANCES

- A. Maximum Variation From True Position: 1/8 inch in 10 feet (3 mm in 3 m).
- B. Maximum Variation From Plumb: 1/8 inch in 10 feet (3 mm in 3 m).

END OF SECTION
SECTION 093000 TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Tile for floor applications.
- B. Tile for wall applications.
- C. Cementitious backer board as tile substrate.
- D. Coated glass mat backer board as tile substrate.
- E. Non-ceramic trim.

1.02 RELATED REQUIREMENTS

- A. Section 079200 Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.
- B. Section 092116 Gypsum Board Assemblies: Tile backer board.

1.03 REFERENCE STANDARDS

- A. ANSI A108/A118/A136 American National Standard Specifications for the Installation of Ceramic Tile (Compendium); 2019.
- B. ANSI A108.1a American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2017 (Reaffirmed 2022).
- C. ANSI A108.1b American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar; 2017.
- D. ANSI A108.1c Contractor's Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar or Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar; 1999 (Reaffirmed 2021).
- E. ANSI A108.2 American National Standard General Requirements: Materials, Environmental and Workmanship; 2019.
- F. ANSI A108.4 American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesive or Water Cleanable Tile-Setting Epoxy Adhesive; 2019.
- G. ANSI A108.5 American National Standard Specifications for Installation of Ceramic Tile with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar; 2021.
- H. ANSI A108.6 American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grout Epoxy; 1999 (Reaffirmed 2019).
- I. ANSI A108.8 American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant Furan Resin Mortar and Grout; 1999 (Reaffirmed 2019).
- J. ANSI A108.9 American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 1999 (Reaffirmed 2019).
- K. ANSI A108.10 American National Standard Specifications for Installation of Grout in Tilework; 2017 (Reaffirmed 2022).
- L. ANSI A108.11 American National Standard Specifications for Interior Installation of Cementitious Backer Units; 2018.
- M. ANSI A108.12 American National Standard for Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Latex-Portland Cement Mortar; 1999 (Reaffirmed 2019).
- N. ANSI A108.13 American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2005 (Reaffirmed 2021).
- O. ANSI A108.19 American National Standard Specifications for Interior Installation of Gauged Porcelain Tiles and Gauged Porcelain Tile Panels/Slabs by the Thin-Bed Method Bonded with

Modified Dry-Set Cement Mortar or Improved Modified Dry-Set Cement Mortar; 2020.

- P. ANSI A118.6 American National Standard Specifications for Standard Cement Grouts for Tile Installation; 2019.
- Q. ANSI A118.9 American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 2019.
- R. ANSI A118.10 American National Standard Specifications for Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2014 (Reaffirmed 2019).
- S. ANSI A118.12 American National Standard Specifications for Crack Isolation Membranes for Thin-Set Ceramic Tile and Dimension Stone Installation; 2014 (Reaffirmed 2019).
- T. ANSI A137.1 American National Standard Specifications for Ceramic Tile; 2022.
- U. ASTM C373 Standard Test Methods for Determination of Water Absorption and Associated Properties by Vacuum Method for Pressed Ceramic Tiles and Glass Tiles and Boil Method for Extruded Ceramic Tiles and Non-tile Fired Ceramic Whiteware Products; 2018 (Reapproved 2023).
- V. ASTM C1178/C1178M Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel; 2018.
- W. TCNA (HB) Handbook for Ceramic, Glass, and Stone Tile Installation; 2024.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

- A. See Section 013000 Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.
- C. Samples: Mount tile and apply grout on two plywood panels, minimum 18 by 18 inches (457 by 457 mm) in size illustrating pattern, color variations, and grout joint size variations.
- D. Installer's Qualification Statement:
- E. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.
- F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 1. See Section 016000 Product Requirements, for additional provisions.

1.06 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.
- B. Installer Qualifications:
 - 1. Company specializing in performing tile installation, with minimum of five years of documented experience.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.08 FIELD CONDITIONS

A. Maintain ambient and substrate temperature above 50 degrees F (10 degrees C) and below 100 degrees F (38 degrees C) during installation and curing of setting materials.

PART 2 PRODUCTS

2.01 TILE

A. Manufacturers: All products by the same manufacturer. OR APPROVED EQUAL
 1. American Olean Corporation:

- 2. Dal-Tile Corporation:
- 3. Emser Tile, LLC:
- 4. Substitutions: See Section 016000 Product Requirements.
- B. Glazed Wall Tile, Type ceramic: ANSI A137.1 standard grade.
 - 1. Moisture Absorption: 7.0 to 20.0 percent as tested in accordance with ASTM C373.
 - 2. Size: 6" x 18", nominal.
 - 3. Edges: Cushioned.
 - 4. Surface Finish: Semi Gloss.
 - 5. Color(s): As indicated on drawings.
 - 6. Pattern: As indicated on drawings.
 - 7. Products:
 - a. Refer to finish schedule for basis of design product.
 - b. Substitutions: See Section 016000 Product Requirements.
- C. Porcelain Tile: ANSI A137.1 standard grade.
 - 1. Moisture Absorption: 0 to 0.5 percent as tested in accordance with ASTM C373.
 - 2. Size: 12" by 24" inch (305 by 610 mm), nominal.
 - 3. Thickness: 3/8 inch (9.5 mm).
 - 4. Surface Finish: Matte rectified.
 - 5. Color(s): As indicated on drawings.
 - 6. Pattern: As indicated on drawings.
 - 7. Products:
 - a. Refer to finish schedule for basis of design product.
 - b. Substitutions: See Section 016000 Product Requirements.

2.02 TRIM AND ACCESSORIES

- A. Non-Ceramic Trim: Brushed stainless steel, style and dimensions to suit application, for setting using tile mortar or adhesive.
 - 1. Applications:
 - a. Thresholds at door openings indicated on drawings.
 - b. Borders and other trim as indicated on drawings.
 - 2. Manufacturers:
 - a. Schluter-Systems: www.schluter.com/#sle.

2.03 SETTING MATERIALS

- A. Manufacturers:
 - 1. ARDEX Engineered Cements: www.ardexamericas.com.
 - 2. Custom Building Products: www.custombuildingproducts.com.
 - 3. LATICRETE International, Inc: www.laticrete.com.
 - 4. Substitutions: See Section 016000 Product Requirements.

2.04 GROUTS

- A. Manufacturers:
 - 1. ARDEX Engineered Cements: www.ardexamericas.com.
 - 2. Custom Building Products: www.custombuildingproducts.com.
 - 3. LATICRETE International, Inc; LATICRETE PERMACOLOR Grout.
 - 4. Substitutions: See Section 016000 Product Requirements.
- B. Standard Grout: ANSI A118.6 standard cement grout.
 - 1. Applications: Use this type of grout where indicated and where no other type of grout is indicated.
 - 2. Use sanded grout for joints 1/8 inch wide and larger; use unsanded grout for joints less than 1/8 inch wide.
 - 3. Color(s): As indicated on drawings.
 - 4. Products:
 - a. Refer to finish schedule for basis of design.

b. Substitutions: See Section 016000 - Product Requirements.

2.05 MAINTENANCE MATERIALS

- A. Grout Sealer: Liquid-applied, moisture and stain protection for existing or new Portland cement grout.
 - 1. Composition: Water-based colorless silicone.

2.06 ACCESSORY MATERIALS

- A. Waterproofing Membrane at Floors: Specifically designed for bonding to cementitious substrate under thick mortar bed or thin-set tile; complying with ANSI A118.10.
 - 1. Crack Resistance: No failure at 1/16 inch (1.6 mm) gap, minimum; comply with ANSI A118.12.
 - 2. Bonded Sheet Membrane Type:
 - a. Material: Polyethylene sheet membrane with non-woven fabric laminated to both sides, 20 to 30 mils (0.5 to 0.8 mm) thick, nominal.
- B. Backer Board: Cementitious type complying with ANSI A118.9; high density, glass fiber reinforced, 1/2 inch (12.7 mm) thick; 2 inch (51 mm) wide coated glass fiber tape for joints and corners.
- C. Backer Board: Coated glass mat type complying with ASTM C1178/C1178M; inorganic fiberglass mat on both surfaces and integral acrylic coating vapor retarder.
- D. Mesh Tape: 2 inch (50 mm) wide self-adhesive fiberglass mesh tape.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.
- C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of setting materials to sub-floor surfaces.

3.02 PREPARATION

- A. Protect surrounding work from damage.
- B. Vacuum clean surfaces and damp clean.
- C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.
- D. Install backer board in accordance with ANSI A108.11 and board manufacturer's instructions. Tape joints and corners, cover with skim coat of setting material to a feather edge.

3.03 INSTALLATION - GENERAL

- A. Install tile and thresholds and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.19, manufacturer's instructions, and TCNA (HB) recommendations.
- B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.
- C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor and wall joints.
- D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.
- E. Install non-ceramic trim in accordance with manufacturer's instructions.
- F. Sound tile after setting. Replace hollow sounding units.
- G. Keep control and expansion joints free of mortar, grout, and adhesive.
- H. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

- I. Grout tile joints unless otherwise indicated.
- J. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.04 INSTALLATION - FLOORS - THIN-SET METHODS

A. Over interior concrete substrates, install in accordance with TCNA (HB) Method F113, dry-set or latex-Portland cement bond coat, with standard grout, unless otherwise indicated.
 1. Use uncoupling membrane under all tile unless other underlayment is indicated.

3.05 INSTALLATION - WALL TILE

- A. Over cementitious backer units install in accordance with TCNA (HB) Method W223, organic adhesive.
- B. Over coated glass mat backer board on studs, install in accordance with TCNA (HB) Method W245.

3.06 CLEANING

A. Clean tile and grout surfaces.

3.07 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

SECTION 095100 ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Suspended metal grid ceiling system.
- B. Acoustical units.
- C. Supplementary insulation above ceiling.

1.02 REFERENCE STANDARDS

- A. ASTM C635/C635M Standard Specification for Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2022.
- B. ASTM E1264 Standard Classification for Acoustical Ceiling Products; 2022.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Sequence work to ensure acoustical ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- B. Do not install acoustical units until after interior wet work is dry.

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on suspension system components and acoustical units.

1.05 QUALITY ASSURANCE

- A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Acoustic Tiles/Panels: OR APPROVED EQUAL
 - 1. Armstrong World Industries, Inc:
 - 2. CertainTeed Corporation:
 - 3. USG Corporation:
- B. Suspension Systems:
 - 1. Same as for acoustical units.

2.02 ACOUSTICAL UNITS

- A. Acoustical Units General: ASTM E1264, Class A.
- B. Acoustical Panels: Painted mineral fiber, with the following characteristics:
 - 1. Classification: ASTM E1264 Type III.
 - a. Pattern: "G" smooth.
 - 2. Size: 24 by 48 inches (610 by 1219 mm).
 - 3. Thickness: 3/4 inch (19 mm).
 - 4. Ceiling Attenuation Class (CAC): 35, determined in accordance with ASTM E1264.
 - 5. Panel Edge: Reveal.
 - 6. Tile Edge: Beveled.
 - a. Joint: Kerfed and rabbeted.
 - 7. Color: White.
 - 8. Suspension System: Exposed grid.

2.03 SUSPENSION SYSTEM(S)

- A. Metal Suspension Systems General: Complying with ASTM C635/C635M; die cut and interlocking components, with perimeter moldings, clips, and splices as required.
- B. Exposed Suspension System: Hot-dip galvanized steel grid and cap.
 - 1. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
 - 2. Profile: Tee; 9/16 inch (14 mm) face width.
 - 3. Finish: Baked enamel.
 - 4. Color: White.
 - 5. Products: OR APPROVED EQUAL
 - a. CertainTeed Corporation; 9/16" EZ Stab Elite Narrow System:
 - b. USG Corporation; Donn Brand Centricitee DXT/DXLT 9/16 inch Acoustical Suspension System:
 - c. Substitutions: See Section 016000 Product Requirements.
- C. Exposed Suspension System for "Cloud" Applications: Galvanized steel grid and cap; trim as specified under Accessories.
 - 1. Structural Classification: Intermediate-duty, when tested in accordance with ASTM C635/C635M.
 - 2. Profile: Tee; 15/16 inch (24 mm) face width.
 - 3. Finish: Baked enamel.
 - 4. Products: OR APPROVED EQUAL
 - a. USG Corporation; Compositions Decorative Cloud System:
 - b. Substitutions: See Section 016000 Product Requirements.

2.04 ACCESSORIES

- A. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.
- B. Hanger Wire: 12 gauge, 0.08 inch (2 mm) galvanized steel wire.
- C. Perimeter Moldings: Same metal and finish as grid.
 - 1. Angle Molding: L-shaped, for mounting at same elevation as face of grid.
- D. Metal Edge Trim for "Cloud" Suspension Systems: Steel or extruded aluminum; provide attachment clips, splice plates, and preformed corner pieces for complete trim system.
 - 1. Trim Height: 6 inch (152 mm).
 - 2. Finish: Baked enamel.
 - 3. Color: White.
 - 4. Products: OR APPROVED EQUAL
 - a. USG Corporation; Compasso Suspension Trim:
 - b. Armstrong; Axiom Trim.
- E. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that layout of hangers will not interfere with other work.

3.02 PREPARATION

- A. Install after major above-ceiling work is complete.
- B. Coordinate the location of hangers with other work.

3.03 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with manufacturer's instructions and as supplemented in this section.

- B. Locate system on room axis according to reflected plan.
- C. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
 - 1. Use longest practical lengths.
 - 2. Overlap and rivet corners.
- D. Suspension System, Non-Seismic: Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
- E. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.
- F. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.
- G. Support fixture loads using supplementary hangers located within 6 inches (152 mm) of each corner, or support components independently.
- H. Do not eccentrically load system or induce rotation of runners.

3.04 INSTALLATION - ACOUSTICAL UNITS

- A. Install acoustical units in accordance with manufacturer's instructions.
- B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.
- C. Fit border trim neatly against abutting surfaces.
- D. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.
- E. Cutting Acoustical Units:
 - 1. Make field cut edges of same profile as factory edges.
- F. Lay acoustical insulation for a distance of 48 inches (1219 mm) either side of acoustical partitions where indicated.

3.05 TOLERANCES

- A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet (3 mm in 3 m).
- B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

3.06 CLEANING

- A. Ceiling tile surfaces to be free of fingerprint smudges.
- B. Replace damaged or abraded components.

SECTION 096500 RESILIENT FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Resilient sheet flooring.
- B. Resilient tile flooring.
- C. Resilient base.
- D. Installation accessories.

1.02 RELATED REQUIREMENTS

A. Section 090561 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.

1.03 REFERENCE STANDARDS

- A. ASTM F1700 Standard Specification for Solid Vinyl Floor Tile; 2020.
- B. ASTM F1861 Standard Specification for Resilient Wall Base; 2021.

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.
- C. Verification Samples: Submit two samples, illustrating color and pattern for each resilient flooring product specified.
- D. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

1.05 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified flooring with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.
- B. Store all materials off of the floor in an acclimatized, weather-tight space.
- C. Protect roll materials from damage by storing on end.

1.07 FIELD CONDITIONS

A. Store materials for not less than 48 hours prior to installation in area of installation at a temperature of 70 degrees F (21 degrees C) to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F (13 degrees C).

PART 2 PRODUCTS

2.01 SHEET FLOORING

2.02 TILE FLOORING

- A. Vinyl Tile Printed film type, with transparent or translucent wear layer.
 - 1. Manufacturers:
 - a. Refer to finish schedule on drawings.
 - 2. Minimum Requirements: Comply with ASTM F1700, of Class corresponding to type specified.
 - 3. Wear Layer Thickness: 0.020 inch (0.50 mm).
 - 4. Total Thickness: 0.125 inch (3 mm).

2.03 RESILIENT BASE

- A. Resilient Base: ASTM F1861, Type TV, vinyl, thermoplastic; style as scheduled.
 - 1. Manufacturers:
 - a. Johnsonite, a Tarkett Company: www.johnsonite.com/#sle.
 - b. Mannington Commercial: www.manningtoncommercial.com#sle.
 - c. Roppe Corporation; Contours Profiled Wall Base System: www.roppe.com/#sle.
 - 2. Height: 4 inch (100 mm).
 - 3. Thickness: 0.125 inch (3.2 mm).
 - 4. Finish: Satin.
 - 5. Length: Roll.
 - 6. Color: As indicated on drawings.

2.04 ACCESSORIES

- A. Adhesives: Waterproof; types recommended by flooring manufacturer.
- B. Moldings, Transition and Edge Strips: as indicated on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.
- B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive resilient base.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.

3.03 INSTALLATION - GENERAL

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install in accordance with manufacturer's written instructions.

3.04 INSTALLATION - TILE FLOORING

A. Mix tile from container to ensure shade variations are consistent when tile is placed, unless otherwise indicated in manufacturer's installation instructions.

3.05 INSTALLATION - RESILIENT BASE

- A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches (45 mm) between joints.
- B. Install base on solid backing. Bond tightly to wall and floor surfaces.

3.06 CLEANING

- A. Remove excess adhesive from floor, base, and wall surfaces without damage.
- B. Clean in accordance with manufacturer's written instructions.

3.07 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

SECTION 096813 TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Carpet tile, fully adhered.
- B. Removal of existing carpet tile.

1.02 RELATED REQUIREMENTS

A. Section 090561 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.

1.03 SUBMITTALS

- A. See Section 013000 Administrative Requirements, for submittal procedures.
- B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.
- C. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.
- D. Operation and Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

1.04 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.
- B. Installer Qualifications: Company specializing in installing carpet tile with minimum three years documented experience and approved by carpet tile manufacturer.

1.05 FIELD CONDITIONS

PART 2 PRODUCTS

2.01 MATERIALS

A. Tile Carpeting, manufactured in one color dye lot. Refer to finish schedule on drawings.

2.02 ACCESSORIES

A. Carpet Tile Adhesive: Recommended by carpet tile manufacturer; releasable type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive carpet tile.

3.02 PREPARATION

- A. Prepare floor substrates as recommended by flooring and adhesive manufacturers.
- B. Remove subfloor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with subfloor filler.

3.03 INSTALLATION

- A. Starting installation constitutes acceptance of subfloor conditions.
- B. Install carpet tile in accordance with manufacturer's instructions.
- C. Blend carpet from different cartons to ensure minimal variation in color match.
- D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
- E. Locate change of color or pattern between rooms under door centerline.
- F. Fully adhere carpet tile to substrate.
- G. Trim carpet tile neatly at walls and around interruptions.

H. Complete installation of edge strips, concealing exposed edges.

3.04 CLEANING

- A. Remove excess adhesive without damage, from floor, base, and wall surfaces.
- B. Clean and vacuum carpet surfaces.

SECTION 099123 INTERIOR PAINTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Surface preparation.
- B. Field application of paints.
- C. Scope: Finish interior surfaces exposed to view, unless fully factory-finished and unless otherwise indicated.
- D. Do Not Paint or Finish the Following Items:
 - 1. Items factory-finished unless otherwise indicated; materials and products having factoryapplied primers are not considered factory finished.
 - 2. Items indicated to receive other finishes.
 - 3. Items indicated to remain unfinished.
 - 4. Fire rating labels, equipment serial number and capacity labels, bar code labels, and operating parts of equipment.
 - 5. Floors, unless specifically indicated.
 - 6. Glass.
 - 7. Concealed pipes, ducts, and conduits.

1.02 REFERENCE STANDARDS

A. MPI (APSM) - Master Painters Institute Architectural Painting Specification Manual; Current Edition.

1.03 SUBMITTALS

- A. See Section 013000 Administrative Requirements, for submittal procedures.
- B. Product Data: Provide complete list of products to be used, with the following information for each:
 - 1. Manufacturer's name, product name and/or catalog number, and general product category (e.g., "alkyd enamel").
 - 2. MPI product number (e.g., MPI #47).
 - 3. Cross-reference to specified paint system(s) product is to be used in; include description of each system.
- C. Samples: Submit three paper "draw down" samples, 8-1/2 by 11 inches (216 by 279 mm) in size, illustrating range of colors available for each finishing product specified.
 - 1. Where sheen is specified, submit samples in only that sheen.
 - 2. Where sheen is not specified, discuss sheen options with Architect before preparing samples, to eliminate sheens not required.
- D. Maintenance Data: Submit data including finish schedule showing where each product/color/finish was used, product technical data sheets, material safety data sheets (MSDS), care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.
- E. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. Extra Paint and Finish Materials: 1 gallon (4 L) of each color; from the same product run, store where directed.
 - 2. Label each container with color in addition to the manufacturer's label.

1.04 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified, with minimum three years documented experience.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.

- B. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- C. Paint Materials: Store at minimum ambient temperature of 45 degrees F (7 degrees C) and a maximum of 90 degrees F (32 degrees C), in ventilated area, and as required by manufacturer's instructions.

1.06 FIELD CONDITIONS

- A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.
- B. Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- C. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surface.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Provide paints and finishes from the same manufacturer to the greatest extent possible.
 - 1. If a single manufacturer cannot provide specified products; minor exceptions will be permitted provided approval by Architect is obtained using the specified procedures for substitutions.
- B. Paints: OR APPROVED EQUAL
 - 1. Base Manufacturer: Sherwin-Williams Company.
 - 2. Behr Process Corporation:
 - 3. PPG Paints:

2.02 PAINTS AND FINISHES - GENERAL

- A. Paints and Finishes: Ready-mixed, unless intended to be a field-catalyzed paint.
 - 1. Provide paints and finishes of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - 2. Supply each paint material in quantity required to complete entire project's work from a single production run.
 - 3. Do not reduce, thin, or dilute paint or finishes or add materials unless such procedure is specifically described in manufacturer's product instructions.
- B. Colors: As indicated on drawings.

2.03 ACCESSORY MATERIALS

- A. Accessory Materials: Provide primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials as required for final completion of painted surfaces.
- B. Patching Material: Latex filler.
- C. Fastener Head Cover Material: Latex filler.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Do not begin application of paints and finishes until substrates have been adequately prepared.
- B. Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- C. Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- D. Test shop-applied primer for compatibility with subsequent cover materials.
- E. Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces is below the following maximums:
 - 1. Gypsum Wallboard: 12 percent.

3.02 PREPARATION

- A. Clean surfaces thoroughly and correct defects prior to application.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- C. Remove or mask surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- D. Seal surfaces that might cause bleed through or staining of topcoat.
- E. Gypsum Board: Fill minor defects with filler compound. Spot prime defects after repair.
- F. Wood Doors to be Field-Finished: Seal wood door top and bottom edge surfaces with tinted primer.

3.03 APPLICATION

- A. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
- B. Apply products in accordance with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual".
- C. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- D. Apply each coat to uniform appearance in thicknesses specified by manufacturer.
- E. Dark Colors and Deep Clear Colors: Regardless of number of coats specified, apply as many coats as necessary for complete hide.
- F. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- G. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.04 CLEANING

A. Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.05 PROTECTION

- A. Protect finishes until completion of project.
- B. Touch-up damaged finishes after Substantial Completion.

SECTION 210500 COMMON WORK RESULTS FOR FIRE SUPPRESSION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Above ground piping.
- B. Escutcheons.
- C. Pipe hangers and supports.
- D. Retrofit sprinkler piping cover system.

1.02 RELATED REQUIREMENTS

A. Section 211300 - Fire-Suppression Sprinkler Systems: Sprinkler systems design.

1.03 REFERENCE STANDARDS

- A. ASME BPVC-IX Boiler and Pressure Vessel Code, Section IX Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators; 2021.
- B. ASME B16.1 Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250; 2020.
- C. ASME B16.3 Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.
- D. ASME B16.4 Gray Iron Threaded Fittings: Classes 125 and 250; 2021.
- E. ASME B16.5 Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard; 2020.
- F. ASTM A47/A47M Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).
- G. ASTM A795/A795M Standard Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use; 2021.
- H. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.
- I. NFPA 13 Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 723 Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturer's catalog information. Indicate valve data and ratings.
- C. Shop Drawings: Indicate pipe materials used, jointing methods, supports, and floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Sprinkler-based System:
 - 1. Comply with NFPA 13.
 - 2. See Section 211300.
- B. Welding Materials and Procedures: Comply with ASME BPVC-IX.
- C. Provide system pipes, fittings, sleeves, escutcheons, seals, and other related accessories.

2.02 ABOVE GROUND PIPING

- A. Steel Pipe: ASTM A795 Schedule 40, black.
 - 1. Steel Fittings: ASME B16.5 steel flanges and fittings.

- 2. Cast Iron Fittings: ASME B16.1, flanges and flanged fittings and ASME B16.4, threaded fittings.
- 3. Malleable Iron Fittings: ASME B16.3, threaded fittings and ASTM A47/A47M.
- 4. Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, "C" shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

2.03 PIPE HANGERS AND SUPPORTS

- A. Hangers for Pipe Sizes 1/2 to 1-1/2 inch (15 to 40 mm): Malleable iron, adjustable swivel, split ring.
- B. Hangers for Pipe Sizes 2 inches (50 mm) and Over: Carbon steel, adjustable, clevis.

2.04 RETROFIT-SPRINKLER PIPING COVER SYSTEM

- A. General Requirements:
 - 1. Surface Burning Characteristics: Flame spread index/smoke developed index of 20/250, maximum, when tested in accordance with ASTM E84 or UL 723.
- B. Materials:
 - 1. Piping Cover System: Removal-resistant, modular, snap-fit cover units, clips, and anchors for use with CPVC, steel, and copper piping systems.
 - 2. Provide sidewall sprinkler head housing in compliance with NFPA 13.

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and foreign material, from inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

- A. Install sprinkler system and service main piping, hangers, and supports in accordance with NFPA 13.
- B. Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- C. Install piping to conserve building space, to not interfere with use of space and other work.
- D. Group piping whenever practical at common elevations.
- E. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- F. Pipe Hangers and Supports:
 - 1. Install hangers to provide minimum 1/2 inch (15 mm) space between finished covering and adjacent work.
 - 2. Place hangers within 12 inches (300 mm) of each horizontal elbow.
 - 3. Use hangers with 1-1/2 inch (40 mm) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 - 4. Support vertical piping at every other floor. Support riser piping independently of connected horizontal piping.
 - 5. Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- G. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.
- H. Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc-rich primer to welding.
- I. Provide sleeves when penetrating footings, floors, walls, and partitions. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.

- J. Escutcheons:
 - 1. Install and firmly attach escutcheons at piping penetrations into finished spaces.
 - 2. Provide escutcheons on both sides of partitions separating finished areas through which piping passes.
 - 3. Use chrome plated escutcheons in occupied spaces and to conceal openings in construction.
- K. When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, unions, and couplings for servicing are consistently provided.

SECTION 210553 IDENTIFICATION FOR FIRE SUPPRESSION PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Pipe markers.

1.02 REFERENCE STANDARDS

A. ASME A13.1 - Scheme for the Identification of Piping Systems; 2020.

1.03 SUBMITTALS

- A. See Section 013000 Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturers catalog literature for each product required.
- C. Manufacturer's Installation Instructions: Indicate special procedures, and installation instructions.

PART 2 PRODUCTS

2.01 PIPE MARKERS

- A. Color: Comply with ASME A13.1.
- B. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.

PART 3 EXECUTION

3.01 INSTALLATION

SECTION 211300 FIRE-SUPPRESSION SPRINKLER SYSTEMS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. NFPA 13 - Standard for the Installation of Sprinkler Systems; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.02 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on sprinklers, valves, and specialties, including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- C. Shop Drawings:
 - 1. Indicate hydraulic calculations, detailed pipe layout, hangers and supports, sprinklers, components, and accessories. Indicate system controls.
 - 2. Submit shop drawings to Authorities Having Jurisdiction for approval. Submit proof of approval to Architect.
- D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
 - 1. See Section 016000 Product Requirements for additional provisions.
 - 2. Extra Sprinklers: Type and size matching those installed in quantity required by referenced NFPA design and installation standard.
 - 3. Sprinkler Wrenches: For each sprinkler type.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Sprinklers, Valves, and Equipment:
 - 1. Anvil International: www.anvilintl.com/#sle.
 - 2. Tyco Fire Protection Products: www.tyco-fire.com/#sle.
 - 3. Viking Corporation: www.vikinggroupinc.com/#sle.

2.02 SPRINKLER SYSTEM

- A. Sprinkler System: Provide coverage for entire building.
- B. Occupancy: Light hazard; comply with NFPA 13.
- C. Water Supply: Determine volume and pressure from water flow test data.
- D. Storage Cabinet for Spare Sprinklers and Tools: Steel, located adjacent to alarm valve.
- E. Pipe Hanger Fasteners: Attach hangers to structure using appropriate fasteners, as follows:
 1. Concrete Wedge Expansion Anchors: Complying with ICC-ES AC193.

2.03 SPRINKLERS

- A. Suspended Ceiling Type: Semi-recessed pendant type with matching push on escutcheon plate.
 - 1. Response Type: Quick.
 - 2. Coverage Type: Standard.
 - 3. Finish: Brass.
 - 4. Fusible Link: Fusible solder link type temperature rated for specific area hazard.
- B. Flexible Drop System: Stainless steel, multiple use, open gate type.
 - 1. Application: Use to properly locate sprinkler heads.
 - 2. Include all supports and bracing.
 - 3. Provide braided type tube as required for the application.
 - 4. Manufacturers:

PART 3 EXECUTION

3.01 INSTALLATION

TCNJ Roscoe Hall Lower Level Renovation

- A. Install in accordance with referenced NFPA design and installation standard.
- B. Install equipment in accordance with manufacturer's instructions.
- C. Place pipe runs to minimize obstruction to other work.
- D. Place piping in concealed spaces above finished ceilings.
- E. Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace painted sprinklers.
- F. Flush entire piping system of foreign matter.
- G. Hydrostatically test entire system.
- H. Require test be witnessed by Fire Marshal.

SECTION 220523 GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Ball valves.

1.02 REFERENCE STANDARDS

- A. ASME B16.18 Cast Copper Alloy Solder Joint Pressure Fittings; 2021.
- B. MSS SP-110 Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends; 2010, with Errata .
- C. NSF 61 Drinking Water System Components Health Effects; 2022, with Errata.
- D. NSF 372 Drinking Water System Components Lead Content; 2022.

1.03 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

PART 2 PRODUCTS

2.01 APPLICATIONS

- A. See drawings for specific valve locations.
- B. Listed pipe sizes shown using nominal pipe sizes (NPS) and nominal diameter (DN).
- C. Provide the following valves for the applications if not indicated on drawings:
- D. Domestic, Hot and Cold Water Valves:
 - 1. 2 inch (50 mm, DN) and Smaller:
 - a. Bronze and Brass: Provide with solder-joint ends.
 - b. Ball: One piece, full port, brass with brass trim.

2.02 GENERAL REQUIREMENTS

- A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.
- B. Valve Sizes: Match upstream piping unless otherwise indicated.
- C. Valve Actuator Types:
- D. Valve-End Connections:
 - 1. Solder Joint Connections: ASME B16.18.
- E. General ASME Compliance:
- F. Potable Water Use:
 - 1. Certified: Approved for use in compliance with NSF 61 and NSF 372.
 - 2. Lead-Free Certified: Wetted surface material includes less than 0.25 percent lead content.

2.03 BRASS, BALL VALVES

- A. One Piece, Full Port with Brass Trim and Push-to-fit or Threaded Connections:
 - 1. Comply with MSS SP-110.
 - 2. CWP Rating: 200 psi (1,379 kPa).
 - 3. Body: Forged brass.
 - 4. Seats: PTFE.
 - 5. Stem: Brass.
 - 6. Ball: Chrome-plated brass.
 - 7. Operator: Handle.

PART 3 EXECUTION

TCNJ Roscoe Hall Lower Level Renovation

3.01 EXAMINATION

- A. Discard all packing materials and verify that valve interior, including threads and flanges are completely clean without signs of damage or degradation that could result in leakage.
- B. Verify valve parts to be fully operational in all positions from closed to fully open.
- C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.
- D. Should valve is determined to be defective, replace with new valve.

3.02 INSTALLATION

- A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.
- B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

SECTION 220529 HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe hangers.
- B. Pipe supports, guides, shields, and saddles.

1.02 RELATED REQUIREMENTS

A. Section 055000 - Metal Fabrications.

1.03 REFERENCE STANDARDS

- A. ASTM A123/A123M Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- C. ASTM B633 Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2019.

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for metal channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Provide required hardware to hang or support piping, equipment, or fixtures with related accessories as necessary to complete installation of plumbing work.
- B. Provide hardware products listed, classified, and labeled as suitable for intended purpose.
- C. Materials for Metal Fabricated Supports: Comply with Section 055000.
 - 1. Zinc-Plated Steel: Electroplated in accordance with ASTM B633 unless stated otherwise.
 - 2. Galvanized Steel: Hot-dip galvanized in accordance with ASTM A123/A123M or ASTM A153/A153M unless stated otherwise.
- D. Corrosion Resistance: Use corrosion-resistant metal-based materials fully compatible with exposed piping materials and suitable for the environment where installed.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.
- C. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- D. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- E. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.

- F. Equipment Support and Attachment:
 - 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 - 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 - 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 - 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- G. Secure fasteners according to manufacturer's recommended torque settings.
- H. Remove temporary supports.

SECTION 220719 PLUMBING PIPING INSULATION

PART 2 PRODUCTS

1.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

SECTION 221005 PLUMBING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Sanitary waste piping, above grade.
- B. Domestic water piping, above grade.

1.02 RELATED REQUIREMENTS

A. Section 330110.58 - Disinfection of Water Utility Piping Systems.

1.03 REFERENCE STANDARDS

- A. ASME B16.18 Cast Copper Alloy Solder Joint Pressure Fittings; 2021.
- B. ASME B16.22 Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.
- C. ASME B16.23 Cast Copper Alloy Solder Joint Drainage Fittings: DWV; 2021.
- D. ASME B16.29 Wrought Copper and Wrought Copper Alloy Solder-Joint Drainage Fittings—DWV; 2017.
- E. ASTM A74 Standard Specification for Cast Iron Soil Pipe and Fittings; 2021.
- F. ASTM B32 Standard Specification for Solder Metal; 2020.
- G. ASTM B88 Standard Specification for Seamless Copper Water Tube; 2022.
- H. ASTM B88M Standard Specification for Seamless Copper Water Tube (Metric); 2020.
- I. ASTM B813 Standard Specification for Liquid and Paste Fluxes for Soldering of Copper and Copper Alloy Tube; 2016.
- J. ASTM B828 Standard Practice for Making Capillary Joints by Soldering of Copper and Copper Alloy Tube and Fittings; 2016.
- K. ASTM C564 Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2020a.
- L. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.
- M. NSF 61 Drinking Water System Components Health Effects; 2022, with Errata.
- N. NSF 372 Drinking Water System Components Lead Content; 2022.
- O. UL 723 Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Potable Water Supply Systems: Provide piping, pipe fittings, and solder and flux (if used), that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.
- B. Plenum-Installed Acid Waste Piping: Flame-spread index equal or below 25 and smoke-spread index equal or below 50 according to ASTM E84 or UL 723 tests.

2.02 SANITARY WASTE PIPING, ABOVE GRADE

- A. Cast Iron Pipe: ASTM A74, service weight.
 - 1. Fittings: Cast iron.
 - 2. Joint Seals: ASTM C564 neoprene gaskets, or lead and oakum.
- B. Copper Tube: ASTM B88 (ASTM B88M), Type K (A).
 - 1. Fittings: ASME B16.29, wrought copper, or ASME B16.23, sovent.
 - 2. Joints: ASTM B32, alloy Sn50 solder.

2.03 DOMESTIC WATER PIPING, ABOVE GRADE

A. Copper Pipe: ASTM B88 (ASTM B88M), Type K (A), Drawn (H).

- 1. Fittings: ASME B16.18, cast copper alloy or ASME B16.22, wrought copper and bronze.
- 2. Fittings: Cast iron, coated.
- 3. Joints: ASTM B32, alloy Sn95 solder.
- 4. Mechanical Press Sealed Fittings: Double-pressed type, NSF 61 and NSF 372 approved or certified, utilizing EPDM, nontoxic, synthetic rubber sealing elements.

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Remove scale and dirt, on inside and outside, before assembly.
- C. Prepare piping connections to equipment with flanges or unions.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- C. Copper Pipe and Tube: Make soldered joints in accordance with ASTM B828, using specified solder, and flux meeting ASTM B813; in potable water systems use flux also complying with NSF 61 and NSF 372.

3.03 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Disinfect water distribution system in accordance with Section 330110.58.
- B. Prior to starting work, verify system is complete, flushed, and clean.

3.04 SCHEDULES

- A. Pipe Hanger Spacing:
 - 1. Metal Piping:
 - a. Pipe Size: 1/2 inch (15 mm, DN) to 1-1/4 inch (32 mm, DN):
 - 1) Maximum Hanger Spacing: 6.5 ft (2 m).
 - 2) Hanger Rod Diameter: 3/8 inches (9 mm).
 - b. Pipe Size: 1-1/2 inch (40 mm, DN) to 2 inch (50 mm, DN):
 - 1) Maximum Hanger Spacing: 10 ft (3 m).
 - 2) Hanger Rod Diameter: 3/8 inch (9 mm).

SECTION 224000 PLUMBING FIXTURES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Sinks.
- B. Bi-level, electric water coolers.

1.02 REFERENCE STANDARDS

- A. ADA Standards 2010 ADA Standards for Accessible Design; 2010.
- B. ASHRAE Std 18 Methods of Testing for Rating Drinking-Water Coolers with Self-Contained Mechanical Refrigeration; 2008 (Reaffirmed 2013).
- C. ASME A112.18.1 Plumbing Supply Fittings; 2018, with Errata.
- D. ASME A112.19.3 Stainless Steel Plumbing Fixtures; 2022.
- E. NSF 61 Drinking Water System Components Health Effects; 2022, with Errata.
- F. NSF 372 Drinking Water System Components Lead Content; 2022.

1.03 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Product Data: Provide catalog illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.
- C. Manufacturer's Instructions: Indicate installation methods and procedures.
- D. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.04 WARRANTY

- A. See Section 017800 Closeout Submittals for additional warranty requirements.
- B. Provide five year manufacturer warranty for electric water cooler.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Potable Water Systems: Provide plumbing fittings and faucets that comply with NSF 61 and NSF 372 for maximum lead content; label pipe and fittings.

2.02 SINKS

- A. Undermount-Installed Single Compartment Bowl:
 - 1. ASME A112.19.3, stainless steel with ledge back drilled for trim.
 - 2. Undercoated with side and bottom sound deadening pads.
 - 3. Drain: 1-1/2 inch (38 mm), stainless steel with strainer, crumb cup, and tailpiece.
- B. Kitchen Faucets:

1.

- Two-Handle Faucet:
 - a. Type: Deck-mount, lever operated faucet with mounting plate.
 - b. Spray Type: Full stream spray at 1.75 gpm (6.62 L/min), maximum.
 - c. ASME A112.18.1, ADA Standards, and NSF 61 compliant assembly.
- d. Materials: Stainless steel disc valve on brass body with polished chrome finish.

2.03 BI-LEVEL, ELECTRIC WATER COOLERS

- A. Water Cooler: Bi-level, electric, mechanically refrigerated; surface mounted, ADA compliant; stainless steel top, vinyl on steel body, elevated anti-squirt bubbler with stream guard, automatic stream regulator, push button, mounting bracket; integral air cooled condenser and stainless steel grille.
 - 1. Capacity: 8 gph (30.3 Lph) of 50 degrees F (10 degrees C) water with inlet at 80 degrees F (27 degrees C) and room temperature of 90 degrees F (32 degrees C), when tested in

accordance with ASHRAE Std 18.

- 2. Electrical: 115 VAC, 60 Hertz compressor, 6 foot (2 m) cord and plug for connection to electric wiring system including grounding connector.
- B. Bottle Filler: Materials to match fountain.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- B. Verify that electric power is available and of the correct characteristics.

3.02 PREPARATION

A. Rough-in fixture piping connections in accordance with minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.03 INSTALLATION

A. Install components level and plumb.

3.04 SCHEDULES

- A. Fixture Heights: Install fixtures to heights above finished floor as indicated.
 - 1. Drinking Fountain:
 - a. Child: 30 inches (760 mm) to top of basin rim.
 - b. Standard Adult: 40 inches (1015 mm) to top of basin rim.
 - c. Accessible: 36 inches (915 mm) to top of spout.
- B. Fixture Rough-In
 - 1. Sink:
 - a. Cold Water: 1/2 Inch (15 mm).
 - b. Waste: 1-1/2 Inch (40 mm).
 - c. Vent: 1-1/4 Inch (32 mm).
 - 2. Drinking Fountain:
 - a. Cold Water: 1/2 Inch (15 mm).
 - b. Waste: 1-1/4 Inch (32 mm).
 - c. Vent: 1-1/4 Inch (32 mm).

SECTION 230513 COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. General construction and requirements.
- B. Applications.
- C. Three phase electric motors.
- D. Electronically Commutated Motors (ECM).

1.02 RELATED REQUIREMENTS

A. Section 260583 - Wiring Connections: Electrical characteristics and wiring connections.

1.03 REFERENCE STANDARDS

- A. NEMA MG 1 Motors and Generators; 2021.
- B. NFPA 70 National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.
- C. Manufacturer's Installation Instructions: Indicate setting, mechanical connections, lubrication, and wiring instructions.
- D. Operation Data: Include instructions for safe operating procedures.
- E. Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

PART 2 PRODUCTS

2.01 GENERAL CONSTRUCTION AND REQUIREMENTS

- A. Electrical Service: Refer to Section 260583 for required electrical characteristics.
- B. Electrical Service:
 - 1. Motors Larger than 1/2 Horsepower: 460/3 volts, three phase, 60 Hz.
- C. Construction:
 - 1. Open drip-proof type except where specifically noted otherwise.
 - 2. Design for continuous operation in 104 degrees F (40 degrees C) environment.
 - 3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.
- D. Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.
- E. Wiring Terminations:
 - 1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
 - 2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

2.02 APPLICATIONS

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install securely on firm foundation. Mount ball bearing motors with shaft in any position.

C. Check line voltage and phase and ensure agreement with nameplate.

SECTION 230519 METERS AND GAUGES FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pressure gauges and pressure gauge taps.
- B. Thermometers and thermometer wells.

1.02 REFERENCE STANDARDS

- A. ASME B40.100 Pressure Gauges and Gauge Attachments; 2022.
- B. ASTM E1 Standard Specification for ASTM Liquid-in-Glass Thermometers; 2014 (Reapproved 2020).
- C. UL 393 Indicating Pressure Gauges for Fire-Protection Service; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 013000 Administrative Requirements, for submittal procedures.
- B. Product Data: Provide list that indicates use, operating range, total range and location for manufactured components.

PART 2 PRODUCTS

2.01 PRESSURE GAUGES

A. Pressure Gauges: ASME B40.100, UL 393 drawn steel case, phosphor bronze bourdon tube, rotary brass movement, brass socket, with front recalibration adjustment, black scale on white background.

2.02 PRESSURE GAUGE TAPPINGS

A. Gauge Cock: Tee or lever handle, brass for maximum 150 psi (1034 kPa).

2.03 STEM TYPE THERMOMETERS

A. Thermometers - Adjustable Angle: Red- or blue-appearing non-toxic liquid in glass; ASTM E1; lens front tube, cast aluminum case with enamel finish, cast aluminum adjustable joint with positive locking device; adjustable 360 degrees in horizontal plane, 180 degrees in vertical plane.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install thermometers in piping systems in sockets in short couplings. Enlarge pipes smaller than 2-1/2 inch (60 mm) for installation of thermometer sockets. Ensure sockets allow clearance from insulation.

SECTION 230523 GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Globe valves.
- B. Ball valves.
- C. Butterfly valves.
- D. Check valves.
- E. Gate valves.

1.02 REFERENCE STANDARDS

- A. ASME B1.20.1 Pipe Threads, General Purpose, Inch; 2013 (Reaffirmed 2018).
- B. ASME B16.18 Cast Copper Alloy Solder Joint Pressure Fittings; 2021.
- C. ASME B16.34 Valves Flanged, Threaded, and Welding End; 2020.
- D. ASME B31.9 Building Services Piping; 2020.
- E. ASTM A126 Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings; 2004 (Reapproved 2019).
- F. ASTM A216/A216M Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding, for High-Temperature Service; 2021.
- G. ASTM A536 Standard Specification for Ductile Iron Castings; 1984, with Editorial Revision (2019).
- H. ASTM B62 Standard Specification for Composition Bronze or Ounce Metal Castings; 2017.
- I. MSS SP-67 Butterfly Valves; 2022.
- J. MSS SP-68 High Pressure Butterfly Valves with Offset Design; 2021.
- K. MSS SP-70 Gray Iron Gate Valves, Flanged and Threaded Ends; 2011.
- L. MSS SP-71 Gray Iron Swing Check Valves, Flanged and Threaded Ends; 2018.
- M. MSS SP-80 Bronze Gate, Globe, Angle, and Check Valves; 2019.
- N. MSS SP-85 Gray Iron Globe and Angle Valves, Flanged and Threaded Ends; 2011.

1.03 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on valves including manufacturers catalog information. Submit performance ratings, rough-in details, weights, support requirements, and piping connections.
- C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

PART 2 PRODUCTS

2.01 APPLICATIONS

- A. See drawings for specific valve locations.
- B. Listed pipe sizes shown using nominal pipe sizes (NPS) and nominal diameter (DN).
- C. Provide the following valves for the applications if not indicated on drawings:
- D. Chilled Water Valves:
 - 1. Size 2 inch (50 mm, DN) and Smaller, Brass and Bronze Valves:
 - a. Threaded ends.
 - b. Globe: Bronze disc, Class 125.
 - 2. Size 2-1/2 inch (65 mm, DN) and Larger, Iron Valves:
 - a. 2-1/2 inch (65 mm, DN) to 4 inch (100 mm, DN): Threaded ends.

- b. Single-Flange Butterfly: 2-1/2 inch (65 mm, DN) to 12 inch (300 mm, DN), aluminumbronze disc, EPDM seat, 200 CWP.
- c. Grooved-End Butterfly: 2-1/2 inch (65 mm, DN) to 12 inch (300 mm, DN), 175 CWP.
- d. Swing Check: Metal seats, Class 125.
- e. Swing Check with Closure Control: 2-1/2 inch (65 mm, DN) to 12 inch (300 mm, DN), lever and spring, Class 125.
- f. Grooved-End Check: 3 inch (80 mm, DN) to 12 inch (300 mm, DN), 300 CWP.
- g. Gate: NRS, Class 125.
- h. Globe: Class 125.
- E. Heating Hot Water Valves:
 - 1. Size 2 inch (50 mm, DN) and Smaller, Brass and Bronze Valves:
 - a. Threaded ends.
 - b. Ball: Full port, one piece, brass trim.
 - 2. Size 2-1/2 inch (65 mm, DN) and Larger, Iron Valves:
 - a. 2-1/2 inch (65 mm, DN) to 4 inch (100 mm, DN): Threaded ends.
 - b. Single-Flange Butterfly: 2-1/2 inch (65 mm, DN) to 12 inch (300 mm, DN), aluminumbronze disc, EPDM seat, 200 CWP.
 - c. Grooved-End Butterfly: 2-1/2 inch (65 mm, DN) to 12 inch (300 mm, DN), 175 CWP.
 - d. Swing Check: Metal seats, Class 125.
 - e. Swing Check: 2-1/2 inch (65 mm, DN) to 12 inch (300 mm, DN), lever and spring closure control, Class 125.
 - f. Grooved-End Swing Check: 3 inch (80 mm, DN) to 12 inch (300 mm, DN), 300 CWP.
- F. Low Pressure Steam Valves for Pressures of 15 psi (104 kPa) or Less:
 - 1. Size 2 inch (50 mm, DN) and Smaller, Brass and Bronze Valves:
 - a. Gate: NRS, Class 125.
 - b. Globe: Bronze disc, Class 125.
 - 2. Size 2-1/2 inch (65 mm, DN) and Larger, Iron Valves:
 - a. Swing Check: Metal seats, Class 125.
 - b. Globe: 2-1/2 inch (65 mm, DN) to 12 inch (300 mm, DN): Class 125.
- G. High Pressure Steam Valves for Pressures Greater than 15 psi (104 kPa):
 - 1. Size 2 inch (50 mm, DN) and Smaller, Brass and Bronze Valves:
 - a. Swing Check: Bronze disc, Class 125.
 - b. Gate: NRS, Class 125.
 - c. Globe: Bronze disc, Class 125.
 - 2. Size 2-1/2 inch (65 mm, DN) and Larger, Iron Valves:
 - a. Swing Check: Metal seats, Class 125.
 - b. Gate: NRS, Class 125.
 - c. Globe: 2-1/2 inch (65 mm, DN) to 12 inch (300 mm, DN), Class 125.
- H. Steam-Condensate Valves:
 - 1. Size 2 inch (50 mm, DN) and Smaller, Brass and Bronze Valves:
 - 2. Size 2-1/2 inch (65 mm, DN) and Larger, Iron Valves:
 - a. Gate: NRS, Class 125.

2.02 GENERAL REQUIREMENTS

- A. Valve Pressure and Temperature Ratings: No less than rating indicated; as required for system pressures and temperatures.
- B. Valve Sizes: Match upstream piping unless otherwise indicated.
- C. Valve Actuator Types:
 - 1. Handwheel: Valves other than quarter-turn types.
 - 2. Hand Lever: Quarter-turn valves 6 inch (150 mm, DN) and smaller.
- D. Valves in Insulated Piping: Provide 2 inch (50 mm, DN) stem extensions and the following features:
 - 1. Gate Valves: Rising stem.

- 2. Butterfly Valves: Extended neck.
- E. Valve-End Connections:
 - 1. Threaded End Valves: ASME B1.20.1.
 - 2. Solder Joint Connections: ASME B16.18.
- F. General ASME Compliance:
 - 1. Building Services Piping Valves: ASME B31.9.

2.03 BRONZE, GLOBE VALVES

- A. CWP Rating: Class 125: 200 psi (1,380 kPa):
 - 1. Comply with MSS SP-80, Type 1.
 - 2. Body: Bronze; ASTM B62, with integral seat and screw in bonnet.
 - 3. Ends: Threaded or solder joint.
 - 4. Stem and Disc: Bronze or PTFE.
 - 5. Packing: Asbestos free.
 - 6. Handwheel: Malleable iron.

2.04 IRON, GLOBE VALVES

- A. CWP Ratings: Class 125: 200 psi (1,380 kPa) and Class 250: 500 psi (3,450 kPa):
 - 1. Comply with MSS SP-85, Type I.
 - 2. Body: Gray iron; ASTM A126, with bolted bonnet.
 - 3. Ends: Flanged.
 - 4. Trim: Bronze.
 - 5. Packing and Gasket: Asbestos free.
 - 6. Operator: Handwheel or chainwheel.

2.05 CARBON STEEL, GLOBE VALVES

- A. Class 150:
 - 1. Body: ASTM A216/A216M.
 - 2. WOG Rating: 150 psi (1,034 kPa).
 - 3. Bonnet: NRS; Nonrising Stem.
 - 4. End Connections: Flanged.
 - 5. Packing and Gasket: Asbestos free.
 - 6. Operator: Malleable Iron handwheel.
 - 7. Pressure and Temperature Rating: ASME B16.34.

2.06 IRON, SINGLE FLANGE BUTTERFLY VALVES

- A. Lug Style; Bidirectional dead-end service without use of downstream flange:
 - 1. Comply with MSS SP-67, Type I.
 - 2. Lug Style, CWP Ratings:
 - a. Sizes 2 to 12 inch (50 to 300 mm, DN): 150 psi (1,034 kPa).
 - b. Sizes 14 to 24 inch (350 to 600 mm, DN): 100 psi (689.5 kPa).
 - c. Vacuum Service: Down to 29.9 in-Hg (101.2 kPa).
 - 3. Body Material: ASTM A126 cast iron or ASTM A536 ductile iron.
 - 4. Stem: One or two-piece stainless steel.
 - 5. Seat: NBR.
 - 6. Disc: Coated ductile iron.

2.07 IRON, GROOVED-END BUTTERFLY VALVES

2.08 HIGH-PERFORMANCE, SINGLE FLANGE BUTTERFLY VALVES

- A. Lug type; Bidirectional dead end service without downstream flange:
 - 1. Comply with MSS SP-68.
 - 2. Class 150: CWP Rating: 285 psi (1,965 kPa) at 100 degrees F (38 degrees C).
 - 3. Body: Provide carbon steel, cast iron, ductile Iron, or stainless steel.
 - 4. Seat: Metal or reinforced PTFE.
 - 5. Offset stem: Stainless steel.
6. Disc: Carbon steel.

2.09 BRONZE, SWING CHECK VALVES

- A. Class 125:
 - 1. Pressure and Temperature Rating: MSS SP-80, Type 3.
 - 2. Design: Y-pattern, horizontal or vertical flow.
 - 3. WSP Rating: 200 psi (1,380 kPa).
 - 4. Body: Bronze, ASTM B62.
 - 5. End Connections: Threaded or soldered.
 - 6. Disc: Bronze.

2.10 IRON, FLANGED END SWING CHECK VALVES

- A. Class 125:
 - 1. 150 psi (1,035 kPa) with metal seats.
 - 2. 200 psi (1,380 kPa) with metal seats and nonmetallic-to-metal seats.

2.11 IRON, SWING CHECK VALVES WITH CLOSURE CONTROL

- A. Class 125:
 - 1. Comply with MSS SP-71, Type I.
 - 2. Body Design: Clear or full waterway.
 - 3. Body Material: ASTM A126, gray iron with bolted bonnet.
 - 4. Ends: Flanged.
 - 5. Trim: Bronze.
 - 6. Gasket: Asbestos free.
 - 7. Closer Control: Factory installed, exterior lever, and spring or weight.

2.12 IRON, GROOVED-END SWING CHECK VALVES

- A. Class 300:
 - 1. CWP Rating: 300 psi (2,070 kPa).
 - 2. Body Material: ASTM A536, Grade 65-45-12 ductile iron.
 - 3. Seal: EPDM or Nitrile.
 - 4. Disc: Ductile iron.
 - 5. Coating: Black, non-lead paint.

2.13 BRONZE, GATE VALVES

- A. Rising Stem or OS&Y:
 - 1. Pressure-Temperature Range: MSS SP-80, Type I.
 - 2. Body: ASTM B62, bronze with integral seat and screw-in bonnet.
 - 3. End Connections: Threaded or solder.
 - 4. Stem: Bronze.
 - 5. Disc: Solid wedge; bronze.
 - 6. Packing: Asbestos free.
 - 7. Handwheel Operator: Malleable iron, bronze, or aluminum.

2.14 IRON, GATE VALVES

- A. NRS or OS&Y:
 - 1. Comply with MSS SP-70, Type I.
 - 2. Body Material: Gray iron with bolted bonnet.
 - 3. Ends: Flanged.
 - 4. Trim: Bronze.
 - 5. Disc: Solid wedge.
 - 6. Packing and Gasket: Asbestos free.

PART 3 EXECUTION

3.01 EXAMINATION

A. Discard all packing materials and verify that valve interior, including threads and flanges, are completely clean without signs of damage or degradation that could result in leakage.

- B. Verify valve parts to be fully operational in all positions from closed to fully open.
- C. Confirm gasket material to be suitable for the service, to be of correct size, and without defects that could compromise effectiveness.
- D. Should valve is determined to be defective, replace with new valve.

3.02 INSTALLATION

- A. Provide unions or flanges with valves to facilitate equipment removal and maintenance while maintaining system operation and full accessibility for servicing.
- B. Provide separate valve support as required and locate valve with stem at or above center of piping, maintaining unimpeded stem movement.

SECTION 230529 HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Support and attachment components.
- B. Retrofit piping cover system.

1.02 REFERENCE STANDARDS

- A. ASTM A123/A123M Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- C. ASTM A47/A47M Standard Specification for Ferritic Malleable Iron Castings; 1999, with Editorial Revision (2022).
- D. ASTM B633 Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2019.
- E. MFMA-4 Metal Framing Standards Publication; 2004.

1.03 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes and arrangement of supports and bases with the actual equipment and components to be installed.
 - 2. Coordinate the work with other trades to provide additional framing and materials required for installation.
 - 3. Coordinate compatibility of support and attachment components with mounting surfaces at the installed locations.
 - 4. Coordinate the arrangement of supports with ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
 - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not install products on or provide attachment to concrete surfaces until concrete has fully cured in accordance with Section 033000.

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, nonpenetrating rooftop supports, post-installed concrete and masonry anchors, and thermal insulated pipe supports.

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
 - 1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of plumbing work.
 - 2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
 - 3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of _____. Include consideration for vibration, equipment operation, and shock loads where applicable.
 - 4. Steel Components: Use corrosion resistant materials suitable for the environment where installed.

- a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
- b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Prefabricated Trapeze-Framed Metal Strut Systems:
 - 1. Strut Channel or Bracket Material:
 - 2. Accessories: Provide bracket covers, cable basket clips, cable tray clips, clamps, conduit clamps, fire-retarding brackets, j-hooks, protectors, and vibration dampeners.
- C. Hanger Rods:
 - 1. Threaded zinc-plated steel unless otherwise indicated.
- D. Anchors and Fasteners:
 - 1. Unless otherwise indicated and where not otherwise restricted, use the anchor and fastener types indicated for the specified applications.
 - 2. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
 - 3. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
 - 4. Steel: Use beam-ceiling clamps, beam clamps, machine bolts, or welded threaded studs.
 - 5. Beam Ceiling Flanges: ASTM A47/A47M Grade 32510, malleable iron or stainless steel with copper, plain, stainless steel, or zinc finish.
 - 6. Preset Concrete Inserts: Continuous metal channel (strut) and spot inserts specifically designed to be cast in concrete ceilings, walls, and floors.
 - a. Comply with MFMA-4.
 - b. Channel Material: Use galvanized steel.
 - c. Manufacturer: Same as manufacturer of metal channel (strut) framing system.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, conduit, or other systems.
- D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- G. Equipment Support and Attachment:
 - 1. Use metal fabricated supports or supports assembled from metal channel (strut) to support equipment as required.
 - 2. Use metal channel (strut) secured to studs to support equipment surface-mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 - 3. Use metal channel (strut) to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 - 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- H. Preset Concrete Inserts: Use manufacturer-provided closure strips to inhibit concrete seepage during concrete pour.

- I. Secure fasteners according to manufacturer's recommended torque settings.
- J. Remove temporary supports.

SECTION 230553 IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Nameplates.
- B. Pipe markers.

1.02 RELATED REQUIREMENTS

A. Section 099123 - Interior Painting: Identification painting.

1.03 REFERENCE STANDARDS

- A. ASME A13.1 Scheme for the Identification of Piping Systems; 2020.
- B. ASTM D709 Standard Specification for Laminated Thermosetting Materials; 2017.

PART 2 PRODUCTS

2.01 NAMEPLATES

- A. Letter Color: White.
- B. Letter Height: 1/4 inch (6 mm).
- C. Background Color: Black.
- D. Plastic: Comply with ASTM D709.

2.02 PIPE MARKERS

- A. Color: Comply with ASME A13.1.
- B. Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- C. Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure-sensitive adhesive backing and printed markings.

PART 3 EXECUTION

3.01 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.
- B. Prepare surfaces in accordance with Section 099123 for stencil painting.

3.02 INSTALLATION

- A. Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- B. Install tags with corrosion resistant chain.
- C. Install plastic pipe markers in accordance with manufacturer's instructions.
- D. Install plastic tape pipe markers complete around pipe in accordance with manufacturer's instructions.

SECTION 230593 TESTING, ADJUSTING, AND BALANCING FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Testing, adjustment, and balancing of air systems.
- B. Testing, adjustment, and balancing of hydronic, steam, and refrigerating systems.
- C. Measurement of final operating condition of HVAC systems.

1.02 REFERENCE STANDARDS

- A. AABC (NSTSB) AABC National Standards for Total System Balance, 7th Edition; 2016.
- B. ASHRAE Std 111 Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems; 2008, with Errata (2019).
- C. NEBB (TAB) Procedural Standard for Testing Adjusting and Balancing of Environmental Systems; 2019.
- D. SMACNA (TAB) HVAC Systems Testing, Adjusting and Balancing; 2002.

1.03 SUBMITTALS

- A. See Section 013000 Administrative Requirements, for submittal procedures.
- B. Installer Qualifications: Submit name of adjusting and balancing agency and TAB supervisor for approval within 30 days after award of Contract.
- C. TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
 - 1. Submit to Architect.
 - 2. Submit six weeks prior to starting the testing, adjusting, and balancing work.
 - 3. Include certification that the plan developer has reviewed Contract Documents, the equipment and systems, and the control system with the Architect and other installers to sufficiently understand the design intent for each system.
 - 4. Include at least the following in the plan:
 - a. List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
 - b. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
 - c. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
 - d. Final test report forms to be used.
 - e. Procedures for formal deficiency reports, including scope, frequency and distribution.
- D. Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
 - 1. Revise TAB plan to reflect actual procedures and submit as part of final report.
 - 2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
 - 3. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
 - 4. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
 - 5. Units of Measure: Report data in both I-P (inch-pound) and SI (metric) units.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 GENERAL REQUIREMENTS

A. Perform total system balance in accordance with one of the following:

- 1. AABC (NSTSB), AABC National Standards for Total System Balance.
- 2. SMACNA (TAB).
- B. Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C. TAB Agency Qualifications:
 - 1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
 - 2. Certified by one of the following:
 - a. AABC, Associated Air Balance Council: www.aabc.com/#sle; upon completion submit AABC National Performance Guaranty.
 - b. NEBB, National Environmental Balancing Bureau: www.nebb.org/#sle.
 - c. TABB, The Testing, Adjusting, and Balancing Bureau of National Energy Management Institute: www.tabbcertified.org/#sle.
- D. TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.

3.02 EXAMINATION

- A. Verify that systems are complete and operable before commencing work. Ensure the following conditions:
 - 1. Systems are started and operating in a safe and normal condition.
 - 2. Temperature control systems are installed complete and operable.
 - 3. Proper thermal overload protection is in place for electrical equipment.
 - 4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
 - 5. Duct systems are clean of debris.
 - 6. Fans are rotating correctly.
 - 7. Fire and volume dampers are in place and open.
 - 8. Air coil fins are cleaned and combed.
 - 9. Access doors are closed and duct end caps are in place.
 - 10. Air outlets are installed and connected.
 - 11. Duct system leakage is minimized.
 - 12. Hydronic systems are flushed, filled, and vented.
 - 13. Service and balance valves are open.

3.03 ADJUSTMENT TOLERANCES

- A. Air Handling Systems: Adjust to within plus or minus 5 percent of design for supply systems and plus or minus 10 percent of design for return and exhaust systems.
- B. Air Outlets and Inlets: Adjust total to within plus 10 percent and minus 5 percent of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.04 RECORDING AND ADJUSTING

- A. Field Logs: Maintain written logs including:
 - 1. Running log of events and issues.
 - 2. Discrepancies, deficient or uncompleted work by others.
 - 3. Contract interpretation requests.
 - 4. Lists of completed tests.
- B. Ensure recorded data represents actual measured or observed conditions.
- C. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- D. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- E. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

3.05 AIR SYSTEM PROCEDURE

- A. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.
- B. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- C. Measure air quantities at air inlets and outlets.
- D. Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.
- E. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.05 inches (12.5 Pa) positive static pressure near the building entries.
- F. Check multi-zone units for motorized damper leakage. Adjust air quantities with mixing dampers set first for cooling, then heating, then modulating.
- G. For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.
- H. On fan powered VAV boxes, adjust air flow switches for proper operation.

3.06 WATER SYSTEM PROCEDURE

- A. Adjust water systems to provide required or design quantities.
- B. Use calibrated Venturi tubes, orifices, or other metered fittings and pressure gauges to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.
- C. Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.
- D. Effect system balance with automatic control valves fully open to heat transfer elements.
- E. Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.
- F. Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

SECTION 230719 HVAC PIPING INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Piping insulation.
- B. Flexible removable and reusable blanket insulation.
- C. Jacketing and accessories.

1.02 RELATED REQUIREMENTS

A. Section 078400 - Firestopping.

1.03 REFERENCE STANDARDS

- A. ASTM C177 Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus; 2019.
- B. ASTM C547 Standard Specification for Mineral Fiber Pipe Insulation; 2022a.
- C. ASTM C795 Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel; 2008 (Reapproved 2018).
- D. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.
- E. ASTM E96/E96M Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials; 2022a.
- F. UL 723 Standard for Test for Surface Burning Characteristics of Building Materials; Current Edition, Including All Revisions.

PART 2 PRODUCTS

2.01 REGULATORY REQUIREMENTS

A. Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84 or UL 723.

2.02 GLASS FIBER, RIGID

- A. Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
 - 1. K (Ksi) Value: ASTM C177, 0.24 at 75 degrees F (0.035 at 24 degrees C).
 - 2. Maximum Service Temperature: 850 degrees F (454 degrees C).
 - 3. Maximum Moisture Absorption: 0.2 percent by volume.
- B. Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perminches (0.029 ng/(Pa s m)).
- C. Vapor Barrier Lap Adhesive: Compatible with insulation.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Test piping for design pressure, liquid tightness, and continuity prior to applying insulation materials.
- B. Verify that surfaces are clean and dry, with foreign material removed.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Glass Fiber Insulated Pipes Conveying Fluids Below Ambient Temperature:
 - 1. Provide vapor barrier jackets, factory-applied or field-applied; secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.

- 2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.
- C. For hot piping conveying fluids over 140 degrees F (60 degrees C), insulate flanges and unions at equipment.
- D. Glass Fiber Insulated Pipes Conveying Fluids Above Ambient Temperature:
 - 1. Provide standard jackets, with or without vapor barrier, factory-applied, or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure-sensitive adhesive. Secure with outward clinch expanding staples.
 - 2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- E. Inserts and Shields:
 - 1. Application: Piping 1-1/2 inches (40 mm) diameter or larger.
 - 2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
 - 3. Insert location: Between support shield and piping and under the finish jacket.
 - 4. Insert Configuration: Minimum 6 inches (150 mm) long, of same thickness and contour as adjoining insulation; may be factory fabricated.
- F. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 078400.

SECTION 230913 INSTRUMENTATION AND CONTROL DEVICES FOR HVAC

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Control panels.
- B. Control Valves:
 - 1. Ball valves and actuators.
- C. Dampers.
- D. Damper Operators:
 - 1. Electric operators.
- E. HVAC&R Sensors:
 - 1. Temperature sensors.
 - 2. Static pressure (air pressure) sensors.
 - 3. Damper position indicators.
- F. Thermostats:
 - 1. Electric room thermostats.
 - 2. Room thermostat accessories.

1.02 REFERENCE STANDARDS

- A. ANSI/FCI 70-2 Control Valve Seat Leakage; 2021.
- B. NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- C. NEMA DC 3 Residential Controls Electrical Wall-Mounted Room Thermostats; 2013.

1.03 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Product Data: Provide description and engineering data for each control system component. Include sizing as requested. Provide data for each system component and software module.
- C. Shop Drawings: Indicate complete operating data, system drawings, wiring diagrams, and written detailed operational description of sequences. Submit schedule of valves indicating size, flow, and pressure drop for each valve. For automatic dampers indicate arrangement, velocities, and static pressure drops for each system.
- D. Manufacturer's Instructions: Provide for all manufactured components.

PART 2 PRODUCTS

2.01 EQUIPMENT - GENERAL

A. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc., as suitable for the purpose specified and indicated.

2.02 CONTROL PANELS

- A. Unitized cabinet type for each system under automatic control with relays and controls mounted in cabinet and temperature indicators, pressure gauges, pilot lights, push buttons and switches flush on cabinet panel face.
- B. NEMA 250, general purpose utility enclosures with enameled finished face panel.
- C. Provide common keying for all panels.

2.03 CONTROL VALVES

- A. Ball Valves and Actuators:
 - 1. Service: Use for chilled water, hot water, or steam at 15 to 25 psig (104.4 to 172.4).
 - 2. Flow Characteristic: Include 2-way and 3-way diverting operation configured to fail normally closed (NC).
 - 3. Replacements in Kind: Provide pressure-independent type.

- 4. Rangeability: 500 to 1.
- 5. ANSI Rating: Class 150.
- 6. Leakage: Class IV (0.1 percent of rated capacity) per ANSI/FCI 70-2.
- 7. Body Size:
 - a. Under 2-1/2 inches (64 mm):
 - 1) Connection: NPT.
 - 2) Materials:
 - (a) Body: Brass.
 - (b) Flanges: Ductile iron.
 - (c) Ball: Chrome-plated brass.
 - (d) Stem: Nickel-plated brass.
 - (e) Seat: Graphite-reinforced PTFE with EPDM O-Ring backing.
 - (f) Stem Seal: EPDM O-Rings.
 - (g) Flow Control Disk: Thermoplastic synthetic-resin.
 - b. Service Temperature:
 - 1) Fluid Side: 0 to 284 degrees F (0 to 140 degrees C) liquid or 25 psig (172.4 kPa) steam.
 - 2) Ambient Side: From minus 4 to 122 degrees F (minus 20 to 50 degrees C).
- 8. Actuator Requirements:
 - a. Assembly: Factory-mounted.
 - b. Input: 0 to 5 VDC configured for proportional control.
 - c. Accessories: Provide with valve position indicator and manual override.

2.04 DAMPER OPERATORS

- A. General: Provide smooth proportional control with sufficient power for air velocities 20 percent greater than maximum design velocity and to provide tight seal against maximum system pressures. Provide spring return for two position control and for fail safe operation.
 - 1. Provide sufficient number of operators to achieve unrestricted movement throughout damper range.
 - 2. Provide one operator for maximum 36 sq ft (3.34 sq m) damper section.

2.05 HVAC&R SENSORS

- A. Temperature Sensors:
 - 1. Temperature Sensing Device: Compatible with project DDC controllers.
 - 2. Performance Characteristics:
 - a. Room Temperature Sensors with Integral Digital Display:
 - 1) Construct for surface or wall box.
 - 2) Provide a four button keypad with the following capabilities:
 - (a) Indication of space and outdoor temperatures.
 - (b) Setpoint adjustment to accommodate room setpoint, DDC Input/Output Points List, and Sequence of Operation.
 - (c) Display and control fan operation status.
 - (d) Manual occupancy override and indication of occupancy status.
- B. Static Pressure (Air Pressure) Sensors:
 - 1. Unidirectional with ranges not exceeding 150 percent of maximum expected input.
 - 2. Temperature compensate with typical thermal error or 0.06 percent of full scale in temperature range of 40 to 100 degrees F (5 to 40 degrees C).
 - 3. Accuracy: One percent of full scale with repeatability 0.3 percent.
 - 4. Output: 0 to 5 vdc with power at 12 to 28 vdc.
- C. Damper Position Indicators: Potentiometer mounted in enclosure with adjustable crank arm assembly connected to damper to transmit 0 to 100 percent damper travel.

2.06 THERMOSTATS

- A. Electric Room Thermostats:
 - 1. Type: NEMA DC 3, 24 volts, with setback/setup temperature control.

- 2. Service: Cooling only.
- 3. Covers: Locking with set point adjustment, with thermometer.
- B. Room Thermostat Accessories:
 - 1. Insulating Bases: For thermostats located on exterior walls.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify existing conditions before starting work.
- B. Verify that systems are ready to receive work.
- C. Beginning of installation means installer accepts existing conditions.
- D. Sequence work to ensure installation of components is complementary to installation of similar components in other systems.
- E. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.
- F. Ensure installation of components is complementary to installation of similar components.
- G. Coordinate installation of system components with installation of mechanical systems equipment such as air handling units and air terminal units.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Check and verify location of thermostats with plans and room details before installation. Locate 42 inches (1050 mm) above floor. Align with lighting switches; see Section 262726.
- C. Provide conduit and electrical wiring in accordance with Section 260583. Electrical material and installation shall be in accordance with appropriate requirements of Division 26.

3.03 SCHEDULES

- A. Control Valve Schedule
 - 1. Drawing Code
 - 2. Valve Size
 - 3. Valve CV
 - 4. Operator Spring Range
 - 5. Normal Position
- B. Control Damper Schedule
 - 1. Drawing Code
 - 2. Height
 - 3. Width
 - 4. Air Flow
 - 5. Air Pressure Drop

SECTION 230923 DIRECT-DIGITAL CONTROL SYSTEM FOR HVAC

PART 2 PRODUCTS

SECTION 232113 HYDRONIC PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Hydronic system requirements.
- B. Heating water piping, above grade.
- C. Chilled water piping, above grade.
- D. Pipe hangers and supports.
- E. Unions, flanges, mechanical couplings, and dielectric connections.
- F. Valves:
 - 1. Ball valves.

1.02 RELATED REQUIREMENTS

A. Section 232500 - HVAC Water Treatment: Pipe cleaning.

1.03 REFERENCE STANDARDS

- A. ASME B16.3 Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.
- B. ASME B16.18 Cast Copper Alloy Solder Joint Pressure Fittings; 2021.
- C. ASME B16.22 Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings; 2021.
- D. ASME B31.9 Building Services Piping; 2020.
- E. ASTM A53/A53M Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.
- F. ASTM A234/A234M Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2022.
- G. ASTM B32 Standard Specification for Solder Metal; 2020.
- H. ASTM B88 Standard Specification for Seamless Copper Water Tube; 2022.
- I. ASTM B88M Standard Specification for Seamless Copper Water Tube (Metric); 2020.
- J. ASTM F1476 Standard Specification for Performance of Gasketed Mechanical Couplings for Use in Piping Applications; 2007 (Reapproved 2019).
- K. AWS A5.8M/A5.8 Specification for Filler Metals for Brazing and Braze Welding; 2019.
- L. AWS D1.1/D1.1M Structural Welding Code Steel; 2020, with Errata (2022).
- M. AWWA C606 Grooved and Shouldered Joints; 2015.
- N. MSS SP-58 Pipe Hangers and Supports Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Product Data:
 - 1. Include data on pipe materials, pipe fittings, valves, and accessories.
 - 2. Provide manufacturers catalog information.
 - 3. Indicate valve data and ratings.
 - 4. Show grooved joint couplings, fittings, valves, and specialties on drawings and product submittals, specifically identified with the manufacturer's style or series designation.

PART 2 PRODUCTS

2.01 HYDRONIC SYSTEM REQUIREMENTS

- A. Comply with ASME B31.9 and applicable federal, state, and local regulations.
- B. Piping: Provide piping, fittings, hangers, and supports as required, as indicated, and as follows:

- 1. Where more than one piping system material is specified, provide joining fittings that are compatible with piping materials and ensure that the integrity of the system is not jeopardized.
- 2. Use non-conducting dielectric connections whenever jointing dissimilar metals.
- 3. Grooved mechanical joints may be used in accessible locations only.
 - a. Accessible locations include those exposed on interior of building, in pipe chases, and in mechanical rooms, aboveground outdoors, and as approved by Architect.
 - b. Use rigid joints unless otherwise indicated.
- 4. Provide pipe hangers and supports in accordance with ASME B31.9 or MSS SP-58 unless indicated otherwise.
- C. Pipe-to-Valve and Pipe-to-Equipment Connections: Use flanges, unions, or grooved couplings to allow disconnection of components for servicing; do not use direct welded, soldered, or threaded connections.
- D. Valves: Provide valves where indicated:
 - 1. Provide drain valves where indicated, and if not indicated, provide at least at main shutoff, low points of piping, bases of vertical risers, and at equipment. Use 3/4 inch (20 mm) gate valves with cap; pipe to nearest floor drain.

2.02 HEATING WATER PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53/A53M, Schedule 40, black, using one of the following joint types:
 - 1. Welded Joints: ASTM A234/A234M, wrought steel welding type fittings; AWS D1.1/D1.1M welded.
 - 2. Threaded Joints: ASME B16.3, malleable iron fittings.
- B. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), drawn, using one of the following joint types:
 - 1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings.
 - a. Solder: ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
 - b. Braze: AWS A5.8M/A5.8 BCuP copper/silver alloy.
 - 2. Mechanical Press Sealed Fittings: Double pressed type complying with ASME B16.22, utilizing EPDM, nontoxic synthetic rubber sealing elements.

2.03 CHILLED WATER PIPING, ABOVE GRADE

- A. Steel Pipe: ASTM A53/A53M, Schedule 40, black; using one of the following joint types:
 - 1. Welded Joints: ASTM A234/A234M, wrought steel welding type fittings; AWS D1.1/D1.1M welded.
 - 2. Threaded Joints: ASME B16.3, malleable iron fittings.
 - 3. Grooved Joints: AWWA C606 grooved pipe, fittings of same material, and mechanical couplings.
- B. Copper Tube: ASTM B88 (ASTM B88M), Type K (A), hard drawn; using one of the following joint types:
 - 1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22, solder wrought copper fittings.
 - a. Solder: ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.
 - b. Braze: AWS A5.8M/A5.8 BCuP copper/silver alloy.
 - 2. Mechanical Press Sealed Fittings: Double pressed type complying with ASME B16.22, utilizing EPDM, nontoxic synthetic rubber sealing elements.

2.04 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
 - 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
 - 2. Hangers for Pipe Sizes 1/2 to 1-1/2 Inches (13 to 38 mm): Malleable iron, adjustable swivel, split ring.

- 3. Hangers for Cold Pipe Sizes 2 Inches (50 mm) and Greater: Carbon steel, adjustable, clevis.
- B. In grooved installations, use rigid couplings with offsetting angle-pattern bolt pads or with wedge-shaped grooves in header piping to permit support and hanging in accordance with ASME B31.9.

2.05 UNIONS, FLANGES, MECHANICAL COUPLINGS, AND DIELECTRIC CONNECTIONS

- A. Unions for Pipe of 2 Inches (50 mm, DN) and Less:
- B. Flanges for Pipe 2 Inches (50 mm, DN) and Greater:
- C. Mechanical Couplings for Grooved and Shouldered Joints: Two or more curved housing segments with continuous key to engage pipe groove, circular C-profile gasket, and bolts to secure and compress gasket.
 - 1. Dimensions and Testing: In accordance with AWWA C606.
 - 2. Mechanical Couplings: Comply with ASTM F1476.
 - 3. Bolts and Nuts: Hot dipped galvanized or zinc-electroplated steel.
 - 4. When pipe is field grooved, provide coupling manufacturer's grooving tools.

PART 3 EXECUTION

3.01 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B. Prepare pipe for grooved mechanical joints as required by coupling manufacturer.
- C. Remove scale and dirt on inside and outside before assembly.
- D. Prepare piping connections to equipment using jointing system specified.
- E. Keep open ends of pipe free from scale and dirt. Protect open ends with temporary plugs or caps.
- F. After completion, fill, clean, and treat systems. See Section 232500 for additional requirements.

3.02 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Route piping in orderly manner, parallel to building structure, and maintain gradient.
- C. Install piping to conserve building space and to avoid interference with use of space.
- D. Group piping whenever practical at common elevations.
- E. Slope piping and arrange to drain at low points.

SECTION 232114 HYDRONIC SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Strainers.
- B. Suction diffusers.
- C. Pump connectors.
- D. Balancing valves.

PART 2 PRODUCTS

2.01 STRAINERS

- A. Size 2-1/2 inch (65 mm, DN) to 4 inch (100 mm, DN):
 - 1. Provide flanged or grooved iron body for up to 175 psi (1,200 kPa) working pressure, up to 250 degrees F (121.1 degrees C) working temperature, Y-pattern strainer with 1/16 inch (1.6 mm) or 3/64 inch (1.2 mm) stainless steel perforated screen.
 - 2. Body Material by Fluid Service:
 - a. Cast Iron:
 - 1) Steam: Up to 125 psi at 350 degrees F (861.8 kPa at 51.7 degrees C).
 - 2) Liquids: Up to 200 psi at 150 degrees F (1,379 kPa at 65.6 degrees C).
- B. Size 5 inch (125 mm, DN) and Larger:
 - 1. Provide flanged or grooved iron body for up to 175 psi (1200 kPa) working pressure, basket pattern with 1/8 inch (3.2 mm) stainless steel perforated screen.
 - 2. Liquid Fluid Service: Up to 285 psi at 100 degrees F (1,965 kPa at 37.8 degrees C).

2.02 SUCTION DIFFUSERS

- A. Fitting: Angle pattern, cast-iron body, threaded for 2 inch (50 mm) and smaller, flanged for 2-1/2 inch (65 mm, DN) and larger, rated for 175 psi (1200 kPa) working pressure, with inlet vanes, cylinder strainer with 3/16 inch (5 mm) diameter openings, disposable 5/32 inch (4 mm) mesh strainer to fit over cylinder strainer, 20 mesh startup screen, and permanent magnet located in flow stream and removable for cleaning.
- B. Class 125:
 - 1. Horizontally or vertically mounted angle-pattern fitting with integral-cast vanes, fine particle mesh screen and magnetic drain plugs for particle removal without disassembly.
 - 2. Maximum Operating Service: 175 psi (1,200 kPa) and 300 degrees F (148.9 degrees C).
 - 3. Sizes, Material, and Connection:
 - a. 2-1/2 to 12 inch (65 to 300 mm, DN): Ductile iron body, flanged.

2.03 PUMP CONNECTORS

2

- A. Flexible Connectors: Flanged, braided type with wetted components of stainless steel, sized to match piping.
 - 1. Maximum Operating Service: 150 psi (1030 kPa) at 120 degrees F (49 degrees C).
 - Accommodate the Following:
 - a. Axial Deflection in Compression and Expansion: _____ inch (_____ mm).
 - b. Lateral Movement: _____ inch (_____ mm).
 - c. Angular Rotation: 15 degrees.
 - d. Force developed by 1.5 times specified maximum allowable operating pressure.
 - 3. End Connections: Same as specified for pipe jointing.
 - 4. Provide necessary accessories including, but not limited to, swivel joints.

2.04 BALANCING VALVES

- A. Size 2-1/2 inch (65 mm, DN) and Larger:
 - 1. Provide ball, globe, or butterfly style with flow balancing, shut-off capabilities, memory stops, and minimum of two metering ports and flanged, grooved, or weld-end connections.

- 2. Valve body construction materials consist of cast iron, carbon steel, ductile iron, or
- 3. Internal components construction materials consist of brass, aluminum bronze, bronze, Teflon, EPDM, NORYL, engineered resin, or _____.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install specialties in accordance with manufacturer's instructions.

SECTION 232123 HYDRONIC PUMPS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. End-suction pumps.

1.02 RELATED REQUIREMENTS

- A. Section 230513 Common Motor Requirements for HVAC Equipment.
- B. Section 230934 Variable-Frequency Motor Controllers for HVAC.
- C. Section 253500 Integrated Automation Instrumentation and Terminal Devices for HVAC.

1.03 REFERENCE STANDARDS

- A. NFPA 70 National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- B. UL 778 Standard for Motor-Operated Water Pumps; Current Edition, Including All Revisions.

PART 2 PRODUCTS

2.01 GENERAL

- A. Provide pumps that operate at specified system fluid temperatures without vapor binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25 percent of midpoint of published maximum efficiency curve.
- B. Electrical Requirements:
 - 1. Listed and classified by UL or testing agency acceptable to authority having jurisdiction as suitable for the purpose specified and indicated.
 - 2. Variable Frequency Drives (VFDs): Provide in accordance with Section 230934, except for integral-VFDs.
 - 3. Enclosures: Provide unspecified product(s) required to fit motor:

2.02 END-SUCTION PUMPS

- A. Casing: Cast iron or ductile iron with renewable bronze casing wearing rings, seal flush connection, drain plug, flanged suction, and discharge flanged connections with gauge ports.
- B. Impeller: Stainless steel, balanced, fully enclosed, keyed to shaft.
- C. Bearings: Oil lubricated roller or ball bearings.
- D. Shaft: Alloy steel with copper, bronze, or stainless steel shaft sleeve.
- E. Drive: Flexible coupling with coupling guard.
- F. Baseplate: Cast iron or fabricated steel with integral drain rim.
- G. Electrical:
 - 1. Motor: 1,750 rpm, total-enclosed, fan-cooled (TEFC); see Section 230513.
 - 2. Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide access space around pumps for service. Provide no less than minimum space recommended by manufacturer.
- C. Controls Human-Machine Interface (HMI): HVAC operator terminal; see Section 253500.

SECTION 232213 STEAM AND CONDENSATE HEATING PIPING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Pipe and pipe fittings.
- B. Pipe hangers and supports.
- C. Steam piping system.
- D. Steam condensate piping system.

1.02 REFERENCE STANDARDS

- A. ASME B16.3 Malleable Iron Threaded Fittings: Classes 150 and 300; 2021.
- B. ASTM A53/A53M Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2022.
- C. ASTM A234/A234M Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service; 2022.
- D. AWS D1.1/D1.1M Structural Welding Code Steel; 2020, with Errata (2022).
- E. MSS SP-58 Pipe Hangers and Supports Materials, Design, Manufacture, Selection, Application, and Installation; 2018, with Amendment (2019).

1.03 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on pipe materials, pipe fittings, valves and accessories. Provide manufacturers catalogue information. Indicate valve data and ratings.

PART 2 PRODUCTS

2.01 LOW PRESSURE STEAM PIPING (15 PSIG (103 KPA) MAXIMUM)

- A. Steel Pipe: ASTM A53/A53M, Schedule 40, black.
 - 1. Fittings: ASME B16.3 malleable iron Class 150, or ASTM A234/A234M wrought steel.
 - 2. Joints: Threaded, or AWS D1.1/D1.1M welded.

2.02 MEDIUM AND HIGH PRESSURE STEAM CONDENSATE PIPING

- A. Steel Pipe: ASTM A53/A53M, Schedule 80, black.
 - 1. Fittings: ASME B16.3 malleable iron Class 150 or ASTM A234/A234M wrought steel.
 - 2. Joints: Threaded, or AWS D1.1/D1.1M welded.

2.03 LOW PRESSURE STEAM CONDENSATE PIPING

- A. Steel Pipe: ASTM A53/A53M, Schedule 80, black.
 - 1. Fittings: ASME B16.3 malleable iron Class 150, or ASTM A234/A234M wrought steel.
 - 2. Joints: Threaded, or AWS D1.1/D1.1M welded.

2.04 PIPE HANGERS AND SUPPORTS

- A. Provide hangers and supports that comply with MSS SP-58.
 - 1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
- B. Hangers for Pipe Sizes 1/2 to 1-1/2 Inch (13 to 38 mm): Malleable iron, adjustable swivel, split ring.
- C. Hangers for Pipe Sizes 2 to 4 Inches (50 to 100 mm): Carbon steel, adjustable, clevis.
- D. Hangers for Pipe Sizes 6 Inches (150 mm) and Over: Adjustable steel yoke, cast iron roll, double hanger.
- E. Multiple or Trapeze Hangers for Pipe Sizes to 4 inches (100 mm): Steel channels with welded spacers and hanger rods.

- F. Multiple or Trapeze Hangers for Pipe Sizes 6 Inches (150 mm) and Over: Steel channels with welded spacers and hanger rods; cast iron roll and stand.
- G. Wall Support for Pipe Sizes to 3 Inches (70 mm): Cast iron hook.
- H. Wall Support for Pipe Sizes 4 to 5 Inches (100 to 125 mm): Welded steel bracket and wrought steel clamp.
- I. Wall Support for Pipe Sizes 6 Inches (150 mm) and Over: Welded steel bracket and wrought steel clamp; adjustable steel yoke and cast iron roll.
- J. Vertical Support: Steel riser clamp.
- K. Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.
- L. Inserts: Malleable iron case of galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.05 UNIONS, FLANGES, AND COUPLINGS

- A. Unions for Pipe 2 Inches (50 mm) and Under:
 - 1. Ferrous Piping: 150 psig (1034 kPa) galvanized malleable iron, threaded.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Route piping in orderly manner, plumb and parallel to building structure, and maintain gradient.
- C. Install piping to conserve building space and avoid interference with use of space.
- D. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

3.02 SCHEDULES

- A. Hanger Spacing for Steel Steam Piping.
 - 1. 1/2 inch (15 mm): Maximum span, 8 feet (2400 mm); minimum rod size, 1/4 inch (6 mm).
 - 2. 3/4 inch (20 mm) and 1 inch (25 mm): Maximum span, 9 feet (2700 mm); minimum rod size, 1/4 inch (6 mm).
 - 3. 1-1/4 inches (32 mm): Maximum span, 11 feet (3.3 m); minimum rod size, 3/8 inch (9 mm).
 - 4. 1-1/2 inches (40 mm): Maximum span, 12 feet (3.6 m); minimum rod size, 3/8 inch (9 mm).

SECTION 232214 STEAM AND CONDENSATE HEATING SPECIALTIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Steam traps.
- B. Steam air vents.
- C. Receivers.
- D. Condensate pumps.
- E. Direct operated pressure reducing valves.
- F. Pilot-operated steam pressure reducing valves.
- G. Safety relief valves.
- H. Steam control valves.

1.02 REFERENCE STANDARDS

- A. ASME B31.9 Building Services Piping; 2020.
- B. ASTM A276/A276M Standard Specification for Stainless Steel Bars and Shapes; 2017.

PART 2 PRODUCTS

2.01 STEAM TRAPS

- A. Manufacturers:
 - 1. Armstrong International, Inc: www.armstronginternational.com/#sle.
 - 2. Marshall Engineered Products Company: www.mepcollc.com/#sle.
- B. Steam Trap Applications:
 - 1. Use Float and Thermostatic Traps for:
 - a. Heating coils.
- C. Float and Thermostatic Steam Traps:
 - 1. Manufacturers:
 - a. Armstrong International, Inc: www.armstronginternational.com/#sle.
 - b. Spirax-Sarco: www.spiraxsarco.com/us/#sle.
 - c. Watson McDaniel Company: www.watsonmcdaniel.com/#sle.
 - 2. Metal body with bolted cover, stainless steel or bronze bellows type thermostatic air vent, stainless steel or copper float, stainless steel lever valve assembly, bottom drain plug, and accessible to internal parts without disturbing piping.

2.02 STEAM AIR VENTS

2.03 RECEIVERS

A. Condensate Receiver: Cast iron, equipped with tappings for mounting float switches, water level gauge, thermometers, pump suction fittings, condensate inlet, and lifting eye bolts.

2.04 CONDENSATE PUMPS

- A. Pumps: Vertical design, bronze fitted with stainless steel shaft, enclosed bronze impeller, renewable bronze case ring, mechanical shaft seal, close coupled to motor.
- B. Capacity:

2.05 PILOT OPERATED STEAM PRESSURE REDUCING VALVES

- A. Ductile iron body, full port trim, stainless or chrome steel valve spring and stem, copper tubing, phosphor bronze diaphragm and pressure pilot control.
- B. End Connections: Female thread for sizes 2 inch (50 mm, DN) and smaller otherwise flanged.
- C. Pressure Range Service: 15 to 300 psi (1 to 20.7 bar) with 10 psi (0.68 bar) differential.
- D. Low Pressure Range Service: 5 to 20 psi (0.34 to 1.37 bar) with 2 psi (0.137 bar) differential.

E. Maximum Operating Temperature: 650 degrees F (343.3 degrees C).

2.06 SAFETY RELIEF VALVES

- A. Valve: Bronze body, stainless steel valve spring, stem, and trim, direct pressure actuated, capacities ASME certified and labelled.
- B. Accessories: Drip pan elbow.

2.07 STEAM CONTROL VALVES

- A. Valve Configuration:
 - 1. Pneumatically actuated, fail open, 2-way body with threaded end connections.
 - 2. Pneumatic Actuator: 2-position, 3 to 15 psi (20.6 to 106.4 kPa) with 6 to 8 second travel.
 - 3. Electrical Actuator: 2-position, 4 to 20 mA with 6 to 8 second travel.
- B. Materials:
 - 1. Valve Body: Carbon steel A216 Grade WCB.
 - 2. Bonnet: Carbon steel A216 Grade WCB.
 - 3. Valve Spindle: Stainless steel, comply with ASTM A276/A276M, Type 431.
 - 4. Gland Packing:

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install steam and steam condensate piping and specialties in accordance with ASME B31.9.
- B. Install specialties in accordance with manufacturer's instructions.
- C. Steam Traps:
 - 1. Provide minimum 3/4 inch (20 mm) size on steam mains and branches.
 - 2. Install with union or flanged connections at both ends.
 - 3. Provide gate valve and strainer at inlet, and gate valve and check valve at discharge.
 - 4. Provide minimum 10 inch (250 mm) long, line size dirt pocket between apparatus and trap.

SECTION 233100 HVAC DUCTS AND CASINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Metal ducts.
- B. Flexible ducts.

1.02 RELATED REQUIREMENTS

A. Section 233319 - Duct Silencers.

1.03 REFERENCE STANDARDS

- A. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2022.
- B. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials; 2022.
- C. NFPA 90A Standard for the Installation of Air-Conditioning and Ventilating Systems; 2021.
- D. SMACNA (DCS) HVAC Duct Construction Standards Metal and Flexible; 2021.
- E. UL 181 Standard for Factory-Made Air Ducts and Air Connectors; current edition, including all revisions.

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Shop Drawings: Indicate duct fitting types, gauges, sizes, welds, and configuration.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

- A. Provide UL Class 1 ductwork, fittings, hangers, supports, and appurtenances in accordance with NFPA 90A and SMACNA (DCS) guidelines unless stated otherwise.
- B. Provide metal duct unless otherwise indicated. Fibrous glass duct can be substituted at the Contractor's option.
- C. Acoustical Treatment: Provide sound-absorbing liners and sectional silencers for metal-based ducts in compliance with Section 233319.
- D. Duct Shape and Material in accordance with Allowed Static Pressure Range:
- E. Duct Sealing and Leakage in accordance with Static Pressure Class:
- F. Duct Fabrication Requirements:
 - 1. Duct and Fitting Fabrication and Support: SMACNA (DCS) including specifics for continuously welded round and oval duct fittings.
 - 2. Use reinforced and sealed sheet-metal materials at recommended gauges for indicated operating pressures or pressure class.
 - 3. Construct tees, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide airfoil turning vanes of perforated metal with glass fiber insulation.
 - 4. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.
 - Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
 - 6. Provide turning vanes of perforated metal with glass fiber insulation when an acoustical lining is required.
 - 7. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.

2.02 METAL DUCTS

2.03 METAL DUCTS

- A. Material Requirements:
 - 1. Galvanized Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G60/Z180 coating.
- B. Round Metal Ducts:
 - 1. Round Single Wall Duct: Round lock seam duct with galvanized steel outer wall.
 - 2. Round Connection System: Interlocking duct connection system per SMACNA (DCS).
- C. Round Spiral Duct:
 - 1. Round spiral lock seam duct with galvanized steel outer wall.
- D. Connectors, Fittings, Sealants, and Miscellaneous:
 - 1. Fittings: Manufacture with solid inner wall of perforated galvanized steel.
 - 2. Transverse Duct Connection System: SMACNA "E" rated rigid class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips in accordance with SMACNA (DCS).
 - 3. Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
 - a. Type: Heavy mastic or liquid used alone or with tape, suitable for joint configuration and compatible with substrates, and recommended by manufacturer for pressure class of ducts.
 - b. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
- E. Flexible Ducts: UL 181, Class 1, polyethylene film, mechanically fastened and rolled using galvanized steel to form a spiral helix.
 - 1. Insulation: R6 insulation with polyethylene vapor barrier film.
 - 2. Pressure Rating: 10 in-wc (2.50 kPa) positive and 5 in-wc (1.25 kPa) negative.
 - 3. Maximum Velocity: 5500 fpm (27.9 m/sec).
 - 4. Temperature Range: Minus 20 degrees F to 250 degrees F (Minus 28 degrees C to 121 degrees C).

2.04 FLEXIBLE DUCTS

- A. Flexible Air Ducts:
 - 1. UL 181, Class 1, multiple layers of aluminum laminate supported by helically wound spring steel wire.
 - 2. Pressure Rating: From 10 in-wc (2.5 kPa) positive to 1 in-wc (250 Pa) negative.
 - 3. Maximum Velocity: 4,000 fpm (20.3 m/s).
 - 4. Temperature Range: Minus 20 to 210 degrees F (Minus 28 to 99 degrees C).

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install, support, and seal ducts in accordance with SMACNA (DCS).
- B. Install products following the manufacturer's instructions.
- C. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- D. Duct sizes indicated are precise inside dimensions. For lined ducts, maintain sizes inside lining.
- E. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

SECTION 233300 AIR DUCT ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Air turning devices/extractors.
- B. Combination fire and smoke dampers.
- C. Duct access doors.
- D. Duct test holes.
- E. Fire dampers.
- F. Flexible duct connectors.
- G. Smoke dampers.
- H. Smoke and fire-smoke damper test module.
- I. Volume control dampers.
- J. Low leakage (Class 1A) control dampers.
- K. Air measuring control dampers.
- L. Miscellaneous products:
 - 1. Damper operators.
 - 2. Damper position switch.

1.02 REFERENCE STANDARDS

- A. NFPA 80 Standard for Fire Doors and Other Opening Protectives; 2022.
- B. NFPA 90A Standard for the Installation of Air-Conditioning and Ventilating Systems; 2021.
- C. NFPA 92 Standard for Smoke Control Systems; 2021.
- D. NFPA 96 Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations; 2021.
- E. NFPA 105 Standard for Smoke Door Assemblies and Other Opening Protectives; 2022.
- F. SMACNA (DCS) HVAC Duct Construction Standards Metal and Flexible; 2021.
- G. UL 33 Safety Heat Responsive Links for Fire-Protection Service; Current Edition, Including All Revisions.
- H. UL 50 Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- I. UL 50E Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- J. UL 555 Standard for Fire Dampers; Current Edition, Including All Revisions.
- K. UL 555S Standard for Smoke Dampers; Current Edition, Including All Revisions.

1.03 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Product Data: Provide for shop-fabricated assemblies including volume control dampers, duct access doors, duct test holes, and hardware used. Include electrical characteristics and connection requirements.
- C. Shop Drawings: Indicate for shop fabricated assemblies including volume control dampers.
- D. Manufacturer's Installation Instructions: Provide instructions for fire dampers.

PART 2 PRODUCTS

2.01 AIR TURNING DEVICES/EXTRACTORS

A. Multi-blade device with blades aligned in short dimension; steel construction; with individually adjustable blades, mounting straps.

2.02 COMBINATION FIRE AND SMOKE DAMPERS

2.03 DUCT ACCESS DOORS

- A. Fabricate in accordance with SMACNA (DCS) and as indicated.
- B. Fabrication: Rigid and close fitting of galvanized steel with sealing gaskets and quick-fastening locking devices. For insulated ducts, install minimum 1-inch (25 mm) thick insulation with sheet metal cover.
 - 1. Less Than 12 inches (300 mm) Square: Secure with sash locks.

2.04 DUCT TEST HOLES

- A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.
- B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.05 FIRE DAMPERS

- A. Fabricate in accordance with NFPA 90A and UL 555, and as indicated.
- B. Horizontal Dampers: Galvanized steel, 22-gauge, 0.0299-inch (0.76 mm) frame, stainless steel closure spring, and lightweight, heat-retardant, non-asbestos fabric blanket.
- C. Multiple Blade Dampers: 16-gauge, 0.0598-inch (1.52 mm) galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, 1/8 by 1/2 inch (3.2 by 12.7 mm) plated steel concealed linkage, stainless steel closure spring, blade stops, and lock.
- D. Fusible Links: UL 33, separate at 160 degrees F (71 degrees C) with adjustable link straps for combination fire/balancing dampers.

2.06 FLEXIBLE DUCT CONNECTORS

- A. Fabricate in accordance with SMACNA (DCS) and as indicated.
- B. Flexible Duct Connections: Fabric crimped into metal edging strip.
 - 1. Fabric: UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 30 oz/sq yd (1.0 kg/sq m).

2.07 SMOKE DAMPERS

- A. Fabricate in accordance with NFPA 90A and UL 555S, and as indicated.
- B. Dampers: UL Class 1 airfoil blade type smoke damper, normally open automatically operated by pneumatic actuator.
- C. Electro Thermal Link: Fusible link melting at 165 degrees F (74 degrees C); 120 volts, single phase, 60 Hz; UL listed and labeled.

2.08 SMOKE AND FIRE-SMOKE DAMPER TEST MODULE

- A. Addressable fire alarm system proprietary controller module preconfigured for remote testing of dedicated smoke damper or combination fire-smoke damper.
- B. Provide module, accessories, and connectivity to meet NFPA 80 and NFPA 105 requirements.

2.09 VOLUME CONTROL DAMPERS

- A. Products for Automatic Controls: See Section 253523.
- B. Fabricate in accordance with SMACNA (DCS) and as indicated.

2.10 LOW LEAKAGE (CLASS 1A) CONTROL DAMPERS

- A. Manufacturers:
- B. Maximum Leakage Allowed: 3 cfm/sq ft at 1 in-wc (15.2 L/sec/sq m at 0.25 kPa).

2.11 AIR MEASURING CONTROL DAMPERS

- A. Factory-Mounted Assembly Requirements:
 - 1. Damper Unit or Multi-Unit:
 - a. Construction: Flanged-to-duct frame made of extruded aluminum with V or 3V blades for low to medium pressure applications, zinc-plated steel hardware, frame-mounted shaft bearings, frame-assembly sleeve, and silicone seals at frame and blade ends.
 - b. Control: Opposed blade modulation by damper actuator(s) from air measuring sensor transmitter-controller unit.
 - 2. Air Measuring Sensor Transmitter-Controller:
 - a. Transmitter: Five percent accuracy, adjustable zero and span, 10 to 1 turndown, 0.1 percent of calibrated span linearity, 30 to 50 millisecond response time, minimum overpressure of 150 percent over highest range value, alphanumeric indicating display, wired or wireless connectivity for configuration, and terminal strip within enclosed electronic components.
 - b. Controller: Configure to control hardware-linked damper actuator(s) based on locally typed or software-defined setpoint. Access for user to do local or remote proportional, integrative, and derivative control-loop tuning.
 - c. Hardwired External Damper Actuator Output: Two-wire, 4 to 20 mA.
 - d. BTU Metering: Provide temperature sensor for field mounting upstream or downstream of heating or cooling source.
- B. Service Temperature Range: Minus 20 to 160 degrees F (Minus 28.8 to 71.1 degrees C).
- C. Enclosure Rating for Transmitter-Controller and Damper Actuator(s):
 - 1. General: UL 50 or UL 50E listed for use in non-hazardous locations.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). See Section 233100 for duct construction and pressure class.
- B. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide for cleaning kitchen exhaust ducts in accordance with NFPA 96 Provide minimum 8 by 8 inch (200 by 200 mm) size access door for hand and shoulder access, or as indicated on drawings. Provide minimum 4 by 4 inch (100 by 100 mm) size access door for balancing dampers only. Review locations prior to fabrication.
- C. Provide duct test holes where indicated and required for testing and balancing purposes.
- D. Provide fire dampers, combination fire and smoke dampers, and smoke dampers at locations indicated, where ducts and outlets pass through fire-rated components, and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
- E. Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92.
- F. Demonstrate re-setting of fire dampers to Owner's representative.

SECTION 233416 CENTRIFUGAL HVAC FANS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Backward inclined centrifugal fans.
- B. Bearings and drives.

1.02 REFERENCE STANDARDS

- A. ABMA STD 9 Load Ratings and Fatigue Life for Ball Bearings; 2015 (Reaffirmed 2020).
- B. AMCA (DIR) (Directory of) Products Licensed Under AMCA International Certified Ratings Program; 2015.
- C. AMCA 210 Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating; 2016.

1.03 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Product Data: Provide data on centrifugal fans and accessories including fan curves with specified operating point plotted, power, rpm, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.
- C. Shop Drawings: Indicate assembly of centrifugal fans and accessories including fan curves with specified operating point plotted, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

A. Performance Ratings: Determined in accordance with AMCA 210 and bearing the AMCA Certified Rating Seal.

2.02 WHEEL AND INLET

A. Backward Inclined: Steel or aluminum construction with smooth curved inlet flange, heavy back plate, backwardly curved blades welded or riveted to flange and backplate; cast iron hub riveted to back plate and keyed to shaft with set screws.

2.03 BEARINGS AND DRIVES

A. Bearings: Heavy duty pillow block type, selfgreasing ball bearings, with ABMA STD 9 life at 50,000 hours.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install flexible connections between fan inlet and discharge ductwork; see Section 233300. Ensure metal bands of connectors are parallel with minimum one inch (25 mm) flex between ductwork and fan while running.

SECTION 233700 AIR OUTLETS AND INLETS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Diffusers:
 - 1. Perforated ceiling diffusers.
- B. Registers/grilles:
 - 1. Ceiling-mounted, exhaust and return register/grilles.
- C. Duct-mounted supply and return registers/louvers.

1.02 REFERENCE STANDARDS

A. SMACNA (ASMM) - Architectural Sheet Metal Manual; 2012.

1.03 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

PART 2 PRODUCTS

2.01 PERFORATED FACE CEILING DIFFUSERS

- A. Type: Perforated face with fully adjustable pattern and removable face.
- B. Fabrication: Steel with steel frame and baked enamel finish.
- C. Color: As indicated.

2.02 DUCT-MOUNTED SUPPLY AND RETURN REGISTERS/LOUVERS

- A. Type: Duct-mounted, rectangular register for round-spiral duct with adjustable pivot-ended blades, end caps, built-in volume damper, and dual cover flanges to lay flush on duct surface regardless of diameter. Performance to match manufacturer's catalog data.
- B. Material: 22 gauge, 0.0299 inch (0.76 mm).1. Provide crossing spiral fitting-body of matching duct diameter.
- C. Color: As indicated on drawings.

2.03 CEILING EXHAUST AND RETURN REGISTERS/GRILLES

- A. Type: Streamlined blades, 3/4 inch (19 mm) minimum depth, 3/4 inch (19 mm) maximum spacing, with blades set at 45 degrees, vertical face.
- B. Frame: 1-1/4 inch (32 mm) margin with countersunk screw mounting.
- C. Fabrication: Steel with 20 gauge, 0.0359 inch (0.91 mm) minimum frames and 22 gauge, 0.0299 inch (0.76 mm) minimum blades, steel and aluminum with 20 gauge, 0.0359 inch (0.91 mm) minimum frame, or aluminum extrusions, with factory baked enamel finish.
- D. Color: As indicated.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Comply with SMACNA (ASMM) for flashing/counter-flashing of roof penetrations and supports for roof curbs and roof mounted equipment.
- C. Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.
- D. Install diffusers to ductwork with air tight connection.

- E. Provide balancing dampers on duct take-off to diffusers and grilles and registers, despite whether dampers are specified as part of diffuser, or grille and register assembly.
- F. Paint ductwork visible behind air outlets and inlets matte black, see Section 099123.

SECTION 236213

PACKAGED AIR-COOLED REFRIGERANT COMPRESSOR AND CONDENSER UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Condensing unit package.
- B. Charge of refrigerant and oil.
- C. Controls and control connections.
- D. Refrigerant piping connections.
- E. Motor starters.
- F. Electrical power connections.

1.02 RELATED REQUIREMENTS

A. Section 230513 - Common Motor Requirements for HVAC Equipment.

1.03 REFERENCE STANDARDS

- A. AHRI 210/240 Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2023.
- B. ASHRAE Std 23 Methods for Performance Testing Positive Displacement Refrigerant Compressors and Compressor Units; 2022.
- C. ASHRAE Std 90.1 I-P Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Product Data: Provide rated capacities, weights specialties and accessories, electrical nameplate data, and wiring diagrams. To ensure capacities are complementary, include equipment served by condensing units in submittal or submit at the same time.
- C. Shop Drawings: Indicate components, assembly, dimensions, weights and loadings, required clearances, and location and size of field connections. Include schematic layouts showing condensing units, cooling coils, refrigerant piping, and accessories required for complete system.
- D. Design Data: Indicate pipe and equipment sizing.
- E. Manufacturer's Instructions: Submit manufacturer's complete installation instructions.
- F. Warranty: Submit manufacturer's warranty and ensure forms have been filled out in Owner's name and registered with manufacturer.

1.05 WARRANTY

- A. See Section 017800 Closeout Submittals, for additional warranty requirements.
- B. Provide a five year warranty to include coverage for refrigerant compressors.

PART 2 PRODUCTS

2.01 PERFORMANCE REQUIREMENTS

2.02 MANUFACTURED UNITS

- A. Units: Self-contained, packaged, factory-assembled and pre-wired units suitable for outdoor use consisting of cabinet, compressors, condensing coil and fans, integral subcooling coil, controls, liquid receiver, wind deflector, and screens.
- B. Construction and Ratings: In accordance with AHRI 210/240. Test in accordance with ASHRAE Std 23.

C. Performance Ratings: Energy Efficiency Rating (EER) and Coefficient of Performance (COP) not less than prescribed by ASHRAE Std 90.1.

2.03 CASING

- A. House components in welded steel frame with galvanized steel panels with weather resistant, baked enamel finish.
- B. Mount starters, disconnects, and controls in weatherproof panel provided with full opening access doors. Provide mechanical interlock to disconnect power when door is opened.
- C. Provide removable access doors or panels with quick fasteners and piano hinges.

2.04 CONDENSER COILS

A. Coils: Aluminum fins mechanically bonded to seamless copper tubing. Provide subcooling circuits. Air test under water to 425 psig (2900 kPa), and vacuum dehydrate. Seal with holding charge of nitrogen.

2.05 FAN REQUIREMENTS

- A. Vertical discharge, direct-driven propeller-type condenser fans with fan guard on discharge. Equip with roller or ball bearings with grease fittings extended to outside of casing.
- B. Motors as indicated, in compliance with Section 230513.

2.06 COMPRESSORS

- A. Compressor: Semi-hermetic reciprocating type.
- B. Mounting: Statically and dynamically balance rotating parts and mount on spring vibration isolators.
- C. Lubrication System: Reversible, positive displacement oil pump with oil charging valve, oil level sight glass, and magnetic plug or strainer.
- D. Motor: Constant speed 1800 rpm suction gas cooled with electronic sensor and winding over temperature protection, designed for across-the-line starting.
 - 1. Furnish with starter, see Section 230513.
 - 2. Furnish with starter, see Section 230513.
- E. Capacity Reduction Equipment: Suction valve unloaders, with lifting mechanism operated by electrically actuated solenoid valve, with unloaded compressor start; controlled from suction pressure.
- F. Sump Oil Heater: Evaporates refrigerant returning to sump during shut down. Energizes heater continuously when compressor is not operating.

2.07 CONTROLS

- A. On unit, mount weatherproof steel control panel, NEMA 250, containing power and control wiring, molded case disconnect switch, factory wired with single point power connection.
- B. For each compressor, provide across-the-line starter, nonrecycling compressor overload, starter relay, and control power transformer or terminal for controls power. Provide manual reset current overload protection. For each condenser fan, provide across-the-line starter with starter relay.
- C. Provide safety controls arranged so any one will shut down machine:
 - 1. High discharge pressure switch (manual reset) for each compressor.
 - 2. Low suction pressure switch (automatic reset) for each compressor.
 - 3. Oil Pressure switch (manual reset).
- D. Provide the following operating controls:
- E. Provide controls to permit operation down to 0 degrees F (minus 18 degrees C) ambient temperature.
- F. Gauges: Prepiped for suction and discharge refrigerant pressures and oil pressure for each compressor.

PART 3 EXECUTION

TCNJ Roscoe Hall Lower Level Renovation

3.01 INSTALLATION

- A. Install in accordance with manufacturer's installation instructions.
- B. Complete structural, mechanical, and electrical connections in accordance with manufacturer's installation instructions.

3.02 SYSTEM STARTUP

- A. Supply initial charge of refrigerant and oil for each refrigeration system. Replace losses of oil or refrigerant prior to end of correction period.
- B. Charge system with refrigerant and test entire system for leaks after completion of installation. Repair leaks, put system into operation, and test equipment performance.
SECTION 237433 DEDICATED OUTDOOR AIR UNITS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Outdoor-mounted DOAS.

1.02 RELATED REQUIREMENTS

- A. Section 230513 Common Motor Requirements for HVAC Equipment.
- B. Section 230934 Variable-Frequency Motor Controllers for HVAC.
- C. Section 251400 Integrated Automation Local Control Units.
- D. Section 251500 Integrated Automation Software: BAS, BMS, or SCADA.

1.03 REFERENCE STANDARDS

- A. AHRI 210/240 Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment; 2023.
- B. AHRI 270 Sound Performance Rating of Outdoor Unitary Equipment; 2015, with Addendum (2016).
- C. ASHRAE Std 23 Methods for Performance Testing Positive Displacement Refrigerant Compressors and Compressor Units; 2022.
- D. ASHRAE Std 90.1 I-P Energy Standard for Buildings Except Low-Rise Residential Buildings; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. NFPA 70 National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. NFPA 90A Standard for the Installation of Air-Conditioning and Ventilating Systems; 2021.
- G. UL (DIR) Online Certifications Directory; Current Edition.
- H. UL 207 Standard for Refrigerant-Containing Components and Accessories, Nonelectrical; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements for submittal procedures.
- B. Product Data: Provide data with dimensions, duct and service connections, accessories, controls, electrical nameplate data, and wiring diagrams.
- C. Shop Drawings: Indicate dimensions, duct and service connections, accessories, controls, electrical nameplate data, and wiring diagrams.

PART 2 PRODUCTS

2.01 OUTDOOR-MOUNTED DOAS PERFORMANCE REQUIREMENTS

- A. Performance Ratings: ASHRAE Std 90.1, EER and COP as applicable.
- B. Regulatory Requirements: AHRI 270 rated, NFPA 70, and UL (DIR) listed.
- C. Supply Fan Section:
 - 1. Aiflow: _____ cfm (_____ L/sec).
 - 2. External Static Pressure: _____ in-wc (_____ Pa).
 - 3. Fan Operation: Constant volume.
- D. Electrical: 480 VAC, 3-phase, 60 Hz, single point to factory-mounted fused disconnect switch internally wired into motors and compressors, and other powered components including system safeties.

2.02 OUTDOOR-MOUNTED DOAS

- A. Packaged Unit:
 - 1. Casing and Components:

- a. Fabrication: AHRI 210/240 and UL 207 construction, ASHRAE Std 23 tested.
- b. 18 gauge, 0.0478 inch (1.21 mm) steel panels reinforced with structural angles and channels to ensure rigidity.
- c. Provide bolted access panels to access each sections from either side of unit.
- d. Provide hinged door with lockable handle for serviceable sections.
- e. Drain Pan: Galvanized steel with corrosion-resistant coating.
- 2. Performance Ratings: ASHRAE Std 90.1, EER and COP as applicable.
- 3. Regulatory Requirements: AHRI 270 rated, NFPA 70, and UL (DIR) listed.
- 4. Insulation: Minimum 1/2 inch (13 mm) thick acoustic duct liner for lining cabinet interior.
- 5. External Surface Finish: Heat resistant baked enamel.
- 6. Outdoor Installation: Weatherproofed casing, with intake louver or hood.
- 7. Outside Air Damper with Rain Hood and Screen:
- B. Filter Section:
 - 1. Prefilter: Removable, metal frame fitted 1 inch (25 mm) thick disposable glass fiber.
 - 2. Filter: Removable, 4 inches (100 mm) thick combined MERV-8 and MERV-14.
- C. Heating Section:
 - 1. Electrical:
 - a. Helical nickel-chrome resistance wire coil heating elements with refractory ceramic support bushings easily accessible with automatic reset thermal cut-out, built-in silicone-controlled rectifier (SCR) interface, galvanized steel frame with airflow proving switch, load fuse, manual reset switch, pilot-duty toggle switches, step-down controls transformer, service lights, service GFCI receptacle, and thermal cut-out switch.
 - b. Controls: Start supply fan before electric elements are energized and continue operating until air temperature reaches minimum setting, with switch for continuous fan operation. Integrate or coordinate controls with unit controller.
- D. Cooling Section:
 - 1. Air-Source Heat Pump:
 - a. Packaged air-source heat pump with integrated or coordinated controls.
 - b. Compressor Section:
 - 1) Hermetically sealed, direct-driven single-stage scroll or dual-stage scroll type with centrifugal type oil pumps.
 - 2) Motor: Suction gas-cooled with voltage utilization range of plus/minus 10 percent of unit nameplate voltage.
 - 3) Internal spring isolation and sound muffling to minimize vibration transmission and noise.
 - 4) External high-and low-pressure switches.
 - c. Refrigerant Load Control: Provide hot-gas bypass and hot-gas reheat coil.
 - d. Evaporator Section: Internally finned aluminum, copper, or cupro-nickel tubes mechanically bonded to aluminum plate fins.
- E. Fan Section:
 - 1. Provide direct or plenum mounted variable-speed fan motors; see Section 230513.
 - 2. Draw-through, forward-curved fan, constructed of corrosion-resistant, galvanized material and designed for efficient, quiet operation.
 - 3. Factory program for both soft start and constant flow output over static pressure range.
 - 4. Provide preinstalled neutral wire protection when required to support specified fan type.
 - 5. Motor to include thermal overload protection, quick disconnect plug, and permanently lubricated bearings.
 - 6. Belt-Driven Motor Requirements: Provide adjustable blower motor/sheave combination device based on indicated flow performance requirements. Statically and dynamically balanced centrifugal fan mounted on solid steel shaft with heavy-duty, self-aligning, prelubricated ball bearings and V-belt drive with matching motor sheaves and belts.
 - 7. Variable Speed Control: Configure controller to maintain adjustable flow setpoint for modulating or speed-switched units; see Section 230934.

- 8. Fan Turndown: Design control features to allow fan speed reduction to adjustable 50 percent of its capacity when the zone set point temperature is satisfied or when unit runs in fan-only mode.
- F. Unit Controls:
 - 1. DDC:
 - a. Application Specific Controller; see Section 251400 unless factory-provided.
 - b. Tested to monitor and handle sequencing functions and other operational modes using field-mounted thermostat and other sensors.
 - c. Coordination and Sequencing:
 - 1) Internal Devices: Include compressors, blower, sensors, switches, valves, safeties, other components.
 - 2) Field-Installed Devices: Solenoid valves, thermostat, EWT sensors, LWT sensors, internal and remote contacts, and other devices required for operation.
 - Safeties: At minimum include anti-short-cycle compressor protection, condensate overflow, refrigerant high pressure, refrigerant low pressure, loss-ofcharge, refrigerant freeze protection, and freezestat.
 - 2. Thermostat:
 - a. Field mounted and wired, tied into prewired control-interface terminals.
 - b. Smart Thermostat:
 - 1) BAS, SCADA, or Integrated Automation linked programmable thermostat; see Section 251400.
 - c. Programmable Thermostat:
 - 1) Electro-mechanical type with key- or pushbutton-operated display.
 - 2) Programmable occupied/unoccupied weekly and holiday schedule.
 - d. Nonprogrammable Thermostat:
 - 1) Electro-mechanical type with key- or pushbutton-operated display.
 - 2) User-configurable, precoded options aligned with equipment functions.
 - e. Thermostat: Single-gang-box-mounted platinum or thermistor.
 - 1) Local Interface to Include:
 - (a) Filter maintenance indicating status.
 - 3. Local Control Panel: Interface to include on-off-auto switch, summer-winter switch, heatoff-cool switch, indicating lights for supply fan, pilot operation, burner operation, lockout indication, and clogged filter indication.
- G. Electrical: 480 VAC, 3-phase, 60 Hz, single point to factory-mounted nonfused disconnect switch internally wired into motors and compressors, and other powered components including system safeties.
- H. Furnish dedicated outdoor air unit and associated components and accessories produced by a single manufacturer.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Provide unit- or duct-mounted smoke detectors and other NFPA 90A provisions.
- C. Connect drain pan outlet to nearest building drain system piping.
- D. Adjusting: Use plenum static pressure readings against manufacturer calibration chart to adjust primary airflow as other measuring methods will not work.
- E. Coordinate BAS, BMS, or Integrated Automation linking between unit controller(s) and remote front-end interface; see Section 25 1500.

SECTION 260505 SELECTIVE DEMOLITION FOR ELECTRICAL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical demolition.

PART 2 PRODUCTS

2.01 MATERIALS AND EQUIPMENT

A. Materials and equipment for patching and extending work: As specified in individual sections.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that abandoned wiring and equipment serve only abandoned facilities.
- B. Demolition drawings are based on casual field observation and existing record documents.
- C. Report discrepancies to Architect before disturbing existing installation.
- D. Beginning of demolition means installer accepts existing conditions.

3.02 PREPARATION

- A. Disconnect electrical systems in walls, floors, and ceilings to be removed.
- B. Coordinate utility service outages with utility company.
- C. Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
- D. Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
- E. Existing Fire Alarm System: Maintain existing system in service until new system is accepted. Disable system only to make switchovers and connections. Minimize outage duration.
 - 1. Notify Owner before partially or completely disabling system.
 - 2. Make notifications at least 24 hours in advance.
 - 3. Make temporary connections to maintain service in areas adjacent to work area.

3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- A. Perform work for removal and disposal of equipment and materials containing toxic substances regulated under the Federal Toxic Substances Control Act (TSCA) in accordance with applicable federal, state, and local regulations. Applicable equipment and materials include, but are not limited to:
 - 1. PCB- and DEHP-containing lighting ballasts.
 - 2. Mercury-containing lamps and tubes, including fluorescent lamps, high intensity discharge (HID), arc lamps, ultra-violet, high pressure sodium, mercury vapor, ignitron tubes, neon, and incandescent.
- B. Remove, relocate, and extend existing installations to accommodate new construction.
- C. Remove abandoned wiring to source of supply.
- D. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- E. Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.
- F. Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.

- G. Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.
- H. Repair adjacent construction and finishes damaged during demolition and extension work.
- I. Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.
- J. Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

3.04 CLEANING AND REPAIR

- A. See Section 017419 Construction Waste Management and Disposal for additional requirements.
- B. Clean and repair existing materials and equipment that remain or that are to be reused.
- C. Panelboards: Clean exposed surfaces and check tightness of electrical connections. Replace damaged circuit breakers and provide closure plates for vacant positions. Provide typed circuit directory showing revised circuiting arrangement.

SECTION 260519 LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Single conductor building wire.
- B. Nonmetallic-sheathed cable.
- C. Metal-clad cable.
- D. Manufactured wiring systems.
- E. Wiring connectors.
- F. Electrical tape.
- G. Heat shrink tubing.
- H. Wire pulling lubricant.
- I. Cable ties.

1.02 RELATED REQUIREMENTS

- A. Section 078400 Firestopping.
- B. Section 270526 -
- C. Section 260526 Grounding and Bonding for Electrical Systems: Additional requirements for grounding conductors and grounding connectors.
- D. Section 260553 Identification for Electrical Systems: Identification products and requirements.
- E. Section 284600 Fire Detection and Alarm: Fire alarm system conductors and cables.

1.03 REFERENCE STANDARDS

- A. ASTM B3 Standard Specification for Soft or Annealed Copper Wire; 2013 (Reapproved 2018).
- B. ASTM B8 Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft; 2011 (Reapproved 2017).
- C. ASTM B33 Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes; 2010, with Editorial Revision (2020).
- D. ASTM B787/B787M Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation; 2004 (Reapproved 2020).
- E. ASTM D4388 Standard Specification for Nonmetallic Semi-Conducting and Electrically Insulating Rubber Tapes; 2020.
- F. NECA 1 Standard for Good Workmanship in Electrical Construction; 2015.
- G. NEMA WC 70 Power Cables Rated 2000 Volts or Less for the Distribution of Electrical Energy; 2021.
- H. NETA ATS Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- I. NFPA 70 National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 44 Thermoset-Insulated Wires and Cables; Current Edition, Including All Revisions.
- K. UL 83 Thermoplastic-Insulated Wires and Cables; Current Edition, Including All Revisions.
- L. UL 183 Manufactured Wiring Systems; Current Edition, Including All Revisions.
- M. UL 267 Outline of Investigation for Wire-Pulling Compounds; Most Recent Edition, Including All Revisions.
- N. UL 486A-486B Wire Connectors; Current Edition, Including All Revisions.
- O. UL 486C Splicing Wire Connectors; Current Edition, Including All Revisions.

- P. UL 486D Sealed Wire Connector Systems; Current Edition, Including All Revisions.
- Q. UL 510 Polyvinyl Chloride, Polyethylene, and Rubber Insulating Tape; Current Edition, Including All Revisions.
- R. UL 719 Nonmetallic-Sheathed Cables; Current Edition, Including All Revisions.
- S. UL 1569 Metal-Clad Cables; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate sizes of raceways, boxes, and equipment enclosures installed under other sections with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
 - 2. Coordinate with electrical equipment installed under other sections to provide terminations suitable for use with the conductors to be installed.
 - 3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. See Section 013000 Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conductors and cables in accordance with manufacturer's instructions.

1.08 FIELD CONDITIONS

A. Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F (-10 degrees C), unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

PART 2 PRODUCTS

2.01 CONDUCTOR AND CABLE APPLICATIONS

- A. Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B. Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
- C. Nonmetallic-sheathed cable is not permitted.
- D. Metal-clad cable is permitted only as follows:
 - 1. Where not otherwise restricted, may be used:
 - a. Where concealed above accessible ceilings for final connections from junction boxes to luminaires.
 - 1) Maximum Length: 6 feet (1.8 m).
 - b. Where concealed in hollow stud walls and above accessible ceilings for branch circuits up to 20 A.

2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.

- C. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- D. Comply with NEMA WC 70.
- E. Thermoplastic-Insulated Conductors and Cables: Listed and labeled as complying with UL 83.
- F. Thermoset-Insulated Conductors and Cables: Listed and labeled as complying with UL 44.
- G. Conductors for Grounding and Bonding: Also comply with Section 260526.
- H. Conductors and Cables Installed Exposed in Spaces Used for Environmental Air (only where specifically permitted): Plenum rated, listed and labeled as suitable for use in return air plenums.
- I. Conductor Material:
 - 1. Provide copper conductors only. Aluminum conductors are not acceptable for this project. Conductor sizes indicated are based on copper.
 - 2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors complying with ASTM B3, ASTM B8, or ASTM B787/B787M unless otherwise indicated.
 - 3. Tinned Copper Conductors: Comply with ASTM B33.
- J. Minimum Conductor Size:
 - 1. Branch Circuits: 12 AWG.
 - a. Exceptions:
 - 1) 20 A, 120 V circuits longer than 75 feet (23 m): 10 AWG, for voltage drop.
 - 2) 20 A, 120 V circuits longer than 150 feet (46 m): 8 AWG, for voltage drop.
 - 2. Control Circuits: 14 AWG.
- K. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- L. Conductor Color Coding:
 - 1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
 - 2. Color Coding Method: Integrally colored insulation.
 - 3. Color Code:
 - a. 480Y/277 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Brown.
 - 2) Phase B: Orange.
 - 3) Phase C: Yellow.
 - 4) Neutral/Grounded: Gray.
 - b. 208Y/120 V, 3 Phase, 4 Wire System:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - 4) Neutral/Grounded: White.
 - c. Equipment Ground, All Systems: Green.
 - d. Travelers for 3-Way and 4-Way Switching: Pink.
 - e. For modifications or additions to existing wiring systems, comply with existing color code when existing code complies with NFPA 70 and is approved by the authority having jurisdiction.

2.03 SINGLE CONDUCTOR BUILDING WIRE

- A. Description: Single conductor insulated wire.
- B. Conductor Stranding:
 - 1. Feeders and Branch Circuits:
 - a. Size 10 AWG and Smaller: Solid.
 - b. Size 8 AWG and Larger: Stranded.

- C. Insulation Voltage Rating: 600 V.
- D. Insulation:
 - Copper Building Wire: Type THHN/THWN or THHN/THWN-2, except as indicated below.
 a. Size 4 AWG and Larger: Type XHHW-2.

2.04 METAL-CLAD CABLE

- A. Description: NFPA 70, Type MC cable listed and labeled as complying with UL 1569, and listed for use in classified firestop systems to be used.
- B. Conductor Stranding:
 - 1. Size 10 AWG and Smaller: Solid.
 - 2. Size 8 AWG and Larger: Stranded.
- C. Insulation Voltage Rating: 600 V.
- D. Insulation: Type THHN, THHN/THWN, or THHN/THWN-2.
- E. Provide dedicated neutral conductor for each phase conductor where indicated or required.
- F. Grounding: Full-size integral equipment grounding conductor.
- G. Armor: Steel, interlocked tape.

2.05 WIRING CONNECTORS

- A. Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B. Connectors for Grounding and Bonding: Comply with Section 260526.
- C. Wiring Connectors for Splices and Taps:
 - 1. Copper Conductors Size 8 AWG and Smaller: Use twist-on insulated spring connectors.
 - 2. Copper Conductors Size 6 AWG and Larger: Use mechanical connectors or compression connectors.
- D. Wiring Connectors for Terminations:
 - 1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
 - 2. Copper Conductors Size 8 AWG and Larger: Use mechanical connectors or compression connectors where connectors are required.
- E. Do not use insulation-piercing or insulation-displacement connectors designed for use with conductors without stripping insulation.
- F. Do not use push-in wire connectors as a substitute for twist-on insulated spring connectors.
- G. Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F (105 degrees C) for standard applications and 302 degrees F (150 degrees C) for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.
 - 1. Manufacturers:
 - a. 3M: www.3m.com/#sle.
 - b. Ideal Industries, Inc: www.idealindustries.com/#sle.
 - c. NSI Industries LLC: www.nsiindustries.com/#sle.
- H. Mechanical Connectors: Provide bolted type or set-screw type.
- I. Compression Connectors: Provide circumferential type or hex type crimp configuration.
- J. Crimped Terminals: Nylon-insulated, with insulation grip and terminal configuration suitable for connection to be made.

2.06 ACCESSORIES

- A. Electrical Tape:
 - 1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221

degrees F (105 degrees C).

- Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil (0.18 mm); resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F (-18 degrees C) and suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
- 3. Rubber Splicing Electrical Tape: Ethylene Propylene Rubber (EPR) tape, complying with ASTM D4388; minimum thickness of 30 mil (0.76 mm); suitable for continuous temperature environment up to 194 degrees F (90 degrees C) and short-term 266 degrees F (130 degrees C) overload service.
- 4. Electrical Filler Tape: Rubber-based insulating moldable putty, minimum thickness of 125 mil (3.2 mm); suitable for continuous temperature environment up to 176 degrees F (80 degrees C).
- 5. Varnished Cambric Electrical Tape: Cotton cambric fabric tape, with or without adhesive, oil-primed and coated with high-grade insulating varnish; minimum thickness of 7 mil (0.18 mm); suitable for continuous temperature environment up to 221 degrees F (105 degrees C).
- 6. Moisture Sealing Electrical Tape: Insulating mastic compound laminated to flexible, allweather vinyl backing; minimum thickness of 90 mil (2.3 mm).
- B. Heat Shrink Tubing: Heavy-wall, split-resistant, with factory-applied adhesive; rated 600 V; suitable for direct burial applications; listed as complying with UL 486D.
- C. Wire Pulling Lubricant:
 - 1. Listed and labeled as complying with UL 267.
 - 2. Suitable for use with conductors/cables and associated insulation/jackets to be installed.
 - 3. Suitable for use at installation temperature.
- D. Cable Ties: Material and tensile strength rating suitable for application.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that interior of building has been protected from weather.
- B. Verify that work likely to damage wire and cable has been completed.
- C. Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- D. Verify that field measurements are as indicated.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

A. Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

3.03 INSTALLATION

- A. Circuiting Requirements:
 - 1. Unless dimensioned, circuit routing indicated is diagrammatic.
 - 2. When circuit destination is indicated without specific routing, determine exact routing required.
 - 3. Arrange circuiting to minimize splices.
 - 4. Include circuit lengths required to install connected devices within 10 ft (3.0 m) of location indicated.
 - 5. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and powerlimited circuits in accordance with NFPA 70.
 - 6. Circuiting Adjustments: Unless otherwise indicated, when branch circuits are indicated as separate, combining them together in a single raceway is permitted, under the following conditions:
 - a. Provide no more than six current-carrying conductors in a single raceway. Dedicated neutral conductors are considered current-carrying conductors.

- b. Increase size of conductors as required to account for ampacity derating.
- c. Size raceways, boxes, etc. to accommodate conductors.
- 7. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.
- B. Install products in accordance with manufacturer's instructions.
- C. Perform work in accordance with NECA 1 (general workmanship).
- D. Install metal-clad cable (Type MC) in accordance with NECA 120.
- E. Installation in Raceway:
 - 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
 - 2. Pull all conductors and cables together into raceway at same time.
 - 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
 - 4. Use suitable wire pulling lubricant where necessary, except when lubricant is not recommended by the manufacturer.
- F. Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- G. Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
 - 1. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conductors and cables to lay on ceiling tiles.
- H. Terminate cables using suitable fittings.
 - 1. Metal-Clad Cable (Type MC):
 - a. Use listed fittings.
 - b. Cut cable armor only using specialized tools to prevent damaging conductors or insulation. Do not use hacksaw or wire cutters to cut armor.
- I. Install conductors with a minimum of 12 inches (300 mm) of slack at each outlet.
- J. Neatly train and bundle conductors inside boxes, wireways, panelboards and other equipment enclosures.
- K. Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.
- L. Make wiring connections using specified wiring connectors.
 - 1. Make splices and taps only in accessible boxes. Do not pull splices into raceways or make splices in conduit bodies or wiring gutters.
 - 2. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
 - 3. Do not remove conductor strands to facilitate insertion into connector.
 - 4. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminates. Do not use wire brush on plated connector surfaces.
 - 5. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 - 6. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- M. Insulate splices and taps that are made with uninsulated connectors using methods suitable for the application, with insulation and mechanical strength at least equivalent to unspliced conductors.

- 1. Dry Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
 - a. For taped connections, first apply adequate amount of rubber splicing electrical tape or electrical filler tape, followed by outer covering of vinyl insulating electrical tape.
 - b. For taped connections likely to require re-entering, including motor leads, first apply varnished cambric electrical tape, followed by adequate amount of rubber splicing electrical tape, followed by outer covering of vinyl insulating electrical tape.
- 2. Damp Locations: Use insulating covers specifically designed for the connectors, electrical tape, or heat shrink tubing.
 - a. For connections with insulating covers, apply outer covering of moisture sealing electrical tape.
 - b. For taped connections, follow same procedure as for dry locations but apply outer covering of moisture sealing electrical tape.
- 3. Wet Locations: Use heat shrink tubing.
- N. Insulate ends of spare conductors using vinyl insulating electrical tape.
- O. Identify conductors and cables in accordance with Section 260553.
- P. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.
- Q. Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

3.04 FIELD QUALITY CONTROL

- A. See Section 014000 Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.3.2. The insulation resistance test is required for all conductors. The resistance test for parallel conductors listed as optional is not required.
- D. Correct deficiencies and replace damaged or defective conductors and cables.

SECTION 260526 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Grounding and bonding requirements.
- B. Conductors for grounding and bonding.
- C. Connectors for grounding and bonding.
- D. Ground bars.

1.02 RELATED REQUIREMENTS

- A. Section 260519 Low-Voltage Electrical Power Conductors and Cables: Additional requirements for conductors for grounding and bonding, including conductor color coding.
- B. Section 260553 Identification for Electrical Systems: Identification products and requirements.
- C. Section 270526 Grounding and Bonding for Communication Systems: Additional grounding and bonding requirements for all telecommunications system.

1.03 REFERENCE STANDARDS

- A. IEEE 81 IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System; 2012.
- B. NECA 1 Standard for Good Workmanship in Electrical Construction; 2015.
- C. NETA ATS Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- D. NFPA 70 National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. UL 467 Grounding and Bonding Equipment; Current Edition, Including All Revisions.

1.04 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 GROUNDING AND BONDING REQUIREMENTS

- A. Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.
- B. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- C. Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- D. Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- E. Grounding System Resistance:
 - 1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.
 - 2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
- F. Grounding Electrode System:

- 1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
 - a. Provide continuous grounding electrode conductors without splice or joint.
 - b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
- 2. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
- G. Bonding and Equipment Grounding:
 - 1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
 - 2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
 - 3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
 - 4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
 - 5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
 - 6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
 - 7. Provide bonding for interior metal air ducts.
 - 8. Provide bonding for metal building frame.
- H. Communications Systems Grounding and Bonding:
 - 1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.
 - 2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
 - a. Bonding Jumper Size: 6 AWG, unless otherwise indicated or required.
 - b. Raceway Size: 3/4 inch (21 mm) trade size unless otherwise indicated or required.
 - c. Ground Bar Size: 1/4 by 2 by 12 inches (6 by 50 by 300 mm) unless otherwise indicated or required.
 - d. Ground Bar Mounting Height: 18 inches (450 mm) above finished floor unless otherwise indicated.

2.02 GROUNDING AND BONDING COMPONENTS

- A. General Requirements:
 - 1. Provide products listed, classified, and labeled as suitable for the purpose intended.
 - 2. Provide products listed and labeled as complying with UL 467 where applicable.
- B. Conductors for Grounding and Bonding, in Addition to Requirements of Section 260526:
 - 1. Use insulated copper conductors unless otherwise indicated.
 - a. Exceptions:
 - 1) Use bare copper conductors where installed underground in direct contact with earth.
 - 2) Use bare copper conductors where directly encased in concrete (not in raceway).
- C. Connectors for Grounding and Bonding:
 - 1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
 - 2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.

- 3. Unless otherwise indicated, use mechanical connectors, compression connectors, or exothermic welded connections for accessible connections.
- D. Ground Bars:
 - 1. Description: Copper rectangular ground bars with mounting brackets and insulators.
 - 2. Size: As indicated.
 - 3. Holes for Connections: As indicated or as required for connections to be made.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that work likely to damage grounding and bonding system components has been completed.
- B. Verify that field measurements are as indicated.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Make grounding and bonding connections using specified connectors.
 - 1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
 - 2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
 - 3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
 - 4. Mechanical Connectors: Secure connections according to manufacturer's recommended torque settings.
 - 5. Compression Connectors: Secure connections using manufacturer's recommended tools and dies.
- D. Identify grounding and bonding system components in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.13.
- D. Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.
- E. Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.

SECTION 260529 HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

1.02 RELATED REQUIREMENTS

- A. Section 260533.16 Boxes for Electrical Systems: Additional support and attachment requirements for boxes.
- B. Section 260548 Vibration and Seismic Controls for Electrical Systems.
- C. Section 262513 Low-Voltage Busways: Additional support and attachment requirements for busway.
- D. Section 265100 Interior Lighting: Additional support and attachment requirements for interior luminaires.

1.03 REFERENCE STANDARDS

- A. ASTM A123/A123M Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2017.
- B. ASTM A153/A153M Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2016a.
- C. ASTM B633 Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel; 2019.
- D. MFMA-4 Metal Framing Standards Publication; 2004.
- E. NECA 1 Standard for Good Workmanship in Electrical Construction; 2015.
- F. NFPA 70 National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 QUALITY ASSURANCE

PART 2 PRODUCTS

2.01 SUPPORT AND ATTACHMENT COMPONENTS

- A. General Requirements:
 - 1. Comply with the following. Where requirements differ, comply with most stringent.
 - a. NFPA 70.
 - b. Requirements of authorities having jurisdiction.
 - 2. Provide required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for complete installation of electrical work.
 - 3. Provide products listed, classified, and labeled as suitable for purpose intended, where applicable.
 - 4. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for load to be supported with minimum safety factor of _____. Include consideration for vibration, equipment operation, and shock loads where applicable.
 - 5. Do not use products for applications other than as permitted by NFPA 70 and product listing.
 - 6. Steel Components: Use corrosion-resistant materials suitable for environment where installed.
 - a. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
 - b. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
- B. Conduit and Cable Supports: Straps and clamps suitable for conduit or cable to be supported.
 - 1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.

- 2. Conduit Clamps: Bolted type unless otherwise indicated.
- C. Outlet Box Supports: Hangers and brackets suitable for boxes to be supported.
- D. Metal Channel/Strut Framing Systems:
 - 1. Description: Factory-fabricated, continuous-slot, metal channel/strut and associated fittings, accessories, and hardware required for field assembly of supports.
 - 2. Comply with MFMA-4.
- E. Hanger Rods: Threaded, zinc-plated steel unless otherwise indicated.
- F. Anchors and Fasteners:
 - 1. Unless otherwise indicated and where not otherwise restricted, use anchor and fastener types indicated for specified applications.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive support and attachment components.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install hangers and supports in accordance with NECA 1.
- C. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- D. Unless specifically indicated or approved by Architect, do not provide support from suspended ceiling support system or ceiling grid.
- E. Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- F. Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- G. Provide required vibration isolation and/or seismic controls; see Section 260548.
- H. Equipment Support and Attachment:
 - 1. Use metal, fabricated supports or supports assembled from metal channel/strut to support equipment as required.
 - 2. Use metal channel/strut secured to studs to support equipment surface mounted on hollow stud walls when wall strength is not sufficient to resist pull-out.
 - 3. Use metal channel/strut to support surface-mounted equipment in wet or damp locations to provide space between equipment and mounting surface.
 - 4. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- I. Busway Support and Attachment: See Section 262513 for additional requirements.
- J. Interior Luminaire Support and Attachment: See Section 265100 for additional requirements.
- K. Secure fasteners in accordance with manufacturer's recommended torque settings.
- L. Remove temporary supports.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 Quality Requirements for additional requirements.
- B. Inspect support and attachment components for damage and defects.
- C. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- D. Correct deficiencies and replace damaged or defective support and attachment components.

SECTION 260533.13 CONDUIT FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Galvanized steel rigid metal conduit (RMC).
- B. Galvanized steel intermediate metal conduit (IMC).
- C. Flexible metal conduit (FMC).
- D. Galvanized steel electrical metallic tubing (EMT).
- E. Stainless steel electrical metallic tubing (EMT).
- F. Rigid polyvinyl chloride (PVC) conduit.
- G. Reinforced thermosetting resin conduit (RTRC).

1.02 RELATED REQUIREMENTS

- A. Section 078400 Firestopping.
- B. Section 260519 Low-Voltage Electrical Power Conductors and Cables: Cable assemblies consisting of conductors protected by integral metal armor.
- C. Section 260526 Grounding and Bonding for Electrical Systems.
 1. Includes additional requirements for fittings for grounding and bonding.
- D. Section 260529 Hangers and Supports for Electrical Systems.
- E. Section 260533.16 Boxes for Electrical Systems.
- F. Section 260553 Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. ANSI C80.1 American National Standard for Electrical Rigid Steel Conduit (ERSC); 2020.
- B. ANSI C80.3 American National Standard for Electrical Metallic Tubing -- Steel (EMT-S); 2020.
- C. NECA 1 Standard for Good Workmanship in Electrical Construction; 2015.
- D. NECA 101 Standard for Installing Steel Conduits (Rigid, IMC, EMT); 2020.
- E. NEMA FB 1 Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- F. NEMA TC 2 Electrical Polyvinyl Chloride (PVC) Conduit; 2020.
- G. NEMA TC 3 Polyvinyl Chloride (PVC) Fittings for Use with Rigid PVC Conduit and Tubing; 2021.
- H. NEMA TC 14 (SERIES) Reinforced Thermosetting Resin Conduit and Fittings Series; 2015.
- I. NFPA 70 National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- J. UL 1 Flexible Metal Conduit; Current Edition, Including All Revisions.
- K. UL 6 Electrical Rigid Metal Conduit-Steel; Current Edition, Including All Revisions.
- L. UL 360 Liquid-Tight Flexible Metal Conduit; Current Edition, Including All Revisions.
- M. UL 514B Conduit, Tubing, and Cable Fittings; Current Edition, Including All Revisions.
- N. UL 651 Schedule 40, 80, Type EB and A Rigid PVC Conduit and Fittings; Current Edition, Including All Revisions.
- O. UL 797 Electrical Metallic Tubing-Steel; Current Edition, Including All Revisions.
- P. UL 797A Electrical Metallic Tubing Aluminum and Stainless Steel; Current Edition, Including All Revisions.
- Q. UL 1242 Electrical Intermediate Metal Conduit-Steel; Current Edition, Including All Revisions.

R. UL 2419 - Outline of Investigation for Electrically Conductive Corrosion Resistant Compounds; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate minimum sizes of conduits with actual type and quantity of conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
 - 2. Coordinate arrangement of conduits with structural members, ductwork, piping, equipment, and other potential conflicts.
 - 3. Verify exact conduit termination locations required for boxes, enclosures, and equipment.
 - 4. Coordinate work to provide roof penetrations that preserve integrity of roofing system and do not void roof warranty.
 - 5. Notify Architect of conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B. Sequencing:
 - 1. Do not begin installation of conductors and cables until installation of conduit between termination points is complete.

1.05 QUALITY ASSURANCE

1.06 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store conduit and fittings in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 CONDUIT APPLICATIONS

- A. Do not use conduit and associated fittings for applications other than as permitted by NFPA 70, manufacturer's instructions, and product listing.
- B. Unless otherwise indicated and where not otherwise restricted, use conduit types indicated for specified applications. Where more than one listed application applies, comply with most restrictive requirements. Where conduit type for particular application is not specified, use galvanized steel rigid metal conduit.
- C. Embedded Within Concrete:
 - Within Slab on Grade: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit (RMC), galvanized steel electrical metallic tubing (EMT), rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC). Embed within structural slabs only where approved by Structural Engineer.
- D. Concealed Within Masonry Walls: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- E. Concealed Within Hollow Stud Walls: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- F. Concealed Above Accessible Ceilings: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- G. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

- H. Exposed, Interior, Not Subject to Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- I. Exposed, Exterior, Not Subject to Severe Physical Damage: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- J. Concealed, Exterior, Not Embedded in Concrete or in Contact With Earth: Use galvanized steel rigid metal conduit (RMC), stainless steel rigid metal conduit (RMC), galvanized steel intermediate metal conduit (IMC), stainless steel intermediate metal conduit (IMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).
- K. Flexible Connections to Vibrating Equipment:
 - 1. Dry Locations: Use flexible metal conduit (FMC).
 - 2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit (LFMC).
 - 3. Maximum Length: 6 feet (1.8 m) unless otherwise indicated.
 - 4. Vibrating equipment includes, but is not limited to:

a. Motors.

L. Fished in Existing Walls, Where Necessary: Use flexible metal conduit (FMC), galvanized steel electrical metallic tubing (EMT), or stainless steel electrical metallic tubing (EMT).

2.02 CONDUIT - GENERAL REQUIREMENTS

- A. Comply with NFPA 70.
- B. Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling mandrel through them.
- C. Electrical Service Conduits: See Section 262100 for additional requirements.
- D. Fittings for Grounding and Bonding: See Section 260526 for additional requirements.
- E. Provide conduit, fittings, supports, and accessories required for complete raceway system.
- F. Provide products listed, classified, and labeled as suitable for purpose intended.
- G. Minimum Conduit Size, Unless Otherwise Indicated:
 - 1. Branch Circuits: 3/4 inch (21 mm) trade size.
 - 2. Branch Circuit Homeruns: 3/4-inch (21 mm) trade size.
 - 3. Control Circuits: 1/2-inch (16 mm) trade size.
 - 4. Flexible Connections to Luminaires: 3/8-inch (12 mm) trade size.
- H. Where conduit size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)

- A. Description: NFPA 70, Type RMC galvanized steel rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- B. Fittings:
 - 1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 6.
 - 2. Material: Use steel or malleable iron.
 - 3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.04 GALVANIZED STEEL INTERMEDIATE METAL CONDUIT (IMC)

- A. Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
- B. Fittings:

- 1. Nonhazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B or UL 1242.
- 2. Material: Use steel or malleable iron.
- 3. Connectors and Couplings: Use threaded type fittings only. Threadless fittings, including set screw and compression/gland types, are not permitted.

2.05 FLEXIBLE METAL CONDUIT (FMC)

- A. Description: NFPA 70, Type FMC standard-wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.

2.06 LIQUIDTIGHT FLEXIBLE METAL CONDUIT (LFMC)

- A. Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.

2.07 GALVANIZED STEEL ELECTRICAL METALLIC TUBING (EMT)

- A. Description: NFPA 70, Type EMT galvanized steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Material: Use steel or malleable iron.
 - Connectors and Couplings: Use compression/gland or set-screw type.
 a. Do not use indenter type connectors and couplings.

2.08 STAINLESS STEEL ELECTRICAL METALLIC TUBING (EMT)

- A. Description: NFPA 70, Type EMT stainless steel electrical metallic tubing complying with ANSI C80.3 and listed and labeled as complying with UL 797A.
- B. Fittings:
 - 1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
 - 2. Connectors and Couplings: Use compression/gland or set-screw type.

2.09 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT

- A. Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 unless otherwise indicated, Schedule 80 where subject to physical damage; rated for use with conductors rated 90 degrees C.
- B. Fittings:
 - 1. Manufacturer: Same as manufacturer of conduit to be connected.
 - 2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

2.10 REINFORCED THERMOSETTING RESIN CONDUIT (RTRC)

- A. Description: NFPA 70, Type RTRC reinforced thermosetting resin conduit complying with NEMA TC 14 (SERIES).
- B. Supports: As recommended by manufacturer.
- C. Fittings: Same type and manufacturer as conduit to be connected.

2.11 ACCESSORIES

- A. Conduit Joint Compound: Corrosion-resistant, electrically conductive compound listed as complying with UL 2419; suitable for use with conduit to be installed.
- B. Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.
- C. Epoxy Adhesive for RTRC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.
- D. Pull Strings: Use nylon or polyester tape with average breaking strength of not less than 1,250 lbf (5.6 kN).
- E. Sealing Compound for Hazardous/Classified Location Sealing Fittings: Listed for use with particular fittings to be installed.
- F. Sealing Systems for Concrete Penetrations:
 - 1. Sleeves: Provide water stop ring or cement coating that bonds to concrete to prevent water infiltration.
 - 2. Rate for minimum of 40 psig; suitable for sealing around conduits to be installed.
- G. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.
- H. Firestop Sleeves: Listed; provide as required to preserve fire resistance rating of building elements.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive conduits.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install conduit in accordance with NECA 1.
- C. Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- D. Install intermediate metal conduit (IMC) in accordance with NECA 101.
- E. Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
- F. Conduit Routing:
 - 1. Unless dimensioned, conduit routing indicated is diagrammatic.
 - 2. When conduit destination is indicated without specific routing, determine exact routing required.
 - 3. Conceal conduits unless specifically indicated to be exposed.
 - 4. Arrange conduit to maintain adequate headroom, clearances, and access.
 - 5. Arrange conduit to provide no more than equivalent of four 90-degree bends between pull points.
 - 6. Arrange conduit to provide no more than 150 feet (46 m) between pull points.
 - 7. Route conduits above water and drain piping where possible.
 - 8. Maintain minimum clearance of 6 inches (150 mm) between conduits and piping for other systems.
 - 9. Maintain minimum clearance of 12 inches (300 mm) between conduits and hot surfaces. This includes, but is not limited to:
 - a. Hot water piping.
- G. Conduit Support:

- 1. Secure and support conduits in accordance with NFPA 70 using suitable supports and methods approved by authorities having jurisdiction; see Section 260529.
- 2. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- 3. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.
- H. Connections and Terminations:
 - 1. Use approved conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
 - 2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
 - 3. Use suitable adapters where required to transition from one type of conduit to another.
 - 4. Provide drip loops for liquidtight flexible conduit connections to prevent drainage of liquid into connectors.
 - 5. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
 - 6. Provide insulating bushings, insulated throats, or listed metal fittings with smooth, rounded edges at conduit terminations to protect conductors.
 - 7. Secure joints and connections to provide mechanical strength and electrical continuity.
- I. Penetrations:
 - 1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams, without approval of Structural Engineer.
 - 2. Make penetrations perpendicular to surfaces unless otherwise indicated.
 - 3. Provide sleeves for penetrations as indicated or as required to facilitate installation. Set sleeves flush with exposed surfaces unless otherwise indicated or required.
 - 4. Conceal bends for conduit risers emerging above ground.
 - 5. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
 - 6. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as indicated or as required to preserve integrity of roofing system and maintain roof warranty.
 - 7. Install firestopping to preserve fire resistance rating of partitions and other elements; see Section 078400.
- J. Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
 - 1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
 - 2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
 - Where calculated in accordance with NFPA 70 for reinforced thermosetting resin conduit (RTRC) conduit installed above ground to compensate for thermal expansion and contraction.
 - 4. Where conduits are subject to earth movement by settlement or frost.
- K. Conduit Sealing:
 - 1. Use foam conduit sealant to prevent entry of moisture and gases. This includes, but is not limited to:
 - a. Where conduits enter building from outside.
 - b. Where service conduits enter building from underground distribution system.
 - c. Where conduits enter building from underground.
 - d. Where conduits may transport moisture to contact live parts.
 - 2. Where conduits cross barriers between areas of potential substantial temperature differential, use foam conduit sealant at accessible point near penetration to prevent condensation. This includes, but is not limited to:

- a. Where conduits pass from outdoors into conditioned interior spaces.
- b. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
- L. Provide pull string in each empty conduit and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches (300 mm) at each end.
- M. Provide grounding and bonding; see Section 260526.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 Quality Requirements for additional requirements.
- B. Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- C. Correct deficiencies and replace damaged or defective conduits.

3.04 CLEANING

A. Clean interior of conduits to remove moisture and foreign matter.

3.05 PROTECTION

A. Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

SECTION 260533.16 BOXES FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Outlet and device boxes up to 100 cubic inches (1,650 cu cm), including those used as junction and pull boxes.
- B. Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches (1,650 cu cm).
- C. Boxes and enclosures for integrated power, data, and audio/video.
- D. Floor boxes.
- E. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 078400 Firestopping.
- B. Section 083100 Access Doors and Panels: Panels for maintaining access to concealed boxes.
- C. Section 260526 Grounding and Bonding for Electrical Systems.
- D. Section 260529 Hangers and Supports for Electrical Systems.
- E. Section 260533.13 Conduit for Electrical Systems:
 - 1. Conduit bodies and other fittings.
 - 2. Additional requirements for locating boxes to limit conduit length and/or number of bends between pulling points.
- F. Section 260553 Identification for Electrical Systems: Identification products and requirements.
- G. Section 262726 Wiring Devices:
 - 1. Wall plates.
 - 2. Floor box service fittings.
 - 3. Additional requirements for locating boxes for wiring devices.

1.03 REFERENCE STANDARDS

- A. NECA 1 Standard for Good Workmanship in Electrical Construction; 2015.
- B. NECA 130 Standard for Installing and Maintaining Wiring Devices; 2016.
- C. NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- D. NEMA FB 1 Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit, Electrical Metallic Tubing, and Cable; 2014.
- E. NEMA OS 1 Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports; 2013 (Reaffirmed 2020).
- F. NFPA 70 National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- G. UL 50 Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- H. UL 50E Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- I. UL 508A Industrial Control Panels; Current Edition, Including All Revisions.
- J. UL 514A Metallic Outlet Boxes; Current Edition, Including All Revisions.

1.04 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Receive, inspect, handle, and store products in accordance with manufacturer's instructions.

PART 2 PRODUCTS

2.01 BOXES

- A. General Requirements:
 - 1. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
 - 2. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
 - 3. Provide products listed, classified, and labeled as suitable for the purpose intended.
 - 4. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
 - 5. Provide grounding terminals within boxes where equipment grounding conductors terminate.
- B. Outlet and Device Boxes Up to 100 cubic inches (1,650 cu cm), Including Those Used as Junction and Pull Boxes:
 - 1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
 - 2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
 - 3. Use suitable concrete type boxes where flush-mounted in concrete.
 - 4. Use suitable masonry type boxes where flush-mounted in masonry walls.
 - 5. Use raised covers suitable for the type of wall construction and device configuration where required.
 - 6. Use shallow boxes where required by the type of wall construction.
 - 7. Do not use "through-wall" boxes designed for access from both sides of wall.
 - 8. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
 - 9. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
 - 10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
 - 11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes unless specifically indicated or permitted.
 - 12. Minimum Box Size, Unless Otherwise Indicated:
 - a. Wiring Devices (Other Than Communications Systems Outlets): 4 inch square by 1-1/2 inch deep (100 by 38 mm) trade size.
 - 13. Wall Plates: Comply with Section 262726.
- C. Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
 - 1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
 - NEMA 250 Environment Type, Unless Otherwise Indicated:
 a. Indoor Clean, Dry Locations: Type 1, painted steel.
 - 3. Junction and Pull Boxes Larger Than 100 cubic inches (1,650 cu cm):
 - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
- D. Boxes and Enclosures for Integrated Power, Data, and Audio/Video: Size and configuration as indicated or as required with partitions to separate services; field-connected gangable boxes may be used.
- E. Floor Boxes:
 - 1. Description: Floor boxes compatible with floor box service fittings provided in accordance with Section 262726; with partitions to separate multiple services; furnished with all components, adapters, and trims required for complete installation.
 - 2. Manufacturer: Same as manufacturer of floor box service fittings.

2.02 ACCESSORIES

A. Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for boxes and facade materials to be installed.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that mounting surfaces are ready to receive boxes.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install boxes in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards where mounting heights are not indicated.
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- E. Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.
- F. Box Locations:
 - 1. Locate boxes to be accessible. Provide access panels in accordance with Section 083100 as required where approved by the Architect.
 - Locate boxes as required for devices installed under other sections or by others.
 a. Switches, Receptacles, and Other Wiring Devices: Comply with Section 262726.
 - Locate boxes so that wall plates do not span different building finishes.
 - 4. Locate boxes so that wall plates do not cross masonry joints.
 - 5. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
 - 6. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches (150 mm) horizontal separation unless otherwise indicated.
 - 7. Acoustic-Rated Walls: Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches (610 mm) horizontal separation.
 - 8. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
 - a. Do not install flush-mounted boxes on opposite sides of walls back-to-back; provide minimum 24 inches (610 mm) separation where wall is constructed with individual noncommunicating stud cavities or protect both boxes with listed putty pads.
 - 9. Provide putty-pads on all boxes within walls in and adjacent to office and other finished areas.
 - 10. Locate junction and pull boxes as indicated, as required to facilitate installation of conductors, and to limit conduit length and/or number of bends between pulling points in accordance with Section 260533.13.
 - 11. Locate junction and pull boxes in the following areas, unless otherwise indicated or approved by the Architect:
 - a. Concealed above accessible suspended ceilings.
- G. Box Supports:
 - 1. Secure and support boxes in accordance with NFPA 70 and Section 260529 using suitable supports and methods approved by the authority having jurisdiction.
 - 2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.

- 3. Installation Above Suspended Ceilings: Do not provide support from ceiling grid or ceiling support system.
- H. Install boxes plumb and level.
- I. Flush-Mounted Boxes:
 - 1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch (6 mm) or does not project beyond finished surface.
 - 2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
 - 3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch (3 mm) at the edge of the box.
- J. Install boxes as required to preserve insulation integrity.
- K. Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.
- L. Nonmetallic Floor Boxes: Cut box flush with finished floor after concrete pour.
- M. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- N. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 078400.
- O. Close unused box openings.
- P. Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.
- Q. Provide grounding and bonding in accordance with Section 260526.
- R. Identify boxes in accordance with Section 260553.

3.03 CLEANING

A. Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

3.04 PROTECTION

A. Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

SECTION 260548 VIBRATION AND SEISMIC CONTROLS FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Vibration isolation requirements.
- B. Vibration isolators.

1.02 DEFINITIONS

A. Electrical Component: Where referenced in this section in regards to seismic controls, applies to any portion of the electrical system subject to seismic evaluation in accordance with applicable codes, including distributed systems (e.g., conduit, cable tray).

1.03 REFERENCE STANDARDS

- A. ASHRAE (HVACA) ASHRAE Handbook HVAC Applications; Most Recent Edition Cited by Referring Code or Reference Standard.
- B. NECA 1 Standard for Good Workmanship in Electrical Construction; 2015.
- C. NFPA 70 National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 QUALITY ASSURANCE

- A. Comply with NFPA 70.
- B. Comply with applicable building code.

PART 2 PRODUCTS

2.01 VIBRATION ISOLATION REQUIREMENTS

- A. Design and provide vibration isolation systems to reduce vibration transmission to supporting structure from vibration-producing electrical equipment and/or electrical connections to vibration-isolated equipment.
- B. Comply with applicable general recommendations of ASHRAE (HVACA), where not in conflict with other specified requirements:
- C. General Requirements:
 - 1. Select vibration isolators to provide required static deflection.
 - 2. Select vibration isolators for uniform deflection based on distributed operating weight of actual installed equipment.

D. Conduit Isolation:

- 1. Use flexible conduit or cable for electrical connections to vibration-isolated equipment, including equipment installed under other sections or by others.
 - a. Minimum Length: 3 feet (0.9 m) unless otherwise indicated.
- 2. Vibration Isolators:
 - a. Provide vibration isolators for conduit supports:
 - 1) Located within 50 feet (15.2 m) of connected vibration-isolated equipment where flexible connection to equipment is not possible.

2.02 VIBRATION ISOLATORS

- A. General Requirements:
 - 1. Resilient Materials for Vibration Isolators: Oil, ozone, and oxidant resistant.
 - 2. Spring Elements for Spring Isolators:
 - a. Color code or otherwise identify springs to indicate load capacity.
 - b. Lateral Stability: Minimum lateral stiffness to vertical stiffness ratio of 0.8.
 - c. Designed to operate in the linear portion of their load versus deflection curve over deflection range of not less than 50 percent above specified deflection.
 - d. Designed to provide additional travel to solid of not less than 50 percent of rated deflection at rated load.

- e. Selected to provide designed deflection of not less than 75 percent of specified deflection.
- f. Selected to function without undue stress or overloading.
- B. Vibration Isolators for Nonseismic Applications:
 - 1. Spring Isolator Hangers, Nonseismic:
 - a. Description: Isolator assembly designed for installation in hanger rod suspension system utilizing single or multiple free-standing, laterally stable steel spring(s) in series with an elastomeric element for the lower hanger rod connection.
 - b. Designed to accommodate misalignment of bottom hanger rod up to 30 degrees (plus/minus 15 degrees) without short-circuiting of isolation.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as shown on the drawings.
- B. Verify that mounting surfaces are ready to receive vibration isolation and/or seismic control components and associated attachments.
- C. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install products in accordance with applicable requirements of NECA 1 (general workmanship).
- C. Install anchors and fasteners in accordance with ICC Evaluation Services, LLC (ICC-ES) evaluation report conditions of use where applicable.
- D. Secure fasteners according to manufacturer's recommended torque settings.
- E. Install flexible conduit and cable connections to provide sufficient slack for vibration isolation and/or seismic relative displacements as indicated or as required.
- F. Vibration Isolation Systems:
 - 1. Spring Isolators:
 - a. Position equipment at operating height; provide temporary blocking as required.
 - b. Lift equipment free of isolators prior to lateral repositioning to avoid damage to isolators.
 - c. Level equipment by adjusting isolators gradually in sequence to raise equipment uniformly such that excessive weight or stress is not placed on any single isolator.
 - 2. Isolator Hangers:
 - a. Use precompressed isolator hangers where required to facilitate installation and prevent damage to equipment utility connection provisions.
 - b. Locate isolator hangers at top of hanger rods in accordance with manufacturer's instructions.
 - 3. Clean debris from beneath vibration-isolated equipment that could cause short-circuiting of isolation.
 - 4. Use elastomeric grommets for attachments where required to prevent short-circuiting of isolation.
 - 5. Adjust isolators to be free of isolation short circuits during normal operation.
 - 6. Do not overtighten fasteners such that resilient material isolator pads are compressed beyond manufacturer's maximum recommended deflection.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 Quality Requirements, for additional requirements.
- B. Inspect vibration isolation and/or seismic control components for damage and defects.
- C. Vibration Isolation Systems:
 - 1. Verify isolator static deflections.
 - 2. Verify vibration isolation performance during normal operation; investigate sources of isolation short circuits.

D. Correct deficiencies and replace damaged or defective vibration isolation and/or seismic control components.

SECTION 260553 IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Electrical identification requirements.
- B. Identification nameplates and labels.
- C. Wire and cable markers.
- D. Voltage markers.
- E. Warning signs and labels.

1.02 RELATED REQUIREMENTS

- A. Section 260519 Low-Voltage Electrical Power Conductors and Cables: Color coding for power conductors and cables 600 V and less; vinyl color coding electrical tape.
- B. Section 262726 Wiring Devices Lutron: Device and wallplate finishes; factory pre-marked wallplates.

1.03 REFERENCE STANDARDS

- A. ANSI Z535.2 American National Standard for Environmental and Facility Safety Signs; 2011 (Reaffirmed 2017).
- ANSI Z535.4 American National Standard for Product Safety Signs and Labels; 2011 (Reaffirmed 2017).
- C. NFPA 70 National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- D. NFPA 70E Standard for Electrical Safety in the Workplace; 2024.
- E. UL 969 Marking and Labeling Systems; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.
- B. Sequencing:
 - 1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
 - 2. Do not install identification products until final surface finishes and painting are complete.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.06 FIELD CONDITIONS

A. Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

PART 2 PRODUCTS

2.01 IDENTIFICATION REQUIREMENTS

- A. Existing Work: Unless specifically excluded, identify existing elements to remain that are not already identified in accordance with specified requirements.
- B. Identification for Equipment:
 - 1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
 - a. Panelboards:
 - 1) Identify ampere rating.
 - 2) Identify voltage and phase.

- 3) Identify power source and circuit number. Include location when not within sight of equipment.
- 4) Use typewritten circuit directory to identify load(s) served for panelboards with a door. Identify spares and spaces using pencil.
- 5) For power panelboards without a door, use identification nameplate to identify load(s) served for each branch device. Do not identify spares and spaces.
- b. Enclosed switches, circuit breakers, and motor controllers:
 - 1) Identify voltage and phase.
 - 2) Identify power source and circuit number. Include location when not within sight of equipment.
- 2. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
- 3. Use identification label to identify overcurrent protective devices for branch circuits serving fire alarm circuits. Identify with text "FIRE ALARM CIRCUIT".
- C. Identification for Conductors and Cables:
 - 1. Color Coding for Power Conductors 600 V and Less: Comply with Section 260519.
 - 2. Use identification nameplate or identification label to identify color code for ungrounded and grounded power conductors inside door or enclosure at each piece of feeder or branch-circuit distribution equipment when premises has feeders or branch circuits served by more than one nominal voltage system.
 - Use wire and cable markers to identify circuit number or other designation indicated for power, control, and instrumentation conductors and cables at the following locations:
 a. Within boxes when more than one circuit is present.
 - a. Within boxes when more than one circuit is
- D. Identification for Boxes:
 - 1. Use identification labels or handwritten text using indelible marker to identify circuits enclosed.
 - a. For exposed boxes in public areas, use only identification labels.
- E. Identification for Devices:
 - 1. Wiring Device and Wallplate Finishes: Comply with Section 262726.
 - 2. Use identification label or engraved wallplate to identify serving branch circuit for all receptacles.
 - a. For receptacles in public areas or in areas as directed by Architect, provide identification on inside surface of wallplate.
 - 3. Use identification label or engraved wallplate to identify load controlled for wall-mounted control devices controlling loads that are not visible from the control location and for multiple wall-mounted control devices installed at one location.
 - 4. Use identification label to identify receptacles protected by upstream GFI protection, where permitted.

2.02 IDENTIFICATION NAMEPLATES AND LABELS

- A. Identification Nameplates:
 - 1. Materials:
 - a. Indoor Clean, Dry Locations: Use plastic nameplates.
 - b. Outdoor Locations: Use plastic nameplates suitable for exterior use.
 - 2. Plastic Nameplates: Two-layer or three-layer laminated acrylic or electrically nonconductive phenolic with beveled edges; minimum thickness of 1/16 inch (1.6 mm); engraved text.
 - 3. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch (25 mm) high; Four, located at corners for larger sizes.
- B. Identification Labels:
 - 1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
 - 2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text unless otherwise indicated.

- C. Format for Receptacle Identification:
 - 1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
 - 2. Legend: Power source and circuit number or other designation indicated.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height: 3/16 inch (5 mm).
 - 5. Color: Black text on clear background.
- D. Format for Control Device Identification:
 - 1. Minimum Size: 3/8 inch (10 mm) by 1.5 inches (38 mm).
 - 2. Legend: Load controlled or other designation indicated.
 - 3. Text: All capitalized unless otherwise indicated.
 - 4. Minimum Text Height: 3/16 inch (5 mm).
 - 5. Color: Black text on clear background.

2.03 WIRE AND CABLE MARKERS

- A. Markers for Conductors and Cables: Use wrap-around self-adhesive vinyl cloth, wrap-around self-adhesive vinyl self-laminating, heat-shrink sleeve, plastic sleeve, plastic clip-on, or vinyl split sleeve type markers suitable for the conductor or cable to be identified.
- B. Markers for Conductor and Cable Bundles: Use plastic marker tags secured by nylon cable ties.
- C. Legend: Power source and circuit number or other designation indicated.
- D. Text: Use factory pre-printed or machine-printed text, all capitalized unless otherwise indicated.
- E. Minimum Text Height: 1/8 inch (3 mm).
- F. Color: Black text on white background unless otherwise indicated.

2.04 WARNING SIGNS AND LABELS

- A. Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.
- B. Warning Signs:
 - 1. Materials:
 - 2. Minimum Size: 7 by 10 inches (178 by 254 mm) unless otherwise indicated.
- C. Warning Labels:
 - 1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or selfadhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL 969.
 - 2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.
 - 3. Minimum Size: 2 by 4 inches (51 mm by 102 mm) unless otherwise indicated.

PART 3 EXECUTION

3.01 PREPARATION

A. Clean surfaces to receive adhesive products according to manufacturer's instructions.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance. Unless otherwise indicated, locate products as follows:
 - 1. Surface-Mounted Equipment: Enclosure front.
 - 2. Flush-Mounted Equipment: Inside of equipment door.
 - 3. Free-Standing Equipment: Enclosure front; also enclosure rear for equipment with rear access.
 - 4. Elevated Equipment: Legible from the floor or working platform.
 - 5. Branch Devices: Adjacent to device.
 - 6. Interior Components: Legible from the point of access.
 - 7. Boxes: Outside face of cover.

- 8. Conductors and Cables: Legible from the point of access.
- 9. Devices: Outside face of cover.
- C. Install identification products centered, level, and parallel with lines of item being identified.
- D. Secure nameplates to exterior surfaces of enclosures using stainless steel screws and to interior surfaces using self-adhesive backing or epoxy cement.
- E. Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- F. Mark all handwritten text, where permitted, to be neat and legible.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 Quality Requirements, for additional requirements.
- B. Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

SECTION 260583 WIRING CONNECTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Electrical connections to equipment.

1.02 RELATED REQUIREMENTS

- A. Section 260519 Low-Voltage Electrical Power Conductors and Cables.
- B. Section 260533.13 Conduit for Electrical Systems.
- C. Section 260533.16 Boxes for Electrical Systems.
- D. Section 262726 Wiring Devices.
- E. Section 262816.16 Enclosed Switches.

1.03 REFERENCE STANDARDS

- A. NEMA WD 1 General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).
- B. NEMA WD 6 Wiring Devices Dimensional Specifications; 2021.
- C. NFPA 70 National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Obtain and review shop drawings, product data, manufacturer's wiring diagrams, and manufacturer's instructions for equipment furnished under other sections.
 - 2. Determine connection locations and requirements.
- B. Sequencing:
 - 1. Install rough-in of electrical connections before installation of equipment is required.
 - 2. Make electrical connections before required start-up of equipment.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Disconnect Switches: As specified in Section 262816.16 and in individual equipment sections.
- B. Wiring Devices: As specified in Section 262726.
- C. Flexible Conduit: As specified in Section 260533.13.
- D. Wire and Cable: As specified in Section 260519.
- E. Boxes: As specified in Section 260533.16.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that equipment is ready for electrical connection, wiring, and energization.

3.02 ELECTRICAL CONNECTIONS

- A. Make electrical connections in accordance with equipment manufacturer's instructions.
- B. Make conduit connections to equipment using flexible conduit. Use liquidtight flexible conduit with watertight connectors in damp or wet locations.
- C. Connect heat producing equipment using wire and cable with insulation suitable for temperatures encountered.
- D. Provide receptacle outlet to accommodate connection with attachment plug.
- E. Provide cord and cap where field-supplied attachment plug is required.
- F. Install suitable strain-relief clamps and fittings for cord connections at outlet boxes and equipment connection boxes.
- G. Install disconnect switches, controllers, control stations, and control devices to complete equipment wiring requirements.
- H. Install terminal block jumpers to complete equipment wiring requirements.
- I. Install interconnecting conduit and wiring between devices and equipment to complete equipment wiring requirements.

SECTION 260923 LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Occupancy sensors.
- B. Daylighting controls.
- C. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 260526 Grounding and Bonding for Electrical Systems.
- B. Section 260529 Hangers and Supports for Electrical Systems
- C. Section 260533.16 Boxes for Electrical Systems.
- D. Section 260553 Identification for Electrical Systems: Identification products and requirements.
- E. Section 262726 Wiring Devices: Devices for manual control of lighting, including wall switches, wall dimmers, and fan speed controllers.
- F. Section 265100 Interior Lighting.

1.03 REFERENCE STANDARDS

- A. NECA 1 Standard for Good Workmanship in Electrical Construction; 2015.
- B. NECA 130 Standard for Installing and Maintaining Wiring Devices; 2016.
- C. NEMA ICS 5 Industrial Control and Systems: Control Circuit and Pilot Devices; 2017.
- D. NFPA 70 National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. UL 1472 Solid-State Dimming Controls; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements, for submittal procedures.
- B. Product Data: Include ratings, configurations, standard wiring diagrams, dimensions, colors, service condition requirements, and installed features.
- C. Shop Drawings:
 - 1. Occupancy Sensors: Provide lighting plan indicating location, model number, and orientation of each occupancy sensor and associated system component.
 - 2. Daylighting Controls: Provide lighting plan indicating location, model number, and orientation of each photo sensor and associated system component.
- D. Field Quality Control Reports.
- E. Manufacturer's Installation Instructions: Include application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- F. Operation and Maintenance Data: Include detailed information on device programming and setup.
- G. Project Record Documents: Record actual installed locations and settings for lighting control devices.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.06 DELIVERY, STORAGE, AND PROTECTION

A. Store products in a clean, dry space in original manufacturer's packaging in accordance with manufacturer's written instructions until ready for installation.

1.07 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.08 WARRANTY

- A. See Section 017800 Closeout Submittals, for additional warranty requirements.
- B. Provide five year manufacturer warranty for all occupancy sensors.
- C. Provide two year manufacturer warranty for all daylighting controls.

PART 2 PRODUCTS

2.01 LIGHTING CONTROL DEVICES - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless specifically indicated to be excluded, provide all required conduit, wiring, connectors, hardware, components, accessories, etc. as required for a complete operating system.

2.02 OCCUPANCY SENSORS

- A. Manufacturers:
 - 1. Lutron Electronics Company, Inc: www.lutron.com/#sle.
 - 2. Sensor Switch Inc: www.sensorswitch.com/#sle.
 - 3. WattStopper: www.wattstopper.com/#sle.
- B. All Occupancy Sensors:
 - 1. Description: Factory-assembled commercial specification grade devices for indoor use capable of sensing both major motion, such as walking, and minor motion, such as small desktop level movements, according to published coverage areas, for automatic control of load indicated.
 - 2. Sensor Technology:
 - a. Passive Infrared (PIR) Occupancy Sensors: Designed to detect occupancy by sensing movement of thermal energy between zones.
 - b. Ultrasonic Occupancy Sensors: Designed to detect occupancy by sensing frequency shifts in emitted and reflected inaudible sound waves.
 - c. Passive Infrared/Ultrasonic Dual Technology Occupancy Sensors: Designed to detect occupancy using a combination of both passive infrared and ultrasonic technologies.
 - 3. Provide LED to visually indicate motion detection with separate color LEDs for each sensor type in dual technology units.
 - 4. Operation: Unless otherwise indicated, occupancy sensor to turn load on when occupant presence is detected and to turn load off when no occupant presence is detected during an adjustable turn-off delay time interval.
 - 5. Dual Technology Occupancy Sensors: Field configurable turn-on and hold-on activation with settings for activation by either or both sensing technologies.
 - 6. Passive Infrared Lens Field of View: Field customizable by addition of factory masking material, adjustment of integral blinders, or similar means to block motion detection in selected areas.
 - 7. Turn-Off Delay: Field adjustable, with time delay settings up to 30 minutes.
 - 8. Sensitivity: Field adjustable.
 - 9. Compatibility (Non-Dimming Sensors): Suitable for controlling incandescent lighting, lowvoltage lighting with electronic and magnetic transformers, fluorescent lighting with electronic and magnetic ballasts, and fractional motor loads, with no minimum load requirements.
- C. Wall Switch Occupancy Sensors:
 - 1. All Wall Switch Occupancy Sensors:
 - a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated manual control capability, and no leakage current to load in off mode.

- b. Manual-Off Override Control: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
- 2. Passive Infrared/Ultrasonic Dual Technology Wall Switch Occupancy Sensors: Capable of detecting motion within an area of 900 square feet (83.6 sq m).
- D. Wall Dimmer Occupancy Sensors:
 - 1. General Requirements:
 - a. Description: Occupancy sensors designed for installation in standard wall box at standard wall switch mounting height with a field of view of 180 degrees, integrated dimming control capability, and no leakage current to load in off mode.
 - b. Manual-Off Override Control Capability: When used to turn off load while in automatic-on mode, unit to revert back to automatic mode after no occupant presence is detected during the delayed-off time interval.
 - c. Dimmer: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, and listed as complying with UL 1472; type and rating suitable for load controlled.
- E. Ceiling Mounted Occupancy Sensors:
 - 1. All Ceiling Mounted Occupancy Sensors:
 - a. Description: Low profile occupancy sensors designed for ceiling installation.
 - 2. Passive Infrared/Ultrasonic Dual Technology Ceiling Mounted Occupancy Sensors:
 - a. Standard Range Sensors: Capable of detecting motion within an area of 450 square feet (41.8 sq m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.
 - b. Extended Range Sensors: Capable of detecting motion within an area of 1,200 square feet (111.5 sq m) at a mounting height of 9 feet (2.7 m), with a field of view of 360 degrees.
- F. Power Packs for Low Voltage Occupancy Sensors:
 - 1. Description: Plenum rated, self-contained low voltage class 2 transformer and relay compatible with specified low voltage occupancy sensors for switching of line voltage loads.
 - 2. Provide quantity and configuration of power and slave packs with all associated wiring and accessories as required to control the load indicated on drawings.
 - 3. Input Supply Voltage: Dual rated for 120/277 V ac.
 - 4. Load Rating: As required to control the load indicated on drawings.

2.03 DAYLIGHTING CONTROLS

- A. Manufacturers:
 - 1. Hubbell Control Solutions: www.hubbell.com/hubbellcontrolsolutions/en/#sle.Hubbell Control Solutions: www.hubbell.com/hubbellcontrolsolutions/en/#sle.Hubbell Control Solutions: www.hubbell.com/hubbellcontrolsolutions/en/#sle.
 - 2. Lutron Electronics Company, Inc: www.lutron.com/#sle.
 - 3. Sensor Switch Inc: www.sensorswitch.com/#sle.
 - 4. WattStopper: www.wattstopper.com/#sle.
- B. System Description: Control system consisting of photo sensors and compatible control modules and power packs, contactors, or relays as required for automatic control of load indicated according to available natural light; capable of integrating with occupancy sensors and manual override controls.
- C. Daylighting Control Photo Sensors: Low voltage class 2 photo sensor units with output signal proportional to the measured light level and provision for zero or offset based signal.
 - 1. Sensor Type: Filtered silicon photo diode.
 - 2. Sensor Range:
 - a. Indoor Photo Sensors: 5 to 100 footcandles (53.8 to 1,080 lx).
 - 3. Finish: White unless otherwise indicated.

- D. Accessories:
 - 1. Where indicated, provide compatible accessory wall switches for manual override control.

2.04 ACCESSORIES

- A. Auxiliary Contacts:
 - 1. Comply with NEMA ICS 5.
 - 2. Provide number and type of contacts indicated or required to perform necessary functions, including holding (seal-in) circuit and interlocking, plus one normally open (NO) and one normally closed (NC) spare contact for each lighting contactor, minimum.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that openings for outlet boxes are neatly cut and will be completely covered by devices or wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that branch circuit wiring installation is completed, tested, and ready for connection to lighting control devices.
- F. Verify that the service voltage and ratings of lighting control devices are appropriate for the service voltage and load requirements at the location to be installed.
- G. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A. Install lighting control devices in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of lighting control devices provided under this section.
 - 1. Mounting Heights: Unless otherwise indicated, as follows:
 - a. Wall Switch Occupancy Sensors: 48 inches (1.2 m) above finished floor.
 - 2. Orient outlet boxes for vertical installation of lighting control devices unless otherwise indicated.
 - 3. Locate wall switch occupancy sensors on strike side of door with edge of wall plate 3 inches (80 mm) from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
- C. Install lighting control devices in accordance with manufacturer's instructions.
- D. Unless otherwise indicated, connect lighting control device grounding terminal or conductor to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- E. Install lighting control devices plumb and level, and held securely in place.
- F. Where required and not furnished with lighting control device, provide wall plate in accordance with Section 262726.
- G. Provide required supports in accordance with Section 260529.
- H. Where applicable, install lighting control devices and associated wall plates to fit completely flush to mounting surface with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.

- I. Occupancy Sensor Locations:
 - 1. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for complete coverage of respective room or area based on manufacturer's recommendations for installed devices.
 - 2. Locate ultrasonic and dual technology passive infrared/ultrasonic occupancy sensors a minimum of 4 feet (1.2 m) from air supply ducts or other sources of heavy air flow and as per manufacturer's recommendations, in order to minimize false triggers.
- J. Daylighting Control Photo Sensor Locations:
 - 1. Location Adjustments: Locations indicated are diagrammatic and only intended to indicate which rooms or areas require devices. Provide quantity and locations as required for proper control of respective room or area based on manufacturer's recommendations for installed devices.
 - 2. Unless otherwise indicated, locate photo sensors for closed loop systems to accurately measure the light level controlled at the designated task location, while minimizing the measured amount of direct light from natural or artificial sources such as windows or pendant luminaires.
 - 3. Unless otherwise indicated, locate photo sensors for open loop systems to accurately measure the level of daylight coming into the space, while minimizing the measured amount of lighting from artificial sources.
- K. Lamp Burn-In: Operate lamps at full output for minimum of 100 hours or prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.
- L. Unless otherwise indicated, install power packs for lighting control devices above accessible ceiling or above access panel in inaccessible ceiling near the sensor location.
- M. Unless otherwise indicated, install switches on load side of power packs so that switch does not turn off power pack.

3.04 FIELD QUALITY CONTROL

- A. See Section 014000 Quality Requirements, for additional requirements.
- B. Inspect each lighting control device for damage and defects.
- C. Test occupancy sensors to verify proper operation, including time delays and ambient light thresholds where applicable. Verify optimal coverage for entire room or area. Record test results in written report to be included with submittals.
- D. Test daylighting controls to verify proper operation, including light level measurements and time delays where applicable. Record test results in written report to be included with submittals.
- E. Correct wiring deficiencies and replace damaged or defective lighting control devices.

3.05 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.
- B. Adjust occupancy sensor settings to minimize undesired activations while optimizing energy savings, and to achieve desired function as indicated or as directed by Architect.
- C. Where indicated or as directed by Architect, install factory masking material or adjust integral blinders on passive infrared (PIR) and dual technology occupancy sensor lenses to block undesired motion detection.
- D. Adjust daylighting controls under optimum lighting conditions after all room finishes, furniture, and window treatments have been installed to achieve desired operation as indicated or as directed by Architect. Record settings in written report to be included with submittals. Readjust controls calibrated prior to installation of final room finishes, furniture, and window treatments that do not function properly as determined by Architect.

3.06 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

3.07 CLOSEOUT ACTIVITIES

- A. Demonstration: Demonstrate proper operation of lighting control devices to Architect, and correct deficiencies or make adjustments as directed.
- B. Training: Train Owner's personnel on operation, adjustment, programming, and maintenance of lighting control devices.
 - 1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.

SECTION 262416 PANELBOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Lighting and appliance panelboards.
- B. Overcurrent protective devices for panelboards.

1.02 RELATED REQUIREMENTS

- A. Section 260526 Grounding and Bonding for Electrical Systems.
- B. Section 260526 Grounding and Bonding for Electrical Systems.
- C. Section 260529 Hangers and Supports for Electrical Systems.
- D. Section 260553 Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. FS W-C-375 Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendments (2022).
- B. NECA 1 Standard for Good Workmanship in Electrical Construction; 2015.
- C. NECA 407 Standard for Installing and Maintaining Panelboards; 2015.
- D. NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- E. NEMA PB 1 Panelboards; 2011.
- F. NEMA PB 1.1 General Instructions for Proper Installation, Operation and Maintenance of Panelboards Rated 1000 Volts or Less; 2023.
- G. NETA ATS Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- H. NFPA 70 National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 50 Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- J. UL 50E Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- K. UL 67 Panelboards; Current Edition, Including All Revisions.
- L. UL 489 Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
- M. UL 943 Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.
- N. UL 1053 Ground-Fault Sensing and Relaying Equipment; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
- C. Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions and NECA 407.
- B. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C. Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

1.07 FIELD CONDITIONS

- A. Maintain ambient temperature within the following limits during and after installation of panelboards:
 - 1. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. ABB/GE: www.electrification.us.abb.com/#sle.
- B. Eaton Corporation: www.eaton.com/#sle.
- C. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.
- D. Siemens Industry, Inc: www.usa.siemens.com/#sle.
- E. Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 PANELBOARDS - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet (2,000 m).
 - 2. Ambient Temperature:
 - a. Panelboards Containing Circuit Breakers: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).
- C. Short Circuit Current Rating:
 - 1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
- D. Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
- E. Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- F. Bussing: Sized in accordance with UL 67 temperature rise requirements.
 - 1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
 - 2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
- G. Conductor Terminations: Suitable for use with the conductors to be installed.
- H. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
 - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - 2. Boxes: Galvanized steel unless otherwise indicated.
 - a. Provide wiring gutters sized to accommodate the conductors to be installed.
 - 3. Fronts:
 - a. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
 - 4. Lockable Doors: All locks keyed alike unless otherwise indicated.

- I. Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- J. Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.

2.03 LIGHTING AND APPLIANCE PANELBOARDS

- A. Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B. Conductor Terminations:
 - 1. Main and Neutral Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 - 2. Main and Neutral Lug Type: Mechanical.
- C. Bussing:
 - 1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
 - 2. Phase and Neutral Bus Material: Aluminum.
 - 3. Ground Bus Material: Aluminum.
- D. Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.
- E. Enclosures:
 - 1. Provide flush-mounted enclosuresas indicated.
 - 2. Fronts: Provide lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
 - 3. Provide clear plastic circuit directory holder mounted on inside of door.

2.04 OVERCURRENT PROTECTIVE DEVICES

- A. Molded Case Circuit Breakers:
 - 1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
 - 2. Interrupting Capacity:
 - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
 - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
 - 3. Conductor Terminations:
 - a. Provide mechanical lugs unless otherwise indicated.
 - b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 - 4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
 - 5. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.
 - 6. Provide the following circuit breaker types where indicated:
 - a. Ground Fault Circuit Interrupter (GFCI) Circuit Breakers: Listed as complying with UL 943, class A for protection of personnel.
 - 7. Do not use tandem circuit breakers.
 - 8. Do not use handle ties in lieu of multi-pole circuit breakers.
 - 9. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.

2.05 SOURCE QUALITY CONTROL

A. Factory test panelboards according to NEMA PB 1.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive panelboards.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship).
- B. Install products in accordance with manufacturer's instructions.
- C. Install panelboards in accordance with NECA 407 and NEMA PB 1.1.
- D. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- E. Provide required support and attachment in accordance with Section 260529.
- F. Install panelboards plumb.
- G. Install flush-mounted panelboards so that trims fit completely flush to wall with no gaps and rough opening completely covered.
- H. Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches (2000 mm) above the floor or working platform.
- I. Provide minimum of six spare 1 inch (27 mm) trade size conduits out of each flush-mounted panelboard stubbed into accessible space above ceiling and below floor.
- J. Provide grounding and bonding in accordance with Section 260526.
- K. Install all field-installed branch devices, components, and accessories.
- L. Multi-Wire Branch Circuits: Group grounded and ungrounded conductors together in the panelboard as required by NFPA 70.
- M. Set field-adjustable ground fault protection pickup and time delay settings as indicated.
- N. Provide filler plates to cover unused spaces in panelboards.
- O. Identify panelboards in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than _____ amperes. Tests listed as optional are not required.
- D. Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.
- E. Test GFCI circuit breakers to verify proper operation.
- F. Correct deficiencies and replace damaged or defective panelboards or associated components.

3.04 ADJUSTING

- A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B. Adjust alignment of panelboard fronts.

3.05 CLEANING

- A. Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

SECTION 262726 WIRING DEVICES

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Wall switches.
- B. Wall dimmers.
- C. Receptacles.
- D. Wall plates.
- E. Floor box service fittings.

1.02 RELATED REQUIREMENTS

- A. Section 260519 Low-Voltage Electrical Power Conductors and Cables: Manufactured wiring systems for use with access floor boxes with compatible pre-wired connectors.
- B. Section 260526 Grounding and Bonding for Electrical Systems.
- C. Section 260533.16 Boxes for Electrical Systems.
- D. Section 260553 Identification for Electrical Systems: Identification products and requirements.
- E. Section 260923 Lighting Control Devices: Devices for automatic control of lighting, including occupancy sensors, in-wall time switches, and in-wall interval timers.

1.03 REFERENCE STANDARDS

- A. FS W-C-596 Connector, Electrical, Power, General Specification for; 2014h, with Amendments (2017).
- B. FS W-S-896 Switches, Toggle (Toggle and Lock), Flush Mounted (General Specification); 2014g, with Amendment (2017).
- C. NECA 1 Standard for Good Workmanship in Electrical Construction; 2015.
- D. NECA 130 Standard for Installing and Maintaining Wiring Devices; 2016.
- E. NEMA WD 1 General Color Requirements for Wiring Devices; 1999 (Reaffirmed 2020).
- F. NEMA WD 6 Wiring Devices Dimensional Specifications; 2021.
- G. NFPA 70 National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. UL 20 General-Use Snap Switches; Current Edition, Including All Revisions.
- I. UL 498 Attachment Plugs and Receptacles; Current Edition, Including All Revisions.
- J. UL 514D Cover Plates for Flush-Mounted Wiring Devices; Current Edition, Including All Revisions.
- K. UL 943 Ground-Fault Circuit-Interrupters; Current Edition, Including All Revisions.
- L. UL 1310 Class 2 Power Units; Current Edition, Including All Revisions.
- M. UL 1472 Solid-State Dimming Controls; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the placement of outlet boxes with millwork, furniture, equipment, etc. installed under other sections or by others.
 - 2. Coordinate wiring device ratings and configurations with the electrical requirements of actual equipment to be installed.
 - 3. Coordinate the installation and preparation of uneven surfaces, such as split face block, to provide suitable surface for installation of wiring devices.
 - 4. Coordinate the core drilling of holes for poke-through assemblies with the work covered under other sections.

5. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

- A. Product Data: Provide manufacturer's catalog information showing dimensions, colors, and configurations.
 - 1. Wall Dimmers: Include derating information for ganged multiple devices.
- B. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- C. Operation and Maintenance Data:
 - 1. Wall Dimmers: Include information on operation and setting of presets.
 - 2. GFCI Receptacles: Include information on status indicators.

1.06 QUALITY ASSURANCE

- A. Comply with requirements of NFPA 70.
- B. Products: Listed, classified, and labeled as suitable for the purpose intended.

1.07 DELIVERY, STORAGE, AND PROTECTION

A. Store in a clean, dry space in original manufacturer's packaging until ready for installation.

PART 2 PRODUCTS

2.01 WIRING DEVICE APPLICATIONS

- A. For single receptacles installed on an individual branch circuit, provide receptacle with ampere rating not less than that of the branch circuit.
- B. Provide weather resistant GFCI receptacles with specified weatherproof covers for receptacles installed outdoors or in damp or wet locations.
- C. Provide GFCI protection for receptacles installed within 6 feet (1.8 m) of sinks.
- D. Provide GFCI protection for receptacles installed in kitchens.
- E. Provide GFCI protection for receptacles serving electric drinking fountains.
- F. Unless noted otherwise, do not use combination switch/receptacle devices.
- G. For flush floor service fittings, use tile rings for installations in tile floors.
- H. For flush floor service fittings, use carpet flanges for installations in carpeted floors.

2.02 WIRING DEVICE FINISHES

- A. Provide wiring device finishes as described below unless otherwise indicated.
- B. Wiring Devices Installed in Finished Spaces: White with stainless steel wall plate.
- C. Wiring Devices Installed in Unfinished Spaces: Gray with galvanized steel wall plate.
- D. Flush Poke-Through Service Fittings: Gray wiring devices with aluminum cover and aluminum flange.

2.03 WALL SWITCHES

- A. Manufacturers:
 - 1. Hubbell Incorporated: www.hubbell.com/#sle.
 - 2. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
 - 3. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.
- B. Wall Switches General Requirements: AC only, quiet operating, general-use snap switches with silver alloy contacts, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 20 and where applicable, FS W-S-896; types as indicated on the drawings.
 - 1. Wiring Provisions: Terminal screws for side wiring and screw actuated binding clamp for back wiring with separate ground terminal screw.

C. Standard Wall Switches: Industrial specification grade, 20 A, 120/277 V with standard toggle type switch actuator and maintained contacts; single pole single throw, double pole single throw, three way, or four way as indicated on the drawings.

2.04 WALL DIMMERS

- A. Manufacturers:
 - 1. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
 - 2. Lutron Electronics Company, Inc; Maestro Series: www.lutron.com/#sle.
 - 3. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.
- B. Wall Dimmers General Requirements: Solid-state with continuous full-range even control following square law dimming curve, integral radio frequency interference filtering, power failure preset memory, air gap switch accessible without removing wall plate, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 1472; types and ratings suitable for load controlled as indicated on the drawings.

2.05 RECEPTACLES

- A. Manufacturers:
 - 1. Hubbell Incorporated: www.hubbell.com/#sle.
 - 2. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
 - 3. Lutron Electronics Company, Inc; Designer Style: www.lutron.com/#sle.
 - 4. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.
 - 5. Source Limitations: Where wall controls are furnished as part of lighting control system, provide accessory matching receptacles and wallplates by the same manufacturer in locations indicated.
- B. Receptacles General Requirements: Self-grounding, complying with NEMA WD 1 and NEMA WD 6, and listed as complying with UL 498, and where applicable, FS W-C-596; types as indicated on the drawings.
 - 1. Wiring Provisions: Terminal screws for side wiring or screw actuated binding clamp for back wiring with separate ground terminal screw.
 - 2. NEMA configurations specified are according to NEMA WD 6.
- C. Convenience Receptacles:
 - 1. Standard Convenience Receptacles: Industrial specification grade, 20A, 125V, NEMA 5-20R; single or duplex as indicated on the drawings.
- D. GFCI Receptacles:
 - 1. GFCI Receptacles General Requirements: Self-testing, with feed-through protection and light to indicate ground fault tripped condition and loss of protection; listed as complying with UL 943, class A.
 - 2. Standard GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style.
 - 3. Weather Resistant GFCI Receptacles: Industrial specification grade, duplex, 20A, 125V, NEMA 5-20R, rectangular decorator style, listed and labeled as weather resistant type complying with UL 498 Supplement SD suitable for installation in damp or wet locations.
- E. USB Charging Devices:
 - 1. USB Charging Devices General Requirements: Listed as complying with UL 1310.
- F. Locking Receptacles: Industrial specification grade, configuration as indicated on the drawings.

2.06 WALL PLATES

- A. Manufacturers:
 - 1. Hubbell Incorporated: www.hubbell-wiring.com/#sle.
 - 2. Leviton Manufacturing Company, Inc: www.leviton.com/#sle.
 - 3. Lutron Electronics Company, Inc: www.lutron.com/#sle.
 - 4. Pass & Seymour, a brand of Legrand North America, Inc: www.legrand.us/#sle.
 - 5. Source Limitations: Where wall controls are furnished as part of lighting control system, provide accessory matching receptacles and wallplates by the same manufacturer in

locations indicated.

- B. Wall Plates: Comply with UL 514D.
 - 1. Configuration: One piece cover as required for quantity and types of corresponding wiring devices.
 - 2. Size: Standard; ____
 - 3. Screws: Metal with slotted heads finished to match wall plate finish.
- C. Stainless Steel Wall Plates: Brushed satin finish, Type 302 stainless steel.
- D. Weatherproof Covers for Wet Locations: Gasketed, cast aluminum, with hinged lockable cover and corrosion-resistant screws; listed as suitable for use in wet locations while in use with attachment plugs connected and identified as extra-duty type.

2.07 FLOOR BOX SERVICE FITTINGS

- A. Description: Service fittings compatible with floor boxes provided under Section 260533.16 with components, adapters, and trims required for complete installation.
- B. Flush Floor Service Fittings:
 - Single Service Flush Convenience Receptacles:
 - a. Cover: Rectangular.
 - b. Configuration: One standard convenience duplex receptacle(s) with duplex flap opening(s).
 - 2. Single Service Flush Communications Outlets:
 - a. Cover: Rectangular.
 - b. Configuration:
 - c. Voice and Data Jacks: Provided by others.
 - 3. Dual Service Flush Combination Outlets:
 - a. Cover: Rectangular.
 - b. Configuration:
 - 1) Power: One standard convenience duplex receptacle(s) with duplex flap opening(s).
 - 2) Communications:
 - 3) Voice and Data Jacks: Provided by others.
 - 4. Accessories:
 - a. Tile Rings: Finish to match covers; configuration as required to accommodate specified covers.
 - b. Carpet Flanges: Finish to match covers; configuration as required to accommodate specified covers.

PART 3 EXECUTION

1.

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate devices and conductors in accordance with NFPA 70.
- C. Verify that wall openings are neatly cut and will be completely covered by wall plates.
- D. Verify that final surface finishes are complete, including painting.
- E. Verify that floor boxes are adjusted properly.
- F. Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- G. Verify that core drilled holes for poke-through assemblies are in proper locations.
- H. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A. Perform work in accordance with NECA 1 (general workmanship) and, where applicable, NECA 130, including mounting heights specified in those standards unless otherwise indicated.
- B. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of wiring devices provided under this section.
 - 1. Mounting Heights: Unless otherwise indicated, as follows:
 - a. Wall Switches: 48 inches (1200 mm) above finished floor.
 - b. Wall Dimmers: 48 inches (1200 mm) above finished floor.
 - c. Receptacles: 18 inches (450 mm) above finished floor or 6 inches (150 mm) above counter.
 - 2. Where multiple receptacles, wall switches, or wall dimmers are installed at the same location and at the same mounting height, gang devices together under a common wall plate.
 - 3. Locate wall switches on strike side of door with edge of wall plate 3 inches (80 mm) from edge of door frame. Where locations are indicated otherwise, notify Architect to obtain direction prior to proceeding with work.
 - 4. Locate receptacles for electric drinking fountains concealed behind drinking fountain according to manufacturer's instructions.
- C. Install wiring devices in accordance with manufacturer's instructions.
- D. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- E. Where required, connect wiring devices using pigtails not less than 6 inches (150 mm) long. Do not connect more than one conductor to wiring device terminals.
- F. Connect wiring devices by wrapping conductor clockwise 3/4 turn around screw terminal and tightening to proper torque specified by the manufacturer. Where present, do not use push-in pressure terminals that do not rely on screw-actuated binding.
- G. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
- H. Provide GFCI receptacles with integral GFCI protection at each location indicated. Do not use feed-through wiring to protect downstream devices.
- I. Install wiring devices plumb and level with mounting yoke held rigidly in place.
- J. Install wall switches with OFF position down.
- K. Install wall dimmers to achieve full rating specified and indicated after derating for ganging as instructed by manufacturer.
- L. Do not share neutral conductor on branch circuits utilizing wall dimmers.
- M. Install vertically mounted receptacles with grounding pole on top and horizontally mounted receptacles with grounding pole on left.
- N. Install wall plates to fit completely flush to wall with no gaps and rough opening completely covered without strain on wall plate. Repair or reinstall improperly installed outlet boxes or improperly sized rough openings. Do not use oversized wall plates in lieu of meeting this requirement.
- O. Install blank wall plates on junction boxes and on outlet boxes with no wiring devices installed or designated for future use.
- P. Identify wiring devices in accordance with Section 260553.
- Q. Install poke-through closure plugs in each unused core holes to maintain fire rating of floor.

3.04 FIELD QUALITY CONTROL

- A. See Section 014000 Quality Requirements, for additional requirements.
- B. Inspect each wiring device for damage and defects.

- C. Operate each wall switch, wall dimmer, and fan speed controller with circuit energized to verify proper operation.
- D. Test each receptacle to verify operation and proper polarity.
- E. Test each GFCI receptacle for proper tripping operation according to manufacturer's instructions.
- F. Correct wiring deficiencies and replace damaged or defective wiring devices.

3.05 ADJUSTING

- A. Adjust devices and wall plates to be flush and level.
- B. Adjust presets for wall dimmers according to manufacturer's instructions as directed by Architect.

3.06 CLEANING

A. Clean exposed surfaces to remove dirt, paint, or other foreign material and restore to match original factory finish.

SECTION 262813 FUSES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fuses.

1.02 RELATED REQUIREMENTS

- A. Section 260553 Identification for Electrical Systems: Identification products and requirements.
- B. Section 262816.16 Enclosed Switches: Fusible switches.

1.03 REFERENCE STANDARDS

- A. NEMA FU 1 Low Voltage Cartridge Fuses; 2012.
- B. NFPA 70 National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C. UL 248-1 Low-Voltage Fuses Part 1: General Requirements; Current Edition, Including All Revisions.
- D. UL 248-12 Low-Voltage Fuses Part 12: Class R Fuses; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate fuse clips furnished in equipment provided under other sections for compatibility with indicated fuses.
 - a. Fusible Enclosed Switches: See Section 262816.16.
 - 2. Coordinate fuse requirements according to manufacturer's recommendations and nameplate data for actual equipment to be installed.

1.05 SUBMITTALS

- A. See Section 013000 Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard data sheets including voltage and current ratings, interrupting ratings, time-current curves, and current limitation curves.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Bussmann, a division of Eaton Corporation: www.cooperindustries.com/#sle.
- B. Littelfuse, Inc: www.littelfuse.com/#sle.
- C. Mersen: ep-us.mersen.com/#sle.

2.02 APPLICATIONS

- A. Feeders:
 - 1. Fusible Switches up to 600 Amperes: Class RK1, time-delay.
- B. General Purpose Branch Circuits: Class RK1, time-delay.
- C. Individual Motor Branch Circuits: Class RK1, time-delay.

2.03 FUSES

- A. Provide products listed, classified, and labeled as suitable for the purpose intended.
- B. Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.
- C. Provide fuses of the same type, rating, and manufacturer within the same switch.

- D. Comply with UL 248-1.
- E. Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.
- F. Voltage Rating: Suitable for circuit voltage.
- G. Class R Fuses: Comply with UL 248-12.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that fuse ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.
- B. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Do not install fuses until circuits are ready to be energized.
- B. Install fuses with label oriented such that manufacturer, type, and size are easily read.

SECTION 262816.13 ENCLOSED CIRCUIT BREAKERS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Enclosed circuit breakers.

1.02 RELATED REQUIREMENTS

- A. Section 260526 Grounding and Bonding for Electrical Systems.
- B. Section 260529 Hangers and Supports for Electrical Systems.
- C. Section 260548 Vibration and Seismic Controls for Electrical Systems.
- D. Section 260553 Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. FS W-C-375 Circuit Breakers, Molded Case; Branch Circuit and Service; 2013e, with Amendments (2022).
- B. NECA 1 Standard for Good Workmanship in Electrical Construction; 2015.
- C. NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- D. NETA ATS Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- E. NFPA 70 National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 50 Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- G. UL 50E Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- H. UL 489 Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for circuit breakers, enclosures, and other installed components and accessories.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. ABB/GE: www.electrification.us.abb.com/#sle.
- B. Eaton Corporation: www.eaton.com/#sle.
- C. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.
- D. Siemens Industry, Inc: www.usa.siemens.com/#sle.

2.02 ENCLOSED CIRCUIT BREAKERS

- A. Description: Units consisting of molded case circuit breakers individually mounted in enclosures.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet (2,000 m).
 - 2. Ambient Temperature: Between 23 degrees F (-5 degrees C) and 104 degrees F (40 degrees C).
- D. Short Circuit Current Rating:

- 1. Provide enclosed circuit breakers with listed short circuit current rating not less than the available fault current at the installed location indicated on the drawings.
- E. Conductor Terminations: Suitable for use with the conductors to be installed.
- F. Provide thermal magnetic circuit breakers unless otherwise indicated.
- G. Provide solidly bonded equipment ground bus in each enclosed circuit breaker, with a suitable lug for terminating each equipment grounding conductor.
- H. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
- I. Provide externally operable handle with means for locking in the OFF position.

2.03 MOLDED CASE CIRCUIT BREAKERS

- A. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
- B. Interrupting Capacity:
 - 1. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than:
 - 2. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
- C. Conductor Terminations:
 - 1. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
- D. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
- E. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings of the enclosed circuit breakers are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive enclosed circuit breakers.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required support and attachment in accordance with Section 260529.
- E. Install enclosed circuit breakers plumb.
- F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed circuit breakers such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.
- G. Provide grounding and bonding in accordance with Section 260526.

3.03 FIELD QUALITY CONTROL

A. See Section 014000 - Quality Requirements, for additional requirements.

- B. Inspect and test in accordance with manufacturer's instructions and NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for circuit breakers used for service entrance and for circuit breakers larger than _____ amperes. Tests listed as optional are not required.
- D. Correct deficiencies and replace damaged or defective enclosed circuit breakers.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

- A. Clean dirt and debris from circuit breaker enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

SECTION 262816.16 ENCLOSED SWITCHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Enclosed safety switches.

1.02 RELATED REQUIREMENTS

- A. Section 260526 Grounding and Bonding for Electrical Systems.
- B. Section 260529 Hangers and Supports for Electrical Systems.
- C. Section 260553 Identification for Electrical Systems: Identification products and requirements.
- D. Section 262813 Fuses.

1.03 REFERENCE STANDARDS

- A. NECA 1 Standard for Good Workmanship in Electrical Construction; 2015.
- B. NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- C. NEMA KS 1 Heavy Duty Enclosed and Dead-Front Switches (600 Volts Maximum); 2013.
- D. NETA ATS Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- E. NFPA 70 National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- F. UL 50 Enclosures for Electrical Equipment, Non-Environmental Considerations; Current Edition, Including All Revisions.
- G. UL 50E Enclosures for Electrical Equipment, Environmental Considerations; Current Edition, Including All Revisions.
- H. UL 98 Enclosed and Dead-Front Switches; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
 - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
 - 3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
 - 4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

1.05 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.
- B. Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

1.08 FIELD CONDITIONS

A. Maintain ambient temperature between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C) during and after installation of enclosed switches.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. ABB/GE: www.electrification.us.abb.com/#sle.
- B. Eaton Corporation: www.eaton.com/#sle.
- C. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.
- D. Siemens Industry, Inc: www.usa.siemens.com/#sle.
- E. Source Limitations: Furnish enclosed switches and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

2.02 ENCLOSED SAFETY SWITCHES

- A. Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
 - 1. Altitude: Less than 6,600 feet (2,000 m).
 - 2. Ambient Temperature: Between -22 degrees F (-30 degrees C) and 104 degrees F (40 degrees C).
- D. Horsepower Rating: Suitable for connected load.
- E. Voltage Rating: Suitable for circuit voltage.
- F. Short Circuit Current Rating:
 - 1. Minimum Ratings:
 - a. Switches Protected by Class H Fuses: 10,000 rms symmetrical amperes.
 - b. Heavy Duty Single Throw Switches Protected by Class R, Class J, Class L, or Class T Fuses: 200,000 rms symmetrical amperes.
- G. Provide with switch blade contact position that is visible when the cover is open.
- H. Conductor Terminations: Suitable for use with the conductors to be installed.
- I. Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.
- J. Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
 - 1. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
- K. Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.
- L. Heavy Duty Switches:
 - 1. Comply with NEMA KS 1.
 - 2. Conductor Terminations:
 - a. Provide mechanical lugs unless otherwise indicated.
 - b. Lug Material: Aluminum, suitable for terminating aluminum or copper conductors.
 - 3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

- M. Provide the following features and accessories where indicated or where required to complete installation:
 - 1. Auxiliary Switch: SPDT switch suitable for connection to system indicated, with auxiliary contact operation before switch blades open and after switch blades close.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that the ratings of the enclosed switches are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive enclosed safety switches.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required support and attachment in accordance with Section 260529.
- E. Install enclosed switches plumb.
- F. Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches (2000 mm) above the floor or working platform.
- G. Provide grounding and bonding in accordance with Section 260526.
- H. Provide fuses complying with Section 262813 for fusible switches as indicated or as required by equipment manufacturer's recommendations.
- I. Identify enclosed switches in accordance with Section 260553.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Perform inspections and tests listed in NETA ATS, Section 7.5.1.1.
- D. Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

- A. Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

SECTION 262913 ENCLOSED CONTROLLERS

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Enclosed NEMA controllers for low-voltage (600 V and less) applications:
 - 1. Magnetic motor starters.
 - 2. General purpose contactors.
 - 3. Manual motor starters.
- B. Overcurrent protective devices for motor controllers, including overload relays.
- C. Control accessories:
 - 1. Auxiliary contacts.
 - 2. Pilot devices.
 - 3. Control and timing relays.
 - 4. Control power transformers.

1.02 RELATED REQUIREMENTS

- A. Section 260526 Grounding and Bonding for Electrical Systems.
- B. Section 260529 Hangers and Supports for Electrical Systems.
- C. Section 260548 Vibration and Seismic Controls for Electrical Systems.
- D. Section 260553 Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS

- A. IEEE C57.13 IEEE Standard Requirements for Instrument Transformers; 2016.
- B. NECA 1 Standard for Good Workmanship in Electrical Construction; 2015.
- C. NEMA 250 Enclosures for Electrical Equipment (1000 Volts Maximum); 2020.
- D. NEMA ICS 2 Industrial Control and Systems Controllers, Contactors and Overload Relays Rated 600 Volts; 2008 (Reaffirmed 2020).
- E. NEMA ICS 5 Industrial Control and Systems: Control Circuit and Pilot Devices; 2017.
- F. NEMA ICS 6 Industrial Control and Systems: Enclosures; 1993 (Reaffirmed 2016).
- G. NETA ATS Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems; 2021.
- H. NFPA 70 National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 489 Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.
- J. UL 60947-1 Low-Voltage Switchgear and Controlgear Part 1: General Rules; Current Edition, Including All Revisions.
- K. UL 60947-4-1 Low-Voltage Switchgear and Controlgear Part 4-1: Contactors and Motorstarters - Electromechanical Contactors and Motor-starters; Current Edition, Including All Revisions.

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements, for submittal procedures.
- B. Product Data: Provide manufacturer's standard catalog pages and data sheets for motor controllers, enclosures, overcurrent protective devices, and other installed components and accessories.

1.05 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- B. Handle carefully in accordance with manufacturer's written instructions to avoid damage to internal components, enclosure, and finish.

1.07 FIELD CONDITIONS

A. Maintain field conditions within required service conditions during and after installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. ABB/GE: www.electrification.us.abb.com/#sle.
- B. Eaton Corporation: www.eaton.com/#sle.
- C. Schneider Electric; Square D Products: www.schneider-electric.us/#sle.
- D. Siemens Industry, Inc: www.usa.siemens.com/#sle.
- E. Source Limitations: Furnish enclosed motor controllers and associated components produced by a single manufacturer and obtained from a single supplier.

2.02 ENCLOSED CONTROLLERS

- A. Provide enclosed controller assemblies consisting of all required components, control power transformers, instrumentation and control wiring, accessories, etc. as necessary for a complete operating system.
- B. Provide products listed, classified, and labeled as suitable for the purpose intended.
- C. Description: Enclosed controllers complying with NEMA ICS 2, and listed and labeled as complying with UL 60947-1 and UL 60947-4-1; ratings, configurations and features as indicated on the drawings.
- D. Service Conditions:
 - 1. Provide controllers and associated components suitable for operation under the following service conditions without derating:
 - a. Altitude:
 - 1) Class 1 Km Equipment (devices utilizing power semiconductors, e.g. variable frequency controllers): Less than 3,300 feet (1,000 m).
 - 2) Class 2 Km Equipment (electromagnetic and manual devices): Less than 6,600 feet (2,000 m).
 - b. Ambient Temperature: Between 32 degrees F (0 degrees C) and 104 degrees F (40 degrees C).
 - 2. Provide controllers and associated components suitable for operation at indicated ratings under the service conditions at the installed location.
- E. Short Circuit Current Rating:
 - 1. Provide controllers with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
- F. Conductor Terminations: Suitable for use with the conductors to be installed.
- G. Enclosures:
 - 1. Comply with NEMA ICS 6.
 - 2. Environment Type per NEMA 250: Unless otherwise indicated, as specified for the following installation locations:
 - 3. Finish: Manufacturer's standard unless otherwise indicated.
- H. Instrument Transformers:
 - 1. Comply with IEEE C57.13.
 - 2. Select suitable ratio, burden, and accuracy as required for connected devices.
 - 3. Current Transformers: Connect secondaries to shorting terminal blocks.
 - 4. Potential Transformers: Include primary and secondary fuses with disconnecting means.

- I. Magnetic Motor Starters: Combination type unless otherwise indicated.
 - 1. Combination Magnetic Motor Starters: NEMA ICS 2, Class A combination motor controllers with magnetic contactor(s), externally operable disconnect and overload relay(s).
 - 2. Noncombination Magnetic Motor Starters: NEMA ICS 2, Class A noncombination motor controllers with magnetic contactor(s) and overload relay(s).
 - 3. Configuration: Full-voltage non-reversing unless otherwise indicated.
 - 4. Minimum Starter Size: NEMA Size 0.
 - 5. Use of non-standard starter sizes smaller than specified standard NEMA sizes is not permitted.
 - 6. Disconnects: Circuit breaker type.
 - a. Circuit Breakers: Motor circuit protectors (magnetic-only) unless otherwise indicated or required.
 - b. Provide externally operable handle with means for locking in the OFF position. Provide safety interlock to prevent opening the cover with the disconnect in the ON position with capability of overriding interlock for testing purposes.
 - c. Provide auxiliary interlock for disconnection of external control power sources where applicable.
 - 7. Overload Relays: Bimetallic thermal type unless otherwise indicated.
 - 8. Pilot Devices Required:
 - a. Furnish local pilot devices for each unit as specified below unless otherwise indicated on drawings.
 - b. Single-Speed, Non-Reversing Starters:
 - 1) Pushbuttons: START-STOP.
 - 2) Indicating Lights: Red ON, Green OFF.
- J. General Purpose Contactors: Combination type unless otherwise indicated.
 - 1. Combination Contactors: NEMA ICS 2, Class A combination controllers with magnetic contactor(s) and externally operable disconnect, but without integral overload relay(s).
 - 2. Noncombination Contactors: NEMA ICS 2, Class A noncombination motor controllers with magnetic contactor(s), but without integral overload relay(s).
 - 3. Configuration: Full-voltage non-reversing unless otherwise indicated.
 - 4. Minimum Contactor Size: NEMA Size 0.
 - 5. Disconnects: Circuit breaker type.
 - a. Circuit Breakers: Thermal magnetic unless otherwise indicated or required.
 - b. Provide externally operable handle with means for locking in the OFF position. Provide safety interlock to prevent opening the cover with the disconnect in the ON position with capability of overriding interlock for testing purposes.
 - c. Provide auxiliary interlock for disconnection of external control power sources where applicable.
- K. Manual Motor Starters:
 - 1. Description: NEMA ICS 2, Class A manually-operated motor controllers with overload relay(s).
 - 2. Configuration: Non-reversing unless otherwise indicated.
 - 3. Fractional-Horsepower Manual Motor Starters:
 - a. Furnish with toggle operator.
 - b. Overload Relays: Bimetallic or melting alloy thermal type.
 - c. Furnish Red ON indicating light where not within sight of equipment.
 - 4. Integral-Horsepower Manual Motor Starters:
 - a. Furnish with toggle or pushbutton operator.
 - b. Overload Relays: Bimetallic or melting alloy thermal type.
 - c. Furnish Red ON indicating light where not within sight of equipment.
 - d. Provide auxiliary contact where indicated; normally open (NO) or normally closed (NC) as indicated or as required.

2.03 OVERCURRENT PROTECTIVE DEVICES

- A. Overload Relays:
 - 1. Provide overload relays and, where applicable, associated current elements/heaters, selected according to actual installed motor nameplate data, in accordance with manufacturer's recommendations and NFPA 70; include consideration for motor service factor and ambient temperature correction, where applicable.
 - 2. Inverse-Time Trip Class Rating: Class 20 unless otherwise indicated or required.
 - 3. Trip-free operation.
 - 4. Visible trip indication.
 - 5. Resettable.
 - a. Employ manual reset unless otherwise indicated.
 - b. Do not employ automatic reset with two-wire control.
 - 6. Bimetallic Thermal Overload Relays:
 - a. Interchangeable current elements/heaters.
 - b. Adjustable trip; plus/minus 10 percent of nominal, minimum.
 - c. Trip test function.
 - 7. Melting Alloy Thermal Overload Relays:
 - a. Interchangeable current elements/heaters.
- B. Circuit Breakers:
 - 1. Interrupting Capacity (not applicable to motor circuit protectors):
 - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated, but not less than specified minimum requirements.
 - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
 - 2. Motor Circuit Protectors:
 - a. Description: Instantaneous-trip circuit breakers furnished with magnetic instantaneous tripping elements for short circuit protection, but not with thermal inverse time tripping elements for overload protection; UL 489 recognized only for use as part of a listed combination motor controller with overload protection; ratings, configurations, and features as indicated on the drawings.
 - b. Provide field-adjustable magnetic instantaneous trip setting.
 - 3. Molded Case Circuit Breakers:
 - a. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers; listed and labeled as complying with UL 489; ratings, configurations, and features as indicated on the drawings.
 - 1) Provide thermal magnetic circuit breakers unless otherwise indicated.
 - b. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
 - c. Provide the following features and accessories where indicated or where required to complete installation:
 - 1) Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
 - 2) Auxiliary Switch: SPDT switch suitable for connection to system indicated for indicating when circuit breaker has tripped or been turned off.

2.04 CONTROL ACCESSORIES

- A. Auxiliary Contacts:
 - 1. Comply with NEMA ICS 5.
 - 2. Provide number and type of contacts indicated or required to perform necessary functions, including holding (seal-in) circuit and interlocking, plus one normally open (NO) and one normally closed (NC) spare contact for each magnetic motor starter, minimum.
- B. Pilot Devices:
 - 1. Comply with NEMA ICS 5; heavy-duty type.
 - 2. Pushbuttons: Unless otherwise indicated, provide momentary, non-illuminated type with flush button operator; normally open or normally closed as indicated or as required.

- 3. Selector Switches: Unless otherwise indicated, provide maintained, non-illuminated type with knob operator; number of switch positions as indicated or as required.
- 4. Indicating Lights: Push-to-test type unless otherwise indicated.
- 5. Provide LED lamp source for indicating lights and illuminated devices.
- C. Control and Timing Relays:
 - 1. Comply with NEMA ICS 5.
 - 2. Provide number and type of relays indicated or required to perform necessary functions.
- D. Control Power Transformers:
 - 1. Size to accommodate burden of contactor coil(s) and all connected auxiliary devices, plus ______ VA spare capacity.
 - 2. Include primary and secondary fuses.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that ratings of enclosed controllers are consistent with the indicated requirements.
- C. Verify that mounting surfaces are ready to receive enclosed controllers.
- D. Verify that conditions are satisfactory for installation prior to starting work.

3.02 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Install controllers in accordance with NECA 1 (general workmanship).
- C. Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D. Provide required support and attachment in accordance with Section 260529.
- E. Install enclosed controllers plumb and level.
- F. Provide grounding and bonding in accordance with Section 260526.
- G. Install all field-installed devices, components, and accessories.
- H. Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.
- I. Set field-adjustable controllers and associated components according to installed motor requirements, in accordance with manufacturer's recommendations and NFPA 70.

3.03 FIELD QUALITY CONTROL

- A. See Section 014000 Quality Requirements, for additional requirements.
- B. Inspect and test in accordance with NETA ATS, except Section 4.
- C. Motor Starters: Perform inspections and tests listed in NETA ATS, Section 7.16.1.1. Tests listed as optional are not required.
- D. Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for circuit breakers larger than _____ amperes. Tests listed as optional are not required.
- E. Correct deficiencies and replace damaged or defective enclosed controllers or associated components.

3.04 ADJUSTING

A. Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

3.05 CLEANING

- A. Clean dirt and debris from controller enclosures and components according to manufacturer's instructions.
- B. Repair scratched or marred exterior surfaces to match original factory finish.

3.06 CLOSEOUT ACTIVITIES

A. See Section 017800 - Closeout Submittals, for closeout submittals.

3.07 PROTECTION

A. Protect installed enclosed controllers from subsequent construction operations.

SECTION 265100 INTERIOR LIGHTING

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Interior luminaires.
- B. Emergency lighting units.
- C. Exit signs.
- D. Ballasts and drivers.
- E. Accessories.

1.02 RELATED REQUIREMENTS

- A. Section 260529 Hangers and Supports for Electrical Systems.
- B. Section 260533.16 Boxes for Electrical Systems.
- C. Section 260553 Identification for Electrical Systems: Identification products and requirements.
- D. Section 260923 Lighting Control Devices.
- E. Section 262726 Wiring Devices: Manual wall switches and wall dimmers.

1.03 REFERENCE STANDARDS

- A. IES LM-79 Approved Method: Optical and Electrical Measurements of Solid-State Lighting Products; 2019.
- B. IES LM-80 Approved Method: Measuring Maintenance of Light Output Characteristics of Solid-State Light Sources; 2021.
- C. NECA 1 Standard for Good Workmanship in Electrical Construction; 2015.
- D. NECA/IESNA 500 Standard for Installing Indoor Lighting Systems; 2006.
- E. NECA/IESNA 502 Standard for Installing Industrial Lighting Systems; 2006.
- F. NEMA LE 4 Recessed Luminaires, Ceiling Compatibility; 2012 (Reaffirmed 2018).
- G. NFPA 70 National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- H. NFPA 101 Life Safety Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- I. UL 924 Emergency Lighting and Power Equipment; Current Edition, Including All Revisions.
- J. UL 1598 Luminaires; Current Edition, Including All Revisions.
- K. UL 8750 Light Emitting Diode (LED) Equipment for Use in Lighting Products; Current Edition, Including All Revisions.

1.04 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Coordinate the installation of luminaires with mounting surfaces installed under other sections or by others. Coordinate the work with placement of supports, anchors, etc. required for mounting. Coordinate compatibility of luminaires and associated trims with mounting surfaces at installed locations.
 - 2. Coordinate the placement of luminaires with structural members, ductwork, piping, equipment, diffusers, fire suppression system components, and other potential conflicts installed under other sections or by others.
 - 3. Coordinate the placement of exit signs with furniture, equipment, signage or other potential obstructions to visibility installed under other sections or by others.
 - 4. Notify Architect of any conflicts or deviations from Contract Documents to obtain direction prior to proceeding with work.

1.05 SUBMITTALS

- A. Product Data: Provide manufacturer's standard catalog pages and data sheets including detailed information on luminaire construction, dimensions, ratings, finishes, mounting requirements, listings, service conditions, photometric performance, installed accessories, and ceiling compatibility; include model number nomenclature clearly marked with all proposed features.
 - 1. LED Luminaires:
 - a. Include estimated useful life, calculated based on IES LM-80 test data.
- B. Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- C. Operation and Maintenance Data: Instructions for each product including information on replacement parts.

1.06 QUALITY ASSURANCE

A. Comply with requirements of NFPA 70.

1.07 DELIVERY, STORAGE, AND PROTECTION

- A. Receive, handle, and store products according to NECA/IESNA 500 (commercial lighting), NECA/IESNA 502 (industrial lighting), and manufacturer's written instructions.
- B. Keep products in original manufacturer's packaging and protect from damage until ready for installation.

1.08 FIELD CONDITIONS

A. Maintain field conditions within manufacturer's required service conditions during and after installation.

1.09 WARRANTY

- A. See Section 017800 Closeout Submittals, for additional warranty requirements.
- B. Provide 3-year manufacturer warranty for LED luminaires, including drivers.
- C. Provide 5-year pro-rata warranty for batteries for emergency lighting units.

PART 2 PRODUCTS

2.01 LUMINAIRE TYPES

A. Furnish products as indicated in luminaire schedule included on the drawings.

2.02 LUMINAIRES

- A. Provide products that comply with requirements of NFPA 70.
- B. Provide products that are listed and labeled as complying with UL 1598, where applicable.
- C. Provide products listed, classified, and labeled as suitable for the purpose intended.
- D. Unless otherwise indicated, provide complete luminaires including lamp(s) and all sockets, ballasts, reflectors, lenses, housings and other components required to position, energize and protect the lamp and distribute the light.
- E. Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, hardware, supports, trims, accessories, etc. as necessary for a complete operating system.
- F. Provide products suitable to withstand normal handling, installation, and service without any damage, distortion, corrosion, fading, discoloring, etc.
- G. Recessed Luminaires:
 - 1. Ceiling Compatibility: Comply with NEMA LE 4.
- H. LED Luminaires:
 - 1. Components: UL 8750 recognized or listed as applicable.
 - 2. Tested in accordance with IES LM-79 and IES LM-80.

- 3. LED Estimated Useful Life: Minimum of 50,000 hours at 70 percent lumen maintenance, calculated based on IES LM-80 test data.
- I. Luminaires Mounted in Continuous Rows: Provide quantity of units required for length indicated, with all accessories required for joining and aligning.

2.03 EMERGENCY LIGHTING UNITS

- A. Description: Emergency lighting units complying with NFPA 101 and all applicable state and local codes, and listed and labeled as complying with UL 924.
- B. Operation: Upon interruption of normal power source or brownout condition exceeding 20 percent voltage drop from nominal, solid-state control automatically switches connected lamps to integral battery power for minimum of 90 minutes of rated emergency illumination, and automatically recharges battery upon restoration of normal power source.

C. Battery:

- 1. Size battery to supply all connected lamps, including emergency remote heads where indicated.
- D. Diagnostics: Provide power status indicator light and accessible integral test switch to manually activate emergency operation.
- E. Provide low-voltage disconnect to prevent battery damage from deep discharge.
- F. Self-Diagnostics: Provide units that self-monitor functionality and automatically perform testing required by NFPA 101 where indicated; provide indicator light(s) to report test and diagnostic status.

2.04 EXIT SIGNS

- A. Description: Exit signs complying with NFPA 101 and applicable state and local codes, and listed and labeled as complying with UL 924.
 - 1. Number of Faces: Single- or double-face as indicated or as required for installed location.
 - 2. Directional Arrows: As indicated or as required for installed location.

2.05 BALLASTS AND DRIVERS

- A. Ballasts/Drivers General Requirements:
 - 1. Provide ballasts containing no polychlorinated biphenyls (PCBs).
 - 2. Minimum Efficiency/Efficacy: Provide ballasts complying with all current applicable federal and state ballast efficiency/efficacy standards.
- B. Dimmable LED Drivers:
 - 1. Dimming Range: Continuous dimming from 100 percent to five percent relative light output unless dimming capability to lower level is indicated, without flicker.
 - Control Compatibility: Fully compatible with the dimming controls to be installed.
 a. Wall Dimmers: See Section 262726.
 - b. Daylighting Controls: See Section 260923.

2.06 ACCESSORIES

A. Provide accessory plaster frames for luminaires recessed in plaster ceilings.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that field measurements are as indicated.
- B. Verify that outlet boxes are installed in proper locations and at proper mounting heights and are properly sized to accommodate conductors in accordance with NFPA 70.
- C. Verify that suitable support frames are installed where required.
- D. Verify that branch circuit wiring installation is completed, tested, and ready for connection to luminaires.
- E. Verify that conditions are satisfactory for installation prior to starting work.

3.02 PREPARATION

- A. Provide extension rings to bring outlet boxes flush with finished surface.
- B. Clean dirt, debris, plaster, and other foreign materials from outlet boxes.

3.03 INSTALLATION

- A. Coordinate locations of outlet boxes provided under Section 260533.16 as required for installation of luminaires provided under this section.
- B. Perform work in accordance with NECA 1 (general workmanship).
- C. Install products in accordance with manufacturer's instructions.
- D. Install luminaires securely, in a neat and workmanlike manner, as specified in NECA 500 (commercial lighting) and NECA 502 (industrial lighting).
- E. Provide required support and attachment in accordance with Section 260529.
- F. Install luminaires plumb and square and aligned with building lines and with adjacent luminaires.
- G. Suspended Ceiling Mounted Luminaires:
 - 1. Do not use ceiling tiles to bear weight of luminaires.
 - 2. Do not use ceiling support system to bear weight of luminaires unless ceiling support system is certified as suitable to do so.
 - 3. Secure pendant-mounted luminaires to building structure.
 - 4. Secure lay-in luminaires to ceiling support channels using listed safety clips at four corners.
 - 5. See appropriate Division 9 section where suspended grid ceiling is specified for additional requirements.
- H. Recessed Luminaires:
 - 1. Install trims tight to mounting surface with no visible light leakage.
- I. Suspended Luminaires:
 - 1. Install using the suspension method indicated, with support lengths and accessories as required for specified mounting height.
- J. Wall-Mounted Luminaires: Unless otherwise indicated, specified mounting heights are to center of luminaire.
- K. Install accessories furnished with each luminaire.
- L. Bond products and metal accessories to branch circuit equipment grounding conductor.
- M. Emergency Lighting Units:
 - 1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
- N. Exit Signs:
 - 1. Unless otherwise indicated, connect unit to unswitched power from same circuit feeding normal lighting in same room or area. Bypass local switches, contactors, or other lighting controls.
- O. Install lamps in each luminaire.
- P. Lamp Burn-In: Operate lamps at full output for prescribed period per manufacturer's recommendations prior to use with any dimming controls. Replace lamps that fail prematurely due to improper lamp burn-in.

3.04 FIELD QUALITY CONTROL

- A. See Section 014000 Quality Requirements, for additional requirements.
- B. Inspect each product for damage and defects.
- C. Operate each luminaire after installation and connection to verify proper operation.
- D. Test self-powered exit signs, emergency lighting units, and fluorescent emergency power supply units to verify proper operation upon loss of normal power supply.
E. Correct wiring deficiencies and repair or replace damaged or defective products. Repair or replace excessively noisy ballasts as determined by Architect.

3.05 ADJUSTING

- A. Aim and position adjustable luminaires to achieve desired illumination as indicated or as directed by Architect. Secure locking fittings in place.
- B. Aim and position adjustable emergency lighting unit lamps to achieve optimum illumination of egress path as required or as directed by Architect or authority having jurisdiction.
- C. Exit Signs with Field-Selectable Directional Arrows: Set as indicated or as required to properly designate egress path as directed by Architect or authority having jurisdiction.

3.06 CLEANING

A. Clean surfaces according to NECA 500 (commercial lighting), NECA 502 (industrial lighting), and manufacturer's instructions to remove dirt, fingerprints, paint, or other foreign material and restore finishes to match original factory finish.

3.07 PROTECTION

A. Protect installed luminaires from subsequent construction operations.

END OF SECTION

SECTION 270500

COMMON WORK ELEMENTS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 STIPULATIONS

- A. Project drawings and general provisions of the Contract, including but not limited to all; General and Supplementary Conditions, Division 01 Specification Sections and stipulated Specification Sections shall apply to this and all related Division 27 specification sections.
- B. Related Specification Sections:
 - 1. Division 07 Through-penetration Firestop Systems
 - 2. Division 26 Common Work Results for Electrical
 - 3. Division 26 Low Voltage Electrical Power Conductors and Cables
 - 4. Division 26 Grounding and Bonding for Electrical Systems
 - 5. Division 26 Hangers and Supports for Electrical Systems
 - 6. Division 26 Raceways and Boxes for Electrical Systems
 - 7. Division 26 Identification for Electrical Systems
 - 8. Division 27 Common Work Elements for Communications Systems
 - 9. Division 27 Network Communications
 - 10. Division 27 Two-Way Communications System
 - 11. Division 27 Audiovisual Systems
 - 12. Division 28 Common Work Elements for Electronic Safety and Security
- C. Reference Symbols:
 - 1. All device symbols are defined by the appropriate symbol schedule on the symbols and abbreviations sheet in the telecommunications systems drawing package. Not all device symbols as indicated may be required for the project.
 - 2. Because of the scale of the drawings, symbols are shown on drawings as close as possible to the mounting location. Contractor shall coordinate exact locations with all drawings and affected trades prior to submittal of shop drawings.
 - a. The Contractor shall coordinate exact locations with all architectural, security and telecommunications drawings as well as all affected trades prior to submittal of any shop drawings.
- D. Abbreviations:
 - 1. Refer to drawing legend.
- E. Definitions:
 - 1. Contract Documents: The documents consisting of the Form of Agreement between Owner and Contractor, Conditions of the Contract, (General, Supplementary, and other Conditions), Drawings, Specifications and all Addenda issued prior to the execution of the Contract.
 - 2. Contract Drawings: The drawings that form a part of the Contract Documents that provides the graphical representation of the project requirements intended design and/or performance criteria to be delivered by the Contractor.
 - 3. Reference Drawings: A drawing and/or set of drawings produced by a proprietary supplier, manufacturer, subcontractor, or fabricator included in the Contract Documents for informational purposes, providing specific information related to the installation of related appurtenances, components, devices, hardware, products, and/or systems. Reference Drawings shall also include any Contract Drawings from prior bid packages that may have pertinent information or require coordination of trades related to this contract.
 - 4. Shop Drawings: A drawing and/or set of drawings produced by the contractor, supplier, manufacturer, subcontractor, or fabricator as a detailed representation of the proper installation of the related, appurtenance, component, device, hardware, product, and/or system to be delivered in conformance to the requirements of the Contract Documents.

1.2 SUMMARY

- A. This Section contains the overall requirements associated with all Division 27 and Division 28 Specification Sections, and includes the project design intent for all data, voice, and security network communication cabling and equipment related to the installation of the following systems:
 - 1. Network Communications System
 - 2. Audiovisual System
- B. In addition, this section shall address all requirements for submittals, quality assurance, product handling, record documents, project conditions, installation, system performance, demonstrations, testing, and certifications for all scopes of work related to network communication cabling for this project scope of work. Refer to related Division 26, 27 and 28 specification sections and all contract drawings for additional information.
 - 1. The ICTI shall have overall responsibility for all designs, equipment and all technical support related to all Division 27 scopes of work and shall ensure full coordination of all work as required to provide the following fully operational communications network in accordance with all related specification sections and contract drawings.
 - a. The ICTI shall be responsible for providing all equipment, devices, system components, final cable terminations, programming, commissioning, and testing of all network communications cabling and equipment in accordance with all related Division 27 specification sections.
 - b. All sub-contractors shall meet the minimum technical capabilities, certifications, and licensing requirements as defined by the "Quality Assurance" chapter.
- C. Bidder shall submit complete detailed proposals with line-item cost representation for components and associated installation labor. Lump sum bids will not be accepted.
 - 1. Bidders shall include as part of the bid response the following items:
 - a. Installation schedule with proposed manpower assignments.
 - b. Resumes for project manager and lead technician for this project.
 - c. BICSI RCDD certificate and registration number.
 - d. Corning EWP Installer Certification
 - e. Tyco Electronics ND&I Member (Silver or Better)
- D. The installation, performance, features, functions, software, and programming criteria as specified herein as well as all related Division 27 specification sections have been designed to offer the maximum system efficiency, ease of operation, occupant safety and the protection of equipment as recommended by The Owner and Design Professional.
 - 1. Any deviations from the specified criteria shall be documented, reviewed, and agreed to in writing by The Owner and the Design Professional prior to submission of bids. Refer to Division 01, and all related Division 27 specification sections for any substitutions and/or project deviation requests.
 - a. The required information shall include but not be limited to reason for deviation, all differences in performance, operation and function from the herein specified requirements, all benefits and added features to the Owner as a result of the deviations and any additional incurred costs to the Owner for maintenance and long-term ownership.
 - b. Failure to provide the Owner and Design Professional with the required information shall result in any shop drawing submissions being returned for non- conformance with the contract requirements.
 - 2. The contractor and all sub-contractors for this work shall have read all the General Conditions, Special Requirements, General Requirements and all related specification sections and in the execution of all work shall be bound by all of the conditions and requirements therein.

- 3. Prior to the submission of the Bid any discrepancies or inconsistencies noted within these specifications and/or the project drawings shall be brought to the immediate attention of the Owner and Design Professional.
- E. All device symbols are defined by the appropriate symbol schedules as indicated by the symbol and abbreviation drawing sheets for each discipline. The Contractor shall coordinate exact locations with all architectural, mechanical, electrical, reflected ceiling, furniture drawings and door hardware specifications as well as all affected trades prior to submittal of bids.
 - 1. All symbols are shown on the contract drawings as close as possible to their intended location. Contractor shall coordinate the installation of all equipment, devices, controls, components, cabling conduits/raceways and integration of other systems with all affected trades and specified system integrators. The contractor shall document all coordination requirements at the time of shop drawing submission.
 - 2. Drawings for this work are diagrammatic and intended to convey the extent, general arrangement, and locations of the work. Because of the scale of the drawings, certain basic items such as access panels, conduits, cabinet sizes, penetration sleeves, pull boxes, back-boxes and junction boxes may or may not be shown on the contract drawings. Include all items where required by code and related specification sections for proper installation of all work.
- F. Where ambiguity exists between the project specifications and the contract drawings, the superior in system performance regardless of cost shall prevail and shall be delivered by the Contractor at no additional expense to the project.
- G. Project specifications and drawings may not deal individually with every part, control, device, component, or appurtenance which may be required to produce the equipment performance for the specified system and/or as required for compliance with all specified systems integration.
 - 1. Include such items and components, as required, for complete operational systems as defined by the project documents, whether specifically indicated or not. The contractor shall be responsible for providing conduits/raceways, cable terminations, controls, systems, equipment, materials, devices, components, electrical power, equipment racks/cabinets, software, programming, commissioning, testing and all appurtenances as well as the integration of any ancillary systems or Owner provided equipment/components/systems.
 - 2. Coordinate with other applicable trades in submittal of shop drawings and the installation of all systems. All shop drawings shall detail space conditions in order to accommodate other concerned trades, all equipment locations are subject to final review by the Owner and Design Professional.
- H. Use of Premises
 - 1. General: The Contractor shall have limited use of premises for construction operations only as required to meet the scope of work as delineated by the Contract Documents.
 - 2. The Contractor shall design, prepare, schedule, and coordinate all scopes of work without disruption of any existing system functions or the daily operation of the facility. All communications cabling and equipment shall be installed in such a manner that all new controls, equipment and/or devices shall be installed, programmed, and tested prior to switchover and/or disconnecting of any existing communications systems.
 - 3. The contractor shall coordinate all installation activities so as not to disrupt the daily routines of the facility and shall include any costs related to a phased construction methodology including but not limited all necessary temporary equipment, devices, components, or systems as well as any labor costs associated with any installation, commissioning, testing demolition of any systems required to be performed after normal business hours of the facility.
 - a. Contractor shall plan, schedule and install all communications cabling and equipment in accordance with all requirements of the project construction schedule. Refer to related specification sections for additional information related to project scheduling and facility access.

- b. The contractor shall coordinate all installation and demolition activities so as not to disrupt the daily routine of the facility or negatively impact the integrity of the facility's security and life safety measures.
- c. Contractor shall demolish all existing network communications systems, cabling, devices, components and/or controls not integrated with the new telecommunications system at the completion of each project phase and only after final acceptance by Owner, Owner Representatives, and the Design Professionals. The removal or demolition of all existing system devices and/or field wiring not incorporated into the new systems shall be performed in such a manner consistent with all requirements of NFPA 70.

1.3 REFERENCES

- A. References to industry and trade association standards as well as all building codes are minimum installation requirements. The codes, standards, and agencies listed below shall form a part of this specification section and all work shall comply with the latest adopted standards.
- B. Where the contract drawings and specifications mandate a greater requirement or performance than those specified by any of the below referenced codes and standards, the Contract Documents shall then be the governing requirements for this project. The minimum codes and standards to be applied for this project shall be the following:
 - 1. All applicable requirements of NFPA 70 "National Electrical Code" including, but not limited to:
 - a. Article 250, Grounding
 - b. Article 300, Part A. Wiring Method
 - c. Article 310, Conductors for General Wiring
 - d. Article 725, Remote Control, Signaling Circuits
 - e. Article 770, Optical Fiber Cables and Raceways
 - f. Article 800, Communication Systems
 - 2. National Fire Protection Association:
 - a. NFPA-72: National Fire Alarm and Signaling Code
 - b. NFPA-75: Standard for the Protection of Electronic Computer/Data Processing Equipment
 - c. NFPA 90A: Standard for the Installation of Air-Conditioning and Ventilating Systems
 - d. NFPA 92A: Standard for Smoke-Control Systems
 - e. NFPA-99: Standard for Health Care Facilities
 - f. NFPA-101: Life Safety Code
 - g. NFPA-130: Standard for Fixed Guideway Transit and Passenger Rail Systems
 - 3. ANSI/TIA Compliance: Comply with the following Electronics Industries Association Standards:
 - a. ANSI/TIA-568C: "Commercial Building Telecommunication Standard"
 - b. ANSI/TIA-569: "Commercial Building Standard for Telecommunications Pathways and Spaces"
 - c. ANSI/TIA-455: "FOTP-61, Measurement of Fiber or Cable Attenuation Using an OTDR"
 - d. ANSI/TIA-606: "The Administration Standard for the Telecommunications Infrastructure of Commercial Building"
 - e. ANSI/TIA-607A: "Commercial Building Grounding and Bonding Requirements for Telecommunications"
 - f. ANSI/TIA-492A: "Detail Specification for 850-nm Laser Optimized 50-µm Core Diameter/125µm Cladding Diameter Class 1a Graded Index Multi-Mode Optical Fibers"
 - g. ANSI/TIA-492CAAA: Detail Specification for Single-Mode Optical Fiber
 - 4. Underwriters Laboratories, Inc.:

- a. UL 486A: "Wire connectors and soldering lugs for use with copper conductors"
- b. UL 1449: "Transient voltage surge suppressors"
- c. UL 1581: "Standard for Electrical Wires, Cables, and Flexible Cords"
- d. UL 478: "Standard for Electronic Data-Processing Units and Systems
- e. UL 83: "Thermoplastic-Insulated Wires and Cables,"
- f. UL 910: "Test Method for Fire and Smoke Characteristics of Cables Used in Air-Handling Spaces." Provide products which are UL-listed and labeled.
 - UL 1069: Hospital Signaling and Nurse Call Equipment
- 5. Federal Communications Commission:

g.

- a. FCC Regulations Part 15 Title 47.
- 6. Institute of Electrical and Electronic Engineers (IEEE)
 - a. IEEE 802.3 "Carrier Sense Multiple Access with Collision Detection," and all applicable supplements a through af".
 - b. IEEE 802.3.u-100 "Base T/100-Base-TX, Fast Ethernet"
 - c. IEEE 802.3.z "Gigabit Ethernet"
 - d. IEEE 802.3.ab "1000 Base T"
 - e. IEEE 802.3.ae "10 Gigabit Ethernet"
 - f. IEEE 802.3.af "Data Terminal Equipment (DTE) Power via Media Dependent Interface (MDI) that"
 - g. IEEE 802.11.ax "Wireless Transmission Standard"
 - h. IEEE 802.11.bt "Power over Ethernet"
- 7. ISO/TC International Organization for Standardization's (ISO) Technical Committee (TC)
 - a. 21730 Health informatics Use of mobile wireless communication and computing technology in healthcare facilities.
- 8. NEMA/ICEA Compliance:
 - a. WC-5 "Thermoplastic-Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy,"
 - b. WC30 "Color Coding of Wires and Cables," pertaining to control and signal transmission media.
- 9. ASTM Compliance: Comply with applicable requirements of D-2219 and D-2220. Provide copper conductors with conductivity of not less than 98% at 20°C (68°F).
- 10. BICSI -TDMM Latest edition
- 11. ADA Standards for Accessible Design
- 12. Local Authority Having Jurisdiction
- 13. National Electrical Manufacturers Association (NEMA)

1.4 SUBMITTALS

- A. In addition to all submittal requirements as stipulated by Division 01 specifications sections, the Contractor shall provide all shop drawing submittals in accordance with the following:
 - 1. Owner and Design Professional approval shall be obtained for all equipment and material before delivery to the job site. Delivery, storage, or installation of equipment or material which has not had prior approval will not be permitted at the job site.
 - 2. All submittals shall include adequate descriptive literature, catalog cuts, shop drawings, and other data necessary for The Owner to ascertain that the proposed equipment and materials comply with specification requirements. Catalog cuts submitted for approval shall be legible and clearly identify equipment being submitted.
 - 3. Submittals shall be provided as a complete submission; no partial submissions will be accepted. Failure to provide a complete submission shall result in all submittals being returned for resubmission.
 - 4. Submittal data shall be submitted in a single package, containing the below in the following order:
 - a. Cover Sheet:

- 1) Include name of supplying contractor and project name.
- b. Product Data:
 - 1) Include a catalog sheet per product of equipment listed in the Detailed Bill of Materials, in the exact order as the Detailed Bill of Materials. Each catalog sheet shall describe mechanical, electrical and functional equipment specifications. The catalog sheet must also include a image of the product. Photocopy duplications of the manufacturer's original equipment catalog sheets will be allowed as long as they provide adequate clarity of both the printed word and graphics/pictures. If more than one product is shown on the catalog sheet the intended product must be denoted by either an arrow or highlight.
- c. Installer Qualifications:
 - 1) Provide the following to demonstrate adequate experience and minimum qualifications:
 - a) Corning EWP Certificate
 - b) Commscope Trunet Certificate
 - 2) Installing company shall be certified by manufactures in aspects of design, installation and testing of optical and Category 6 metallic premise distribution systems, be a manufactures Value Added Reseller (VAR) in good standing, with a current, active certification that has been continuous for at least the last 24 months. This applies to both the COMMSCOPE/TE and Corning certifications.
- d. Prequalification Warranty:
 - 1) Recently dated (within one year from submittal date) support letter from manufacturer stating that the supplying contractor is authorized to obtain for the owner the Extended Warranty for Cabling System and the Extended Warranty for System Assurance.
 - 2) Prequalification shall include demonstrating 24 months continuous active certification in the extended warranty program, from the date of the submittal.
- 5. No substituted equipment shall be reviewed without prior approval in accordance with the requirements of "substitutions" under Division 1 specification section.
- 6. Mark the submittals, "SUBMITTED UNDER SECTION____
 - a. Submittals shall be marked to show specification reference including the section and paragraph numbers.
- 7. The Contractor shall schedule submittals in order to maintain the project schedule. For coordination requirements refer to Division 01 Specification Sections, which outline basic submittal requirements and coordination. All Division 01 Specification Sections requirements shall be used in conjunction with this specification section.
- 8. Prior to any submission the contractor shall be responsible for performing the following quality control items to ensure compliance with all project requirements:
 - a. Review all Shop Drawings and Product Data
 - b. Review all field measurement criteria.
 - c. Review all field construction criteria and methodologies.
 - d. Review all catalog numbers and similar data.
 - e. Review all coordination requirements of affected trades.
 - f. Review conformance to all appropriate specification sections.
- 9. All shop drawings shall be prepared using latest version of AutoCAD or Revit, drawn accurately, and in accordance with The Owner's Standards. The Contractor shall not reproduce the Contract Documents or copy standard information as the basis of the technical data, hand drawn mark-ups of the original project drawings shall not be acceptable. Failure to provide a complete set of "contractor prepared" installation

drawings at the time of submittal shall result in all submittals being returned for resubmission.

- 10. Submission Packaging: The Contractor shall organize the submissions according to the following packaging requirements.
 - a. Electronic Copy Submission: One complete set of electronic equipment data sheets and drawings submitted in PDF format and collated in two distinct files:
 - 1) Equipment Data Sheets, equipment schedules, alarm matrixes cable termination spread sheets, and all related pertinent information.
 - 2) Drawings including all site plans, floor plans, risers, point to point wiring, grounding, installation details and mounting elevations.
 - b. Hard Copy Submission: Submit hardcopies of all shop drawings and product datasheets in accordance with the requirements the of Division 01 specifications.
- 11. The ICTI shall have an RCDD professional review all shop drawings related to network designs, installations, testing, certifications, and structured cabling layouts for communications systems. Failure to provide RCDD sealed shop drawings shall result in all shop drawings being returned for resubmission without any reviews taking place.
- 12. The Owner's and the Design Professional's review of the shop drawings and/or samples does not relieve the Contractor from compliance with the requirements of the project documents. Unless the Contractor has informed The Owner and the Design Professional in writing of such deviation at the time of submission, has noted the deviation on the shop drawings, and the Owner and the Design Professional has given written approval of the specific deviation to the project document.
 - a. All project requirements shall stand. The Owner's and the Design Professional's review does not relieve the Contractor from responsibility for any errors of omission in the submission of shop drawings and/or samples.
- 13. Submit all system testing, commissioning, and startup procedures to be employed. Include all estimated times for performance of all tests, all test equipment and workforce necessary for testing.
- 14. Submit all qualifications and certifications in accordance with the requirements as specified elsewhere in this specification section.
- 15. Submit project schedule outlining the time frames for all equipment with long lead times for equipment deliveries; include all system commissioning, testing and training time expectations. Project schedule shall be submitted as CPM schedule and shall utilize a software-based project management program.
- B. Shop Drawings:
 - 1. All shop drawings shall include sufficient information, clearly presented, to determine full compliance with all project drawings and specifications. Include the following information as applicable for review; failure to provide all information listed below shall result in all shop drawing submittals being returned for resubmission:
 - a. All Building Floor and Site Plans.
 - b. All equipment, devices and components with manufacturer's name(s), model numbers,
 - c. All equipment, device and component electrical ratings and power requirements
 - d. All equipment, device, and component performance ratings.
 - e. All equipment /device cable voltage drop calculations,
 - f. All dB losses for all fiber optic devices and cabling,
 - g. All Speaker taps, voltages, and zoning
 - h. All equipment rack/cabinet layouts and rack/cabinet sizes.
 - i. All device-mounting elevations.
 - j. All device wiring details.
 - I. All grounding and bonding connections.

- m. Complete point-to-point-wiring diagrams for all systems. Include all equipment and wiring termination schedules and/or matrices.
- 2. Provide a complete set of "contractor prepared" installation drawings. Drawings at the minimum shall consist of floor plans indicating all; passive and active electronic component locations, field devices, device identifications, distribution racks, patch panels, control panels, auxiliary control panels, power supplies, conduit, and cable requirements as well as all 120-volt electrical circuit locations and designations.
 - a. Drawings shall include at the minimum the following:
 - 1) Detailed equipment layouts for all communications rooms. Coordinate all room layouts with affected trades.
 - 2) Floor plan drawings showing locations of all equipment, devices, equipment cabinets and/or rack locations. Identify type and sizes of all equipment cabinets and/or racks.
 - 3) All cable tray layouts, and conduit routing of all conduits 2-inches in diameter or greater.
 - 4) System riser diagrams and single line drawings
 - 5) Equipment wattage for each location and estimated BTU production.
 - 6) Detailed equipment layouts for all equipment consoles. Indicate all equipment locations, power connections and installation details.
 - 7) All equipment mounting hardware/brackets and installation details. Identify type size, load capacities of all mounting hardware/brackets; include all mounting and installation details, all space requirements, any special architectural modifications required.
 - 8) Outline drawings of all equipment cabinets/racks showing the relative position of all major components, all-wiring and grounding terminations. Include all panel, cabinet and/or rack dimensions.
 - 9) All grounding and bonding termination points
- 3. Provide a complete termination schedule of all communications device drop/outlet locations; indicate on the installation drawings all device drops/outlets' unique identification which shall correspond with schedule and drawings.
- C. Equipment Submittals:
 - 1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
 - a. Include all equipment data sheets pertinent to equipment provided. All data sheets shall be highlighted and annotated indicating specific equipment and options supplied. Failure to provide the proper annotation of all equipment shall result in submittals being returned for resubmission.
 - 2. Submit complete technical data necessary to evaluate the material and equipment. Include a complete technical specification for the submitted equipment, noting differences and adherence to this Section. Failure to provide the required data will result in all submittals being returned for resubmission.
 - 3. Submit performance data, equipment ratings, cable requirements, control sequences, GUI based control panels, programming matrixes, logic diagrams and all other descriptive data necessary to describe the installation and operations of the system being provided. Failure to provide the required data will result in all submittals being returned for resubmission.
 - 4. Parts list which shall include those replacement parts recommended by the equipment manufacturer, quantity of parts, current price, and availability of each part.
- D. Maintenance and Operation Manuals: Submit in accordance with all requirements of Division 01 specification sections and as herein specified.
 - 1. Maintenance and Operation Manuals: Submit as required for systems and equipment specified in the technical sections. Furnish in electronic format. Furnish one complete

manual as specified in the technical section but in no case later than prior to performance of systems or equipment test and furnish the remaining manuals prior to contract completion.

- 2. Inscribe the following identification on the cover: the words "Maintenance and Operations Manual", include the name and location of the system, equipment, building, name of Contractor, and contract number. Include in the manual the names, addresses, and telephone numbers of each subcontractor installing the system or equipment and the local representatives for the system or equipment.
- 3. Provide a "Table of Contents" and assemble the manual to conform to the table of contents, with tab sheets placed before instructions covering the subject. The instructions shall be legible and easily read, with large sheets of drawings folded in.
- 4. Furnish (1) digital copy of all Maintenance and Operation Manuals in PDF format.
- 5. The manuals shall include:
 - a. Internal and interconnecting wiring and control diagrams with data to explain detailed operation and control of the equipment.
 - b. A control sequence describing start-up, operation, and shutdown.
 - c. Description of the function of each principal item of equipment.
 - d. Installation and maintenance instructions.
 - e. Safety precautions.
 - f. Diagrams and illustrations.
 - g. Testing methods.
 - h. Performance data.
 - i. Pictorial "exploded" parts list with part numbers. Emphasis shall be placed on the use of special tools and instruments. The list shall indicate sources of supply, recommended spare parts, and name of servicing organization.
 - j. Appendix; list qualified permanent servicing organizations for support of the equipment, including addresses and certified qualifications.
- 6. Approvals will be based on complete submission of manuals together with shop drawings.

1.5 QUALITY ASSURANCE

- A. Integrator Qualifications: The projects' Information Communication Technology Integrator (ICTI) shall be an accredited and authorized distributor of the appropriate equipment manufacturer and shall be fully certified in the installation, testing and programming of all equipment being provided.
 - 1. The ICTI shall be capable of providing documented successful work experience of at least three (3) facilities of equivalent size and technical requirements utilizing the proposed equipment being provided and have on staff a minimum of one full time individual that holds a current RCDD registration.
 - 2. Cable Installer Qualifications: The cable installation contractor shall demonstrate not less than three (3) years' experience in the installation of structured cabling systems and shall have on staff a minimum of one full time member that holds a current BICSI level II installer credential.
 - a. NOTE: The installation of all communications cabling shall be under the direct supervision of a current BICSI level II installer who shall be knowledgeable in the following technical applications:
 - 1) The Routing and installation of shielded, unshielded, twisted pair, coaxial and fiber optic cables.
 - 2) Bonding and grounding of cable tray and equipment racks.
 - 3) Fusion splicing of fiber optic cabling.
 - 4) Testing copper conductors for electrical continuity.
 - 5) Testing and Certifying of UTP structured cabling for attenuation and worst case near end cross talk.
 - 6) Testing and Certifying of ALL fiber optic cabling employing an Optical Time Domain Reflectometer (OTDR) in accordance with TIA protocols.

- 7) Testing and Certifying of coaxial cable networks for RF leakage
- 8) Termination, connection, and testing of shielded and un-shielded twisted pair cable, coaxial cabling and fiber optic cabling on all specified connectors, electrical protection blocks, termination blocks and patch panels.
- 9) Generally accepted industry standards, as well as manufacturers written installation instructions, will be used for in-process quality control and final acceptance of the work installation.
- 3. The Owner and the Design Professional reserve the right to require the Contractor to submit a list of installations where the products have been in operation before approval.
 - a. Experience shall be defined as the completion of the specific system being provided, with that system being successfully operated by the Owner for its intended purpose for at least three (3) years.
 - b. In addition to the above, "Experience" shall also be defined as the completion of modifications and renovations to any associated system being provided in any existing occupied facility of this size and magnitude.
 - c. For each facility submit the following:
 - 1) Name and location of facility
 - 2) Date of Occupancy or beneficial use by Owner
 - 3) Owner's representative to contact and telephone number
 - 4) Construction Manager or General Contractor
 - 5) Project Architect or Engineer
 - 6) Provide information on the installed locations with operational equipment
 - 7) Registration number and expiration date of RCDD professional
 - 8) Registration number and expiration date of Level II installer.
- 4. Service Qualifications: The ICTI shall be a permanent service organization maintained and/or trained by the product manufacturer on the products being provided for this project.
 - a. The ICTI shall be (where required) properly licensed by the governing municipality to provide the services and work for the specific system being installed. In addition, all integrators shall be capable of providing full service for the entire warranty period within an 8-hour response time upon notification of a service emergency.
- B. Manufacturer's Qualifications: The manufacturer shall regularly and presently produce, as one of the manufacturer's principal products, the equipment and materials specified for this project, and shall have manufactured the items for at least three years.
 - 1. Product Qualification: The Manufacturer's product shall have been in satisfactory operation, on three installations of similar size and type as this project, for approximately three years.
 - a. The manufacturers shall submit the appropriate documentation certifying that the project ICTI is a qualified service provider of all manufacturers' products being provided for this project.

1.6 RECORD DOCUMENTS

- A. In addition to all general provisions of the Contract, including but not limited to all; General and Supplementary Conditions, Division 01 Specification Sections include the following project requirements:
 - 1. Provide complete set of finalized copies of record documents prior to final acceptance of the project by The Owner and the Design Professional in accordance with all requirements of Division 01 specification sections. At the minimum the record documents shall contain all information, data and drawings as described in Chapter 1.4 "Submittals" of this specification section.
 - a. As-built documents shall be submitted in both paper and electronic media formats in the quantities as specified by Division 01 specification requirements.

- All electronic record drawings shall be prepared and submitted utilizing AutoCAD or Revit as manufactured by Autodesk. Where electronic documents are prepared using other than an AutoCAD or Revit manufactured by Autodesk, the contractor shall provide to The Owner and Design Professional the necessary software to electronically view the submitted documents.
- 2) All electronic data sheets, control sequences, programming matrixes and other descriptive data shall be provided in PDF formatted documents.
- 3) Copies of all current system programming and associated software shall be provided on downloadable media formatted for the use in restoration all system operations and functionality in the event of a catastrophic failure.

1.7 EXTRA MATERIAL

- A. In addition to all general provisions of the Contract, including but not limited to all; General and Supplementary Conditions, Division 01 Specification Sections refer to related specification sections "Extra Material" for specific requirements.
- B. All Extra materials shall be provided at the time of final acceptance of the project and a signed packing list shall be obtained at the time of delivery. At no time is the contractor to use the extra materials provided for this project to replace malfunctioning or damaged equipment and or components.
- C. Provide 5% of all material as "Extra Material."

PART 2 – PRODUCTS

2.1 MANUFACTURED PRODUCTS

- A. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items, that meet and/or exceed the specified performance and features of the equipment and/or systems and for which replacement parts shall be readily available to the system integrator and/or using agency.
 - 1. When more than one unit, device, or component of the same class of equipment is required, such units, devices or components shall be the product of a single manufacturer.
 - 2. Acceptable manufacturers for each system shall be as specified and shall be provided in full compliance with the requirements of this and all related specification sections and contract drawings.
 - a. Manufacturers listed as acceptable shall not negate the contractors' responsibility for providing all equipment, devices, components and/or systems, in accordance with all functions and performance requirements of the Contract Documents.
 - b. Where manufacturer and/or manufacturer model numbers reference specific system components in the related specification sections, it is to establish the performance requirements and quality of the systems and components only.
 - It is in no way an inference that the referenced model numbers are the manufacturer's current product and are the only acceptable components for this project unless specifically referenced as "no substitutions."
 - c. The Contractor shall provide the manufacturers' most current product that shall meet and/or exceed the specified performance and features of the equipment and/or systems.
 - d. Equivalent UL-listed equipment may be substituted for the approved manufacturers unless stipulated by other specification sections as "No Substitutions." All substitutions shall be submitted for approval by The Owner and the Design Professional in accordance with all requirements of Division 01 specification sections and Chapter 1.4 "Submittals" of this specification section.
 - 1) Where systems and/or components are referenced as "no substitutions" the specific system and/or components shall be provided.
 - 2) All substitutions shall comply with all requirements as specified above and all system performance standards shall be maintained.

- 3) The contractor shall stipulate the following information impacted by such a substitution.
 - a) Any and all extensions in time impacted by the substitution.
 - b) Any changes to the architectural or structural elements to the project
 - c) Differences in operation and/or performance from intended system criteria.
- 4) Failure to provide the required substitution information shall result in "without consideration" the immediate rejection of the substituted equipment and/or systems.
- B. Equipment Assemblies and Components:
 - 1. Components of an assembled unit need not be products of the same manufacturer.
 - a. Manufacturers of equipment assemblies, which include components made by others, shall assume complete responsibility for the final assembled unit.
 - b. Components shall be compatible with each other and with the total assembly for the intended service.
 - c. Constituent parts which are similar shall be the product of a single manufacturer.
 - d. Factory wiring shall be identified on the equipment being furnished and on all wiring diagrams.
- C. Compatibility and Interoperability of System Components and Devices
 - 1. Where multiple components, devices and/or systems are intended to be interconnected and components of a complete system in accordance with any related specification sections, it shall be the Contractor's responsibility to verify interoperability and compatibility of said components, devices and/or systems in full conformance to the specified performance criteria prior to the submission of shop drawings.
 - 2. Where specified devices are found to be incompatible or incapable of performing as specified in a seamless manner, the contractor shall notify the Engineer in writing prior to submission of shop drawings. Failure to properly identify such functional discrepancies shall not relieve the contractor from providing a complete and fully functional system in accordance with the requirements of all related specification sections.
- D. Where Factory or Off-Premises Testing of any equipment, product or assembly is recommended by the product manufacturer or where specified as part of this section and/or any related specification section:
 - 1. The Owner, the Design Professional and/or Owner representatives shall have the option of witnessing all factory tests. The Contractor shall notify The Owner and the Design Professional at a minimum of thirty (30) working days prior to the performance of any factory or off-premises tests.
 - a. Where the factory or assembly point for all off-premises testing is not within two (2) hours driving time from the project location, the system integrator shall include as part of this project all per diem costs (travel, meals and lodging) for a minimum of two representatives from the using agency and the project Design Professional to witness all testing.
 - 2. Provide four (4) copies of certified test reports containing all preliminary test data and testing procedures shall be furnished to The Owner and the Design Professional prior to any final testing and not more than ninety (90) days after completion of any tests.
 - 3. When equipment, product or assembly fails to meet any factory or off-premises tests, retesting of equipment, product or assembly shall be mandated, the manufacturer/integrator shall be liable for all additional expenses, including all expenses incurred by The Owner and the Design Professional for witnessing the retesting of any equipment, product, or assembly.
- E. Unspecified Equipment and Material: Any item of equipment or material not specifically addressed on the drawings or in this document and required to provide complete and functional

Structured Cabling System shall be provided in a level of quality consistent with other specified items.

PART 3 – EXECUTION

3.1 EQUIPMENT PROTECTION

- A. Protect all materials, equipment, devices, or components permanently installed and/or stored on the job site. Protect all materials, equipment, cabling, devices, or components during construction and after installation. Provide appropriate protection of all materials, equipment, components and/or devices until time of substantial completion. All materials, equipment, components and/or devices shall be protected during shipment and storage against any physical damage, dirt, moisture, cold, snow, wind, or rain:
 - 1. During installation, enclosures, racks/cabinets, equipment, controls, controllers, circuit protective devices, and other like items, shall be protected against entry of any foreign matter; and shall be vacuum cleaned both inside and outside before testing and operating and repainting if required.
 - 2. Any materials, equipment, components and/or devices, stored on site, which have been deemed by The Owner or the Design Professional to exhibit any indications of damage or exposure dust or moisture shall not be installed and shall returned to the source of supply for immediate replacement.
 - a. The use of spare parts or the return of defective equipment for repair to mitigate the damage of defective materials, equipment, components and/or devices shall not be acceptable. All materials, equipment, components and/or devices shall be new and unused until final acceptance by the Design Professional.
 - 3. Provide and apply protective material immediately upon receiving the products and maintain throughout the construction process.
 - a. Painted surfaces shall be protected with factory installed removable heavy kraft paper, sheet vinyl or equal.
 - b. Any damaged paint on equipment and materials shall be refinished with the same quality of paint and workmanship as used by the manufacturer so repaired area is not obvious or detectable.
 - 4. Failure to properly protect all materials, equipment, components and/or devices prior to final acceptance shall constitute sufficient cause for rejection of materials, equipment, components and/or devices should any defects, damage or degradation in performance is observed.
- B. Seismic Performance: All equipment, bracing, and anchoring shall be rated for the seismic zone of the geographical area in which the project resides and shall withstand the effects of earthquake motion and wind forces in accordance with the current editions of the IBC and ASCE/SEI 7. Refer to Refer to Division 01 and Division 26 Hangers and Supports for additional seismic information and requirements.
 - 1. Equipment shall include, but not be limited to, racks/cabinets, cable/basket/ladder tray, conduit, cameras, and all appurtenances.
- C. Immediately replace all malfunctioning materials, equipment, components and/or devices with new unused products up until the time the Design Professional issues final acceptance of the system. The returning of any malfunctioning equipment, devices and/or components to the manufacturer for repair and then reinstallation at the project site shall not be acceptable.
 - 1. All replacement materials, equipment, components and/or devices shall be factory new and not scavenged from the Project's spare parts inventory or factory recycled products unless expressly identified by contractor prior to replacement and approved beforehand by the Design Professional.

3.2 WORK PERFORMANCE

A. Installation, final termination, testing, start-up and commissioning of all systems, system components and cabling infrastructures shall be under the direct supervision of the appropriate

system integrator. The integrator shall be an accredited and authorized distributor of the appropriate equipment manufacturer and shall be fully certified in the installation, testing, commissioning, and programming of all equipment, devices, components and/or systems being provided as part of this project.

- B. Job site safety and worker safety is the responsibility of the Contractor. Ensure that safe access and egress from all work areas is maintained during movement and installation of materials. Clean up all debris generated by installation activities. Keep all communication equipment rooms free of debris at all times.
- C. Pre-installation Conferences: Include provisions to attend all pre- installation conferences at Project site in compliance with all requirements in Division 01 specification section and as herein specified. Review methods and procedures related to installation and operations of all communications systems, including, but not limited to, the following:
 - 1. Inspect and discuss electrical and equipment roughing-in related to all communications systems as well as other preparatory work required to be performed by other trades.
 - 2. Review and discuss all work, equipment deliveries, installation procedures and related scopes as required to conform to the phased construction schedule.
 - 3. Review sequence of operations for each type of system, control, cabling and/or integration to any systems and/or equipment provided by other trades
 - 4. Review and finalize construction schedule and verify availability of materials, installation personnel, equipment, and any preparatory work by other trades needed to make progress and avoid delays.
 - 5. Review required start-up, testing, commissioning, and certifying procedures to be employed for each system and any impacts to other trades.
- D. For work on existing facilities, arrange, phase, and perform work to assure the operation of all communications systems for other buildings and contiguous spaces at all times. Refer to Division 01 specification section for additional information.
- E. All new work shall be installed and connected to existing work neatly and carefully. Disturbed or damaged work shall be replaced or repaired to its prior conditions, as required by Division 01 specification sections.
- F. Coordinate the installation of all cabling, conduits/raceways and cable trays and equipment with applicable trades to ensure proper operation and function of all integrated systems in accordance with all related specification sections. Refer to Division 01 specification section for additional project coordination requirements.
 - 1. Coordinate with all trades at the time of shop drawing submission detailing all space and/or room conditions. The contractor shall coordinate with the appropriate trade all conditions impacting the installation of any system, conduit or cable tray including but not limited to all equipment locations, site conditions, ceilings, lighting fixtures, fire protection piping and ductwork layouts to the satisfaction of all concerned trades, subject to final review by the Design Professional.
 - a. Coordinate exact location of all desktop/counter/wall mounted equipment with The Owner, the Design Professional, and all affected trades prior to the installation of any equipment and/or cabling.
 - b. Coordinate exact location(s) of all cable, conduits, equipment and/or devices installations with all architectural plans, site plans, reflected ceiling plans and affected trades prior to installation.
 - Equipment installations requiring coordination with other trades the contractor shall provide all templates, back- boxes and equipment anchor bolts for mounting or flush mounting preparation, (e.g., pedestals or other devices requiring mounting on walls, concrete pads, or other materials). Coordinate delivery of templates and equipment anchor bolts to preclude any delay in the construction schedule or the work of the affected trade.

- c. If installation of equipment, devices, cabling, raceways, cable trays and/or conduit is performed prior to coordination with other trades, which interferes with work of other trades or operation and maintenance of the facility, make necessary changes to correct the condition at no additional cost to The Owner.
- d. Prior to the final programming of any systems review with The Owner and the Design Professional all system features, functions, system operations, network mapping, system integrated responses and all related programming as required for the proper operation of the respective communications systems.
- **3.3** The Contractor shall maintain a complete set of current and up to date set of shop drawings and equipment submissions at the job site at all times. The Shop drawings and all other submissions shall be marked up to reflect all as-built conditions and shall be made available for review by the Design Professional at request.

3.4 EQUIPMENT INSTALLATION AND REQUIREMENTS

- A. All system equipment installations shall be in accordance with good engineering practices, NEC, local building codes, and all manufacturer's requirements. Cable terminations at all equipment locations shall comply with all state and local electrical codes. All wiring shall test free from all grounds, shorts, stray voltages and EMI.
- B. Follow manufacturers' instructions for installing components and adjusting all equipment and cabling. Submit one (1) copy of such instructions to The Owner and the Design Professional before installing any equipment. Provide an additional copy of such instructions at the equipment during any work on the equipment. Where no instructions are included with the equipment, follow accepted industry practices and workmanlike installation standards.
- C. Equipment location shall be as close as practical to locations as indicated on the contract drawings.
 - 1. Provide all equipment clearances in accordance with NEC requirements. Arrange equipment to facilitate unrestricted access for maintenance and service around all equipment, components and/or cable terminations.
- D. Inaccessible Equipment:
 - 1. Where The Owner and the Design Professional determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, the equipment shall be removed and reinstalled as directed at no additional cost to the project.
 - a. "Conveniently accessible" is defined as being capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as, but not limited to, motors, pumps, belt guards, transformers, piping, ductwork, conduit, and raceways.

3.5 COMMUNICATIONS CABLING REQUIREMENTS

- A. Cabling shall be sized to support the appropriate communication system. All communications cable installations shall be in accordance with good engineering practices as established by IEEE, and NEC. All cabling shall meet all state and local electrical codes.
 - 1. Contractors shall have the option to combine all cable home runs and conductors of same type and voltage "class" in accordance with NEC requirements unless specified elsewhere. Size all conduits and install all conductors in accordance with NEC requirements and manufacturers recommendations.
 - a. All communications cabling located above inaccessible ceilings, exposed ceilings, areas outside of tenant spaces shall be installed in conduit and routed to nearest cable tray or J-hook system in accessible ceiling areas.
 - b. All conduit shall run parallel and perpendicular to building column lines.
 - c. Cabling installed above hard ceiling spaces shall be installed in dedicated conduits.

- d. No exposed cabling will be acceptable in finished or occupied spaces of the facility without approval by The Owner and the Design Professional.
- e. Any communications system cabling installed exterior to the building and/or all cabling being routed from the facility to any remote location external to the project location shall utilize OSP rated fiber optic cable installed in conduit system.
- 2. Do not install bruised, kinked, scored, deformed, abraded or otherwise damaged cable. Do not splice cable between indicated terminations, taps, or junction points. Remove and discard cable where damaged during installation and replace it with new cable.
- 3. Ensure that all communications cabling supports (conduits, support grips, cable trays and cable termination panels) are fully installed before proceeding with cable installation.
- 4. At no time shall any cables be installed and left unsupported, nor shall cables be tiewrapped to any other supporting structure in lieu of specified cable supports. Do not tiewrap or permanently affix cable bundles to approved cable supports.
 - a. NOTE: Cable bundles shall not be cinched too tightly; all cable ties shall be hookand-loop ("Velcro") tie-wraps only.
- 5. The Contractor shall not permit any communications cabling to lie unprotected on the floor at any time. If cables must be left on any floor, protect the cables so that they may not be walked on or have any material or equipment placed or rolled on top. Replace all damaged cables from demarcation to termination point; no splicing of damaged cables shall be permitted.
- 6. Maintain manufacturers recommended minimum bend radii of all cabling. Do not stretch, stress, tightly coil, bend or crimp cables. The Contractor shall keep all cabling out of the way of other trades during staging of any work. The contractor at the contractor's expense will replace all severely stressed or damaged cables, equipment, and materials as determined by the Owner and the Design Professional.
- 7. The maximum allowable horizontal cable length is 295 feet. This maximum allowable length does not include an allowance for the length of 16 feet to the workstation equipment. The maximum allowable length does not include an allowance for the length of 16 feet in the horizontal cross-connect.
- B. Unshielded Twisted Pair (UTP) Cable
 - 1. Refer to specification section 271100 for material.
 - 2. All data TCP/IP based copper network cabling shall be concealed above suspended ceilings, bundled, and independently supported to the building structure. All cabling bundles shall be plenum rated and shall not contain any AC carrying conductors or non-associated network cables.
 - a. All cabling shall be terminated onto termination blocks.
 - b. Copper station cabling may be run outside of conduits and above suspended ceilings only between the cable tray and the conduit wall stub-up.
 - c. All horizontal and backbone cable installed above accessible ceilings shall be installed on J-hooks, cable trays, dedicated conduits, or in cable chases and/or a combination thereof as indicated contract drawing or specified. In no case shall cable be supported on ceiling tiles, T-bars, or tie-wrapped to any conduit or pipes.
 - 1) Cables shall not be cinched too tightly; cable ties shall be VELCRO type tiewraps only. Plastic wire ties shall not be accepted on any cabling.
 - 2) Horizontal network cabling shall not exceed a maximum distance of 295 feet from the associated communications room termination point to the furthermost work area outlet termination point.
 - 3) Cable Support: Properly secure independently to the permanent building structure where not installed in raceway. Provide J-hooks at regular intervals appropriate to the cable and wire size. See drawing details for spacing requirements.
 - 4) Cables shall not lay loose on ceiling tiles or grids. Cables must be supported in all areas. Bridle rings and tie-wrapped supporting methods are not acceptable.

- 5) Install all cabling parallel to building lines and follow building structure. Use cable support equipment/hardware recommended by the manufacturer and/or as herein specified.
- 6) Provide all terminations, cross-connects, wire management, surge protectors, etc. For a complete and operational system.
- 7) Any copper data communications system cabling installed exterior to the building and/or all cabling being routed from the facility to any remote location external to the project location shall be outside rated (OSP), unless specified otherwise. Outside plant cable shall not extend more than fifty (50) feet into a building interior before terminating on surge protection and transitioning to indoor plenum cable.
- C. Environmental Conditions:
 - 1. Systems, components, devices materials and equipment shall be capable of withstanding the environmental conditions of the space without mechanical or electrical damage or degradation of operating capabilities or performance.
 - a. Interior, Controlled Environment: System components, installed in temperaturecontrolled interior environments shall be rated for continuous operation in ambient conditions of 2 to 50 deg C (36 to 122 deg F) dry bulb and 20 to 90 percent relative humidity, non-condensing and shall utilize NEMA 250, Type 1 enclosures.
 - Interior, Uncontrolled Environment: System components installed in nontemperature-controlled interior environments shall be rated for continuous operation in ambient conditions of -18 to 50 deg C (0 to 122 deg F) dry bulb and 20 to 90 percent relative humidity, non-condensing and shall utilize NEMA 250, Type 4X enclosures.
 - c. Exterior Environment: System components, conduits and back boxes installed in locations exposed to weather shall be rated for continuous operation in ambient conditions of -34 to 50 deg C (-30 to 122 deg F) dry bulb and 20 to 90 percent relative humidity, condensing. Rated for continuous operation where exposed to rain as specified in NEMA 250, winds up to 137 km/h (85 mph) and snow cover up to 610 mm (24 in) thick shall utilize NEMA 250, Type 4X enclosures.
 - d. Hazardous Environment: System components, conduits and back boxes located in areas where fire or explosion hazards may exist because of flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers shall be rated, listed, and installed according to NFPA 70.
 - e. Corrosive Environment: System components, conduits and back boxes subjected to corrosive fumes, vapors, and wind-driven salt spray in coastal zones, shall utilize NEMA 250, Type 4X enclosures.
 - f. Submersible Environment: System components, conduits and back-boxes subjected to prolonged submersion in water, shall utilize NEMA 250, Type 6P enclosures.
 - g. Areas where equipment and devices may be subject to damage by the general population shall be installed in vandal resistant enclosures; all fire alarm system and related devices shall be provided with wire guards.
 - h. Console: All console equipment shall, unless noted otherwise, be rated for continuous operation under ambient environmental conditions of 15.6 to 29.4 deg C (60 to 85 deg F) and a relative humidity of 20 to 80 percent.
- D. Conduits/Raceway/Cable Trays:
 - 1. Provide conduit and raceway systems for all communications networks as indicated below. Refer to all related specification sections for additional conduit and raceway information.
 - a. Accessible suspended ceilings: Provide conduit stub-up from each outlet location to space above ceiling. All conduit stub-up shall include nylon bushing at exposed edge of conduit for protection of all cabling.

- b. Exposed structure: Provide conduit run from each drop to a height of 12 feet to cable tray or J-hooks where provided.
- c. Vertical Wire runway shall be installed in dedicated conduits and shall be supported any/all risers between floors in closets or accessible locations; in no case shall any cable risers be unsupported.
- d. Cables entering all communications equipment rooms shall be supported with Cable tray from entrance to rack/cabinet location as indicated on the contract drawings and/or herein specified.
- e. Wire basket cable tray system shall be provided in all corridors as indicated on the contract drawings and installed as herein specified.
- 2. All conduits/raceways shall be concealed and shall be installed above accessible finished ceilings and/or in walls. Any conduits/raceways installed in areas requiring installation to be exposed, shall be installed tight to ceilings and at right angles to walls/building lines and shall not obstruct any access hatches, equipment service panels, lighting or other equipment and/or devices. No exposed conduits/raceways shall be installed without prior approval of The Owner and the Design Professional.
 - a. Where conduits cannot be concealed above ceilings or in walls and must be installed in finished or occupied areas of the building, all conduits shall be finished wire-mold type raceways or approved equal. Finished wire-mold type raceways shall not be installed without prior approval in writing by The Owner and the Design Professional.
 - b. Where any equipment and/or junction boxes are installed above non-accessible finished ceilings, the contractor shall provide access hatches listed for the intended application. Access hatches shall be located so that service access to the equipment and/or junction boxes is unimpeded.
 - 1) Access hatches shall not obstruct any equipment, service panels, lighting equipment, devices, or any architectural elements of the ceiling. At the time of submittals, the contractor shall submit all proposed access hatch locations for review by the Design Professional.
 - c. All conduits/raceways shall be supported in accordance with NEC requirements and shall be affixed in such a manner that tampering and/or removal without the use of specialized tools shall be prevented.
 - d. All conduits/raceways shall be installed in a manner that prevents tampering or removal when installed in areas exposed to the general population.
 - 1) Provide tamper-resistant installation utilizing "torx with peg" securityfastening devices for all conduits/raceways, equipment, devices, and appurtenances in all areas accessible to the general population and/or areas subjected to tampering or vandalism.
 - e. Interior raceways shall be a minimum of 1-1/4-inch unless otherwise noted. Exterior raceways shall be a minimum 1-1/4-inch. Any sub-grade raceways shall be a minimum 1-1/2-inch. Size all raceways and install conductors in accordance with NEC requirements. Fill ratio shall not exceed 40 percent for indoor or exterior raceways.
 - 1) EMT conduit with compression fittings and/or MC cabling may be utilized in all inaccessible ceiling areas unless otherwise restricted by code.
 - 2) Threaded Rigid metal conduit shall be used on all exterior applications, stubups and all interior areas where concealed conduit requirements cannot be met and are exposed to tampering or damage by the general population.
 - a) All areas considered being of high risk due to the nature of the occupancy or the need to protect and maintain the integrity of the cabling shall be installed in rigid threaded conduits.
 - f. Conduits shall be continuous. Conduit runs shall not exceed two (2) 90 degree bends and/or 100 feet without a pull/junction box.

- g. All conduits and pull/junction boxes shall be concealed in walls or ceilings unless otherwise noted.
- h. Conduits shall be connected to pull/junction boxes with set screw connectors and nylon screw on bushings.
- i. Conduit inside bend radius for 2" conduits or less shall be 6 times the internal diameter. Conduit inside bend radius for sizes over 2" shall be 10 times the internal diameter. The use of condulets (lb's) is prohibited.
- j. Pull/junction boxes shall not be used in lieu of a bend.
- k. Firestop all annular space around conduits at through-wall and through-floor penetrations match the rating of the penetrated wall and floor.
- I. Field coordinate installation and exact placement with all trades.
- m. Conduit expansion couplings shall be provided in all areas where expansion/contraction may occur to couple together two sections of a conduit run subject to longitudinal movement. The contractor shall refer to architectural drawings for exact locations of all building expansion joints. Conduit expansion couplings shall be consistent with the size the conduit being installed, shall be steel electrogalvanized, and shall meet all environmental and seismic conditions.
 - 1) Expansion couplings shall be weatherproof and approved for use indoors or outdoors without an external bonding jumper.
 - 2) Expansion couplings shall be UL Listed and approved for use in wet locations.
 - 3) Expansion couplings shall comply with UL 514B, CSA 22.2 No. 18 3-12, NEMA FB1.
- n. Exterior raceways: PVC schedule 40 conduit at the minimum shall be utilized in all underground applications unless otherwise specified by related specification sections. The conduit shall be buried at a minimum 36" below grade. Warning flagging tape shall be buried 12" below grade to indicate the conduit routing location. Refer to related specification sections for additional information.
 - All exterior conduits larger than 2" in diameter shall be provided with dedicated inner-duct conduit systems, segregated by network type (i.e. security, etc.) and shall include a minimum of one spare empty inner-duct per conduit.
 - 2) The Contractor shall have the option to utilize the same trench/routing location as other utilities. In no case shall any system conduits or duct banks be combined with other electrical utilities without providing the required separation between conduits as necessary to ensure the minimal transmission or conduction of any RF and/or EMI signals.
- o. Outlet Boxes: Shall be 5" x 5" x 2-7/8" deep with double gang mounting plate where required for all data outlet locations and single gang reducer plate for wall-mounted telephone locations.
 - 1) All outlet boxes shall be provided with single or dual gang device mud-rings flush to finished wall as required based on type and configuration of outlet and type of wall construction.
 - 2) Use deep masonry boxes at masonry construction. T-Bar hangers or other appropriate mounting hardware shall be utilized to support boxes mounted in the ceiling.
- 3. Cable Trays (Communications Rooms): Provide cable trays in all communications rooms and closets for routing horizontal and vertical distribution and backbone communications cables. All cable trays shall be constructed of aluminum with two side rails and 9" rung spacing. Cable tray shall be complete will all materials, miscellaneous hardware and all appurtenances required for a complete cable distribution and support system.

- a. All cable tray widths shall be sized according to the total number of cables to be supported within the various trays plus an additional 100% spare capacity for future expansion capability. At the minimum all cable trays installed in communications rooms and closets shall be a minimum of 12" wide by 1.25" deep, unless otherwise noted.
- b. Install cable tray in a manner ensuring that all circuits fully comply with all ANSI/TIA standards.
 - 1) Maintain a minimum clearance of 24" between top of cable tray and ceiling structure or other equipment or raceway.
 - 2) Maintain a minimum clearance of 12" between bottom of cable tray and top ceiling grid or other equipment or raceway.
 - 3) Maintain a minimum clearance of 24" from all conduits or cables used for electrical power distribution.
 - 4) Maintain a minimum clearance of 12" between bottom of cable tray and top of equipment racks and/or cabinets.
 - 5) Maintain a minimum clearance of 24" from fluorescent lighting. All Pathways shall cross perpendicular to fluorescent lighting and electrical power cables or conduits.
 - 6) Cable tray supports shall be attached to the structural ceiling or walls with hardware or other installation and support aids specifically designed for the cable tray and designed to support the cable tray's weight and required cable weight and volume.
 - 7) Do not attach cable tray supports to ceiling support system or other mechanical support systems.
 - 8) Load span criteria: Install tray supports in accordance with the load criteria of L/240.
 - 9) Cable Trays shall be supported at 5-foot intervals.
 - 10) All Cable trays shall be installed without burrs, sharp edges, or projections, which may damage cable insulation.
 - 11) All lengths or sections of cable tray shall be bonded and grounded in accordance with NEC, TIA, IEEE.
- c. Follow manufacturers' instructions for installing components and adjusting all equipment and cabling. Submit two (2) copies of such instructions to the Architect before installing any equipment. Provide a copy of such instructions at the equipment during any work on the equipment. Where no instructions are included with the equipment, follow accepted industry practices and workmanlike installation standards.
- E. Penetrations of Walls and Floors:
 - 1. All wall/floor penetrations are to be sleeved and fire stopped with approved fire stopping material or sealant as applicable for the type of penetration. Coordinate all cable and conduit penetrations of building with all affected trades. Refer to all related specification sections for additional wall/floor penetration requirements.
 - a. All penetrations of rated walls and floors shall be firestopped in accordance with the ASTM and NFPA standards. Refer to related specification sections for additional information.
 - b. Floor penetrations shall be sleeved with a minimum sleeve diameter of 4 inches. An additional penetration shall be provided for future use, sleeved and capped and fire stopped as required.
 - c. Coordinate size of wall penetration with conduit size, number of conductors. Comply with all NEC requirements.
 - d. The fire rating of all penetrated walls, floors, and ceiling structures shall be strictly maintained. All penetrations shall be firestopped and sealed by the Contractor.
 - e. Install firestopping in open penetrations and in the annular space of penetrations for fire-rated barriers.

- f. Installation of firestops shall be performed by an applicator/installer qualified and trained by the manufacturer. Installation shall be performed in strict accordance with manufacturer's detailed installation procedures.
- g. Installation of all firestopping shall be in accordance with fire test reports, fire resistance requirements, acceptable sample installations, manufacturer's recommendations, local fire and building authorities, and applicable codes and shall be installed in a manner acceptable to the authority having jurisdiction.

3.6 ELECTRICAL POWER DISTRIBUTION

- A. Refer to division 26 contract documents for circuiting information.
- B. Refer to specification section 271100 for UPS and PDU material.

3.7 TRANSIENT VOLTAGE SUPPRESSION

- A. Transient Voltage Surge Suppression: All cables and conductors extending beyond building façade, except nonconductive fiber optic cables, which serve as communications, control, or signaling circuits shall be protected against Transient Voltage surges and have Transient Voltage Surge Suppression (TVSS) protection.
 - 1. The TVSS device shall be UL listed in accordance with Standard TIA 497B installed at each end. Lighting and surge suppression shall be a multi-strike variety and include a fault indicator.
 - 2. Protection shall be furnished at the equipment and additional triple solid state surge protectors rated for the application on each wire line circuit shall be installed within 914.4 mm (3 ft) of the building cable entrance. Fuses shall not be acceptable for surge protection applications. All inputs and outputs shall be tested in both normal mode and common mode to verify there is no interference at the minimum surge suppression test shall meet the following criteria.
 - a. All system power supplies serving exterior system components or devices shall be provided with the appropriate transient surge suppression protection on both the line side as well as the load side.
 - 1) A 10-microsecond rise time by 1000 microsecond pulse width waveform with a peak voltage of 1500 volts and a peak current of 60 amperes shall be the minimum performance requirements. Provide surge suppression in accordance with all manufacturers' requirements.
 - 2) An 8-microsecond rise time by 20-microsecond pulse width waveform with a peak voltage of 1000 volts and a peak current of 500 amperes shall be the minimum performance requirements. Provide surge suppression in accordance with all manufacturers' requirements.
 - 3) Maximum series current: 2 AMPS. Provide units manufactured by Advanced Protection Technologies, model # TE/FA 10B or TE/FA 20B or approved equal.
 - 4) Operating Temperature and Humidity: -40 to 85 degrees C (-40 to 185 degrees) shall be the minimum performance requirements. Provide surge suppression in accordance with all manufacturers' requirements.

3.8 GROUNDING AND BONDING

- A. All electronic equipment, conduits, cable trays, racks/cabinets and cable shields shall be properly grounded and bonded in accordance with all requirements of TIA 607-A, NEC 250 and IEEE 1100. Where identified as applicable to the project, all equipment grounding and bonding shall be in accordance with all related specification sections and Motorola R56 Standards and Guidelines for Communications Sites.
 - A Telecommunications Grounding System shall be installed in all communications equipment rooms. Grounding system shall provide equalization of the grounding potentials between the building power system and the telecommunications primary bonding bus-bar (PBB) as well as all telecommunications secondary bonding bus-bars (SBB). Grounding bus-bar shall provide the diversion of electrical transients from the telecommunications

cables and to provide a safety ground for all equipment racks/cabinets, conduits, cable trays and cable shields as well as providing the required coupling to cancel and/or reduce transients.

- a. The PBB and each SBB shall be provided where indicated on the drawings and shall provide an effective bonding connection to the nearest approved building grounding electrode (e.g., structural steel) as well as to the local power distribution panel grounding system (e.g., ac branch circuit panel board's equipment grounding busbar).
 - 1) The minimum bonding shall be #6 AWG copper conductor connected to the PBB and all SBB's. Connections shall be 2-hole NEMA type compression or exothermic welded connections.
- 2. All grounding connections shall provide the equalization of all grounding potentials between the building power system and the grounding terminations at the communications equipment in order to provide the diversion of electrical transients as well as providing the necessary coupling in order to cancel and/or reduce any voltage transients.
 - Equipment Grounding: Metallic structures, equipment racks, cabinets, and enclosures as well as all raceways, cable trays, junction boxes, outlet boxes, machine frames, and other conductive items shall be bonded and grounded.
 - b. Duct Banks and Manholes: Provide an insulated equipment grounding conductor in each duct containing any voltage conductors, sized per NEC except that minimum size shall be No. 2 AWG. Bond the equipment grounding conductors to the grounding bus, to all manhole hardware and ground rods, to the cable shielding grounding provisions for all cable splices, terminations, and equipment enclosures.
 - c. Metallic Fences equipped with communications equipment: Fences shall be grounded with a ground rod at each fixed gate post and at each corner post.
 - Drive ground rods until the top is 300 mm (12 inches) below grade. Attach a No. 4 AWG copper conductor, by exothermic weld to the ground rods and extend underground to the immediate vicinity of fence post. Lace the conductor vertically into 300 mm (12 inches) of fence mesh and fasten by two approved bronze compression fittings, one to bond wire to post and the other to bond wire to fence.
 - 2) Each gate section shall be bonded to its gatepost by a 3 by 25 mm (1/8 by one inch) flexible braided copper strap and ground post clamps. Clamps shall be of the anti- electrolysis type.
- 3. All connections of grounding conductors to ground rods, bus bars, rebar, structural members, pipes, and fences, as well as splices of any ground conductors, shall be made by exothermic welds except where otherwise noted. All connections to bar lugs shall be exothermic weld or compression type connections. Bolted type connection of ground conductors may only be made where terminal lugs or blocks have been furnished and installed in equipment by the manufacturer.
 - a. Equipment grounding conductors shall be insulated stranded copper, except for sizes No. 10 AWG and smaller shall be solid copper. Insulation color shall be continuous green for all equipment grounding conductors, except that wire sizes No. 4 AWG and larger shall be green, or have permanent green marking at all accessible locations (e.g. not in conduit).
 - At the minimum bonding connection shall be a #6 AWG copper conductor. All grounding shall provide an effective bonding connection between the protected equipment to the nearest approved building grounding electrode (structural steel) as well as to the local power distribution panel grounding system (e.g., ac branch circuit panel board's equipment grounding busbar). All bonding and grounding connections shall be NEMA type compression or exothermic welded connections.

4. Refer to related specification sections for any additional grounding and bonding requirements.

3.9 EQUIPMENT IDENTIFICATION

- A. Identify all system controls, components and equipment cabinets using plastic laminate engraved ("limacoid") labels or approved equal. Firmly affix to the panel, device and/or component. Refer to all related specification sections for additional information.
 - 1. Nameplates shall be laminated black phenolic resin with a white core with engraved lettering, a minimum of 6 mm (1/4 inch) high. Secure nameplates with screws. Nameplates that are furnished by manufacturer as a standard catalog item or where other method of identification is herein specified. Dymo or Kroy tape adhesive-backed lettering shall not be acceptable.
 - 2. Color-code all junction boxes and enclosures per NEC recommendations. At the minimum provide all communications junction boxes as follows:
 - a. Color for Data/Telecommunications circuits Yellow.
 - b. Color for Audio/Visual circuits White
 - c. Letter all pull boxes and junction boxes located in service areas, tunnels, above accessible ceilings, and pipe chases with laminated black phenolic resin with a white core with engraved lettering, a minimum of 6 mm (1/4 inch) high. Secure nameplates with screws.
 - 3. Permanently label all cabling at both ends with self-adhering plastic labels.
 - a. Labeling: hand-written labels are not acceptable. All labels shall be machine printed on clear or opaque tape, stenciled onto adhesive labels, or type written onto adhesive labels. The font shall be at least one-eighth inch (1/8") in height, block characters, and legible.
 - 1) The text shall be of a color contrasting with the label such that it may be easily read. If labeling tape is utilized, the width of the tape shall not exceed 3/8," and the font color shall contrast with the background.
 - 2) All data patch panels shall exhibit data drop numbers, in sequential order, for all workstations served by the associated network equipment.
 - 4. Provide typewritten circuit directories installed in 3-ring binders with transparent page protectors in each control and sub control cabinet and/or equipment rack.

3.10 WARRANTY

- A. Warrant material and workmanship for a period as specified in Division 1 of the contract documents and all related specification sections. The warranty period shall commence from the date the Contactor received written notification of final acceptance from the Owner's Representative. At the minimum the contractor shall provide warranty provisions:
 - 1. Warrant the replacement of defective components/materials and/or correct defective work when given notice by the Owner's Representative during the warranty period.
 - At no time is the contractor to use the extra materials provided under the scope of this project to replace malfunctioning or damaged equipment and or components. The Contractor shall replace all malfunctioning or damaged equipment and or components with new. The repair and then reinstallation of malfunctioning or damaged equipment shall not be acceptable.
 - 2. Warranty excludes liability for consequential incidental, or special damages due to vandalism, misuse, or acts of God.
 - 3. On-site warranty response time by qualified technician shall be within 8 hours upon receipt of request from Owner.
 - 4. Warranty repairs shall be provided to the Owner at no cost. This shall include but not limited to replacement of all defective components/materials, all labor charges, all travel costs, and all vehicle charges.
 - 5. Response time shall be 7 days a week / 24 hours a day / 365 days a Year.

- 6. Provide test, inspection, and service of each system on a semi-annual basis at six month intervals.
- 7. Contractor must provide verification that they maintain their principle base of operation along with the personnel that will be responsible for providing service within 3 hours driving time to the project site. This tenet of the warranty shall remain in effect for the life of the warranty.
- 8. All TCP/IP based communications systems cabling, and related appurtenances shall be provided with the manufacturers 25 year extended warranty in addition to all requirements above.
- B. The Contractor shall, as a condition of final payment, execute a written warranty certifying all contract requirements have been completed according to all requirements of the Contract Documents.
 - 1. All system testing, commissioning, demonstration, and training shall be performed prior to final system acceptance. All defects or damages due to faulty materials or workmanship shall be replaced without delay, to the satisfaction of the Owner's Representative, at the Contractor's expense.
 - a. The contractor shall provide written documentation of test results and stating what was done to correct any deficiencies. The first inspection shall occur 90 calendar days after the acceptance date. The last inspection shall occur 30 calendar days prior to the end of the warranty.
 - b. The warranty period shall be extended until the last inspection and associated corrective actions are complete. Where any equipment and/or labor covered by Contractor's or manufacturer's warranty, has been replaced, due to failure, the warranty period for any replaced equipment or restored work shall be reinstated for a period equal to the original warranty period, and commencing with the date of completion of the replacement or restoration work.
 - 2. In the event any manufacturer customarily provides a warranty period greater than one (1) year, the Contractor's warranty shall be for the same duration for that component.

3.11 FIELD SERVICES AND TESTING

- A. Notify the Owner and the Design professional in writing, prior to the closing of any ceilings and ten (10) days advance of testing all system cabling to prevent delays in construction schedules.
 - 1. Test all cabling to confirm that no grounds, shorts, sneak currents, RFI and EMI conditions exist prior to start-up and commissioning of all, components, devices, equipment and/or systems.
 - a. Before requesting a final inspection, the contractor shall perform a series of end to end installation performance tests. The contractor shall submit for approval by the Project Engineer and Design Professional all test procedures to be employed, test result forms, and timetable for testing all fiber optic and structured copper wiring.
 - b. Acceptance of the simple test procedures discussed below is predicated on the contractor's use of the recommended products including but not limited to, fiber optic cable, category structured cable, cross-connect blocks, patch panels, and outlet devices specified and adherence to the inspection requirements and practices set forth. Acceptance of the completed installation will be evaluated in the context of each of these factors.
- B. Balanced Twisted Pair Cable Testing
 - 1. Minimum Test Parameter requirements for Category horizontal cabling.
 - a. Each wire/pair shall be tested at both ends for the following utilizing Contractor generated test results forms:
 - 1) Wire Map.
 - 2) Length.
 - 3) Insertion Loss.
 - 4) Near-end crosstalk (NEXT) loss.

- 5) Power sum near-end crosstalk (PSNEXT).
- 6) Equal-level far-end crosstalk (ELFEXT).
- 7) Power sum equal-level far-end crosstalk (PSELFEXT).
- 8) Return loss.
- 9) Propagation delay.
- 10) Delay Skew.
- 11) Power Sum ACR.
- b. All balanced twisted pair cable testing described herein shall exceed specified cabling transmission requirements of ANSI/TIA-568-C.
- 2. When errors are found, the source of each error shall be determined, corrected, and the cable re-tested. All defective components shall be replaced and retested. Defective components not corrected shall be reported to The Owner and the Design professional with explanations of the corrective actions attempted.
- 3. Test records shall be maintained using the approved test result forms. The form shall record closet number, riser pair number or outlet ID, outcome of test, indication of errors found (e.g., a, b, c, d, or e) cable length, re-test results after problem resolution and signature of the technician completing the tests.
- 4. Test results for each cable must be submitted with identification to match labels on all patch panel ports and 8 position modular jacks, and identification to match as- built drawings associated with that cable.
- 5. The Owner and the Design Professional shall observe and verify the accuracy of test results submitted.
- 6. Contractor shall submit both hardcopy printouts and electronic copy of all trace test results.
- D. Notify the Owner and the Design Professional in writing, ten (10) days advance of testing of all equipment and/or components to prevent delays in construction schedules.
 - 1. Perform all tests, as required, by authorities having jurisdiction throughout the facility.
 - 2. Test system for grounds to demonstrate that the ground resistance does not exceed the requirements of the National Electric Codes (NEC).
 - 3. Test all cabling to confirm that no grounds, shorts, sneak currents, RFI and EMI conditions exist prior to start-up and commissioning of all, components, devices, equipment and/or systems.
 - 4. Test all systems and components for proper function and operation; certify that all systems are in proper working operation in accordance with the Contract Documents prior to scheduling any system demonstrations.
 - 5. Testing of all communications systems shall be in the presence of The Owner and the Design Professional (if they so choose) as well as all appropriate representatives of the authorities having jurisdiction.
 - a. All completed communications systems shall be fully tested in accordance with all requirements of TIA. Upon completion of a successful testing, the contractor shall so certify in writing to The Owner and the Design Professional that all testing was completed, certified, and left in first-class operational condition, include all completed copper and fiber testing read-outs, certifications, and test reports.
 - b. The service of a competent, factory-trained engineer or technician authorized by the equipment manufacturer shall be provided to technically supervise installation and participate during initial system programming, start-up, final testing, assist in the final acceptance testing and demonstrations.
 - 6. Provide all testing, commissioning and certifications as specified by Division 01 and this specification section, as well as any manufacturer's recommendations or requirements.
- E. Tester Criteria
 - 1. General
 - a. Tester shall employ a modular platform with a minimum of a 2.0 Ghz processor.

- b. Tester shall be Level IV/V ETL Verified.
- c. Tester shall have a current calibration date. If testing will go past calibration date, contractor shall have tester re-calibrated.
- d. Tester shall be running current firmware.
- e. Tester will be capable of performing 1,2 & 3 jumper set reference. One jumper is recommended.
- f. Set reference shall be done with factory provided test reference cords (TRC's)
- 2. Manufacturers:
 - a. Softing WX4500
 - b. Fluke Versiv
 - c. Or equivalent
- 3. The field-test instrument shall be within a 12-month calibration period.
- 4. Certification tester
 - a. Accuracy
 - 1) Level IV/V accuracy in accordance with ANSI/TIA-1152-A
 - 2) Independent verification of accuracy shall be provided.
- 5. Permanent Link Adapters
 - a. RJ45 plug must meet the requirements for NEXT, FEXT and Return Loss in accordance with ANSI/TIA-568-C.2 Annex C
 - b. Contractor shall perform a successful set reference prior to the start of any project.
 - c. Twisted pair Category 5e, 6, 6A, cords are not permitted as their performance degrades with use and can cause false Return Loss failures.
- 6. Results Storage
 - a. Must be capable of storing > 5000 results for all measurements.
- 7. PC Software
 - a. eXport or LinkWare PC
- 8. Reporting:
 - a. Tester shall be capable of exporting raw data files in native format.

3.12 TRAINING

- A. In addition to all demonstration and training as specified by Division 01 specification section and all related Division 27 specification sections, system demonstrations and training shall be provided in accordance with all requirements of this section.
 - 1. Prior to acceptance of the work, the System Integrator shall demonstrate to The Owner and the Design Professional, all systems and sub-systems all features and functions of each system and shall instruct The Owner's Representatives in the proper operation, event sequences, programming and maintenance of all systems and sub-systems.
 - 2. The ICTI shall furnish the necessary trained personnel to perform all demonstrations and instructions and arrange to have the manufacturer's representatives present to assist with the demonstrations.
 - 3. Training time shall include, as a minimum, the total time determined by the sum of the times per system as specified in this and related specification sections, for performing the prescribed demonstrations/training. Refer to related specification sections for additional training requirements.
 - a. Allow a minimum of 16 hours' time for each system provided for performing the prescribed demonstrations/training.
 - 4. Provide operation, parts and maintenance manuals defining operation and troubleshooting methods of all systems and review with The Owner's User/Operators as part of training demonstrations.

- 5. Provide detailed video recordings in high quality digitally formatted media of all demonstration and training of all systems and system operations.
 - a. Utilize remote microphones as may be required to ensure high quality audio of the recorded demonstrations.
 - b. Permanently and professionally label all recorded materials and provide selfsealing plastic cases.
- B. Inspections
 - 1. At the completion of the project and prior to final acceptance of the Work, provide evidence of final inspections and approvals to The Owner and the Design Professional, in accordance with all requirements of the Contract Documents as well as required by the authorities having jurisdiction.

END OF SECTION

SECTION 271100

NETWORK COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 STIPULATIONS

- A. Project drawings and general provisions of the Contract, including but not limited to all; General and Supplementary Conditions, Division 01 Specification Sections and all stipulated Specification Sections shall apply to this and all related Division 27 specification sections.
- B. Related Sections:
 - 1. Division 07 Through-penetration Firestop Systems
 - 2. Division 26 Common Work Results for Electrical
 - 3. Division 26 Low Voltage Electrical Power Conductors and Cables
 - 4. Division 26 Grounding and Bonding for Electrical Systems
 - 5. Division 26 Hangers and Supports for Electrical Systems
 - Division 26 Raceways and Boxes for Electrical Systems
 - 7. Division 26 Identification for Electrical Systems
 - 8. Division 27 Common Work Elements for Communications Systems
 - 9. Division 27 Network Communications Systems
 - 10. Division 27 Audiovisual Systems
- C. Reference Symbols:
 - 1. All device symbols are defined by the appropriate symbol schedules. Because of the scale of the drawings, symbols are shown on drawings as close as possible to the mounting location.
 - a. Contractor shall coordinate exact locations with all architectural drawings, site plans, reflected ceiling plans, furniture plans, mechanical and electrical drawings as well as all affected trades prior to submittal of any shop drawings.
- D. Abbreviations:
 - 1. Refer to Specification Section 270500 for additional information.
- E. Definitions:
 - 1. Refer to Specification Section 270500 for additional information.

1.2 SUMMARY

- A. The intent of this specification is to establish a standard of quality, overall system configuration and equipment requirements for the installation of a new structured cabling system and audio/visual equipment in support of a facility TCP/IP network and specified Audio/Visual systems. The contractor shall be responsible for providing all installation, programming, commissioning, testing and certifications as necessary to provide a complete infrastructure to support all TCP/IP telecommunications networks in accordance with the Contract Drawings and/or as herein specified.
- B. All communications network cabling for TCP/IP-based Security systems as specified in Division 28 shall also meet the requirements of this section.
 - 1. The installation, performance, features, functions, software, and programming criteria as specified herein as well as all related specification sections have been designed to offer the maximum system efficiency, ease of operation, occupant safety and the protection of equipment as recommended by the Design Professional.
 - a. Any deviations from the specified criteria shall be documented, reviewed, and agreed to in writing by The Owner and the Design Professional prior to submission of bids. Refer to Division 01, Division 28, and all related Division 27 specification section for product substitutions.

- 2. It is the responsibility of the contractor to ensure that the installed system meets or exceeds every standard set forth in these specifications. The contractor shall provide all cabling, communications outlets, conduits, system components, termination equipment, racks/cabinets, emergency electrical power, software, programming, and all appurtenances as well as all necessary testing, commissioning and certifications as required to provide a complete and fully operational TCP/IP based network, whether such items are specifically included in this section or not.
- C. The contractor shall furnish all labor, equipment, materials, testing, commissioning, programming, and certification in connection with the installation of a complete premises communications network system as indicated on the drawings and as herein specified.
 - 1. The systems shall be complete with all equipment as indicated on the contract drawings and/or described herein.
 - a. The systems shall include at the minimum but not limited to the following:
 - 1) Plenum rated cabling.
 - 2) Conduit/Duct/Raceway/Cable Tray Systems
 - 3) Distribution/Termination Patch Panels
 - 4) Equipment Racks/Cabinets
 - 5) Communications Outlets/Jacks
 - 6) Equipment bonding and grounding.
- D. The contractor and all sub-contractors for this work shall have read all the General Conditions, Special Requirements, General Requirements and all applicable related specification sections and in the execution of all work shall be bound by all of the conditions and requirements therein.
- E. Prior to the submission of the Bid, any discrepancies or inconsistencies noted within these specifications and/or the project drawings shall be brought to the immediate attention of The Owner and the Design Professional.
 - 1. Project specifications and drawings may not deal individually with every component, control, device, or appurtenance, which may be required to produce the specified system configuration, and/or as necessary to meet the equipment and cabling requirements. Coordinate all integration requirements with The Owner and the Design Professional and all appropriate systems providers.
 - 2. Because of the scale of the drawings, symbols are shown on drawings as close as possible to the mounting location. The contractor shall coordinate the installation of all cabling, materials, equipment, devices, jacks, cable trays and conduits with all affected trades and document all coordination at the time of shop drawing submittals.
- F. This contractor shall assume total responsibility for coordinating all inter-building wiring, any common carrier provided network equipment, and/or The Owner provided equipment as it relates to the operation of these systems.

1.3 SCOPE OF WORK

- A. The contractor shall furnish all labor, equipment, materials, cabling, and the performance of all testing, commissioning, and certification in connection with the installation of a complete premises TCP/IP-based communications network structured cabling system and specified audio/visual systems in accordance with all requirements of the project drawings and/or as herein specified.
 - 1. Provide and install all equipment described herein, including, but not limited to all, jacks/outlets, Category 6A cabling, fiber optic cabling, coaxial cabling, patch panels, distribution hardware, and patch cables as well as all conduits, outlet boxes and appurtenances necessary to provide complete and fully operating network communications structured cabling system.

- 2. Provide and install all equipment described herein, including, but not limited to all, video displays, projectors, video signal encoders, audio equipment and video processing equipment.
- B. Communications Systems Design Requirements:
 - 1. Provide a complete operational communications network infrastructure including but not limited to all cabling, jacks, cabling distribution and termination components as indicated on the contract drawings and as herein specified.
 - a. All horizontal network connections shall utilize copper cabling and hardware for distribution to all control equipment as indicated on the contract drawings. All horizontal cabling shall be bundled and routed through the facility on "J" hooks sized to support the network cabling requirements and shall terminate on Category 6A patch panels in the communications rooms.
 - 1) NOTE: Cables shall not be cinched too tightly; cable ties at patch panel locations shall be hook-and-loop (VELCRO) type tie-wraps only. Plastic wire ties shall not be accepted on any cabling.
 - b. All communications cabling shall be terminated at both ends of the permanent link at all equipment locations, fiber optic, coaxial and patch panels.
 - c. The Contractor is responsible for the installation of the entire network communications infrastructure: including all workmanship, standards of quality, adherence to the contract documents, certification testing, as-built documentation, labeling, and final warranty in relationship to the performance and installation of the structured cabling systems in accordance with the contract drawings and/or as herein specified.

1.4 SUBMITTALS

A. Refer to Specification Section 270500 for additional information.

1.5 RECORD DOCUMENTS

A. Provide Owner with complete set of record drawings in accordance with the requirements of Section 270500.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Manufacturers listed as acceptable or equal shall not negate the contractor's responsibility for providing all systems in accordance with all functions and performance requirements of the Contract Documents.
- B. Where manufacturer and/or model numbers reference specific system components in this specification, it is to establish the performance requirements and quality of the systems and components only.
 - 1. It is in no way an inference that the referenced model numbers are the manufacturer's current product and are the only acceptable components for this project unless specifically referenced as "no substitutions."
 - 2. Contractor shall provide the manufacturers' most current product that shall meet and/or exceed the specified performance and features of all data, and telecommunications equipment and/or systems.
 - 3. Equivalent UL- listed equipment may be substituted for the approved manufacturers in accordance with all requirements of Division 01 specification section titled "Substitutions" and/or General Conditions to the Construction Contract and where approved equal is referenced in the specific specification section.
 - a. All substitutions shall comply with all requirements as specified in related specification sections and all system performance standards shall be maintained.

- b. The contractor shall stipulate at the time of submission of bid the following information impacted by such a substitution.
 - 1) Any and all extensions in time impacted by the substitution.
 - 2) Any changes to the architectural or structural elements to the project.
 - 3) Differences in operation and/or performance from intended system criteria.
- c. Failure to provide the required substitution information shall result in, without consideration, the immediate rejection of the substituted equipment and/or systems.
- C. Unless specified otherwise, the equipment furnished shall fall into six classes, and with the exception of Class 6, all of the material within a single class shall be the standard product of one manufacturer. Exceptions are noted as "Class Exempt." The six classes are as follows:
 - 1. CLASS ONE-A (1A): Category-6A and Category-3 UTP, and Category-6A F/UTP copper cables (both horizontal and backbone), Category-6A patch cords, blocking kits, interconnection devices, connectors, wiring blocks, patch panels, and telecommunications outlets. Refer to applicable specification paragraphs for acceptable product manufacturers.
 - a. Note: All material covered in "Class One-A" shall conform to all manufacturers' cable/component matching connectivity requirements for the connection of all communications outlets, patch panels and cabling appurtenances provided as part of this project.
 - b. Other cabling systems meeting the listed performance and warranty requirements will be considered following compliance with all substitution requirements in accordance with Division 1 specification section titled "Substitutions."
 - 2. CLASS TWO: Inner-duct systems. All material covered in "Class Two" shall be equal in quality and performance to that manufactured by Carlon, Eastern Wire+Conduit, Endot or approved equal.
 - 3. CLASS THREE: Equipment racks, Wire Management Systems and Cable Trays. All material covered in "Class Three" shall be equal in quality and performance to that manufactured by Commscope, Eaton (Formerly Cooper) B-Line, Chatsworth Products Inc., or approved equal.
 - 4. CLASS FOUR: Communications Equipment Cabinets and Wire Management Panels. All material covered in "Class Four" shall be manufactured by Commscope, Chatsworth Products Inc. or approved equal.
 - 5. CLASS FIVE: Velcro wire ties/cable wraps, storage rings, labels, "D" rings (metal only), nuts, bolts, screws, and other miscellaneous and hardware.
 - 6. CLASS SIX: Active network systems/Equipment/Hardware
- D. All equipment and peripheral devices shall be the standard product of a single manufacturer and shall display the manufacturer's name on each component.

2.2 COMMUNICATIONS NETWORK EQUIPMENT AND COMPONENTS

- A. Data Communications Outlets (Category 6A)
 - 1. Data Jacks/Faceplates: 4 pair, ANSI/TIA-568B pinning, Category 6A compliant.
 - Modular Outlet Jacks & Faceplates: Standard 8-position, RJ-45 style, un-keyed, designed for 4-pair, 100 ohm balanced unshielded twisted pair (UTP) cable, 26-22 AWG solid or stranded conductors.
 - 3. Acceptable manufacturers for this project shall be Commscope Uniprise or approved equal.
 - 4. Accessories: Category-6A Jacks include a translucent stuffer cap for wire retention and to permit visual inspection. Jacks shall have attached wiring instruction labels to permit either T568A or T568B wiring configurations.

- a. Modular Mounting Plates:
 - 1) Commscope
 - 2) All mounting plates shall be supplied with mounting screws, clear screw covers and paper labels, and color matched screw covers. White or Beige, matching electrical wall plate flush mounted with screws. Coordinate final color selection with architect.
 - 3) Plates shall be provided as 1-gang in both 2 and 4 port configurations.
- B. Category 6A Cable Data Network Communications
 - 1. Category 6A Cable shall be tested to a minimum of 500Mhz, plenum-rated (CMP):
 - a. Commscope: CS44P or approved equal
 - b. Category 6A cable color coding requirements shall be as follows:
 - 1) Data Blue
 - 2) Voice White
 - 2. Provide horizontal cabling connecting blocks in sufficient quantities to support all Category 6A cabling terminations as indicated on the contract drawings, plus 25% spare of both brackets and blocks.
 - a. UMS Bracket Black: Commscope 66572165-40 or approved equal.
 - b. 8 pair Ultim8 Highband Block: Commscope 64685060-08 or approved equal.
 - c. UMS Backboard Black: Commscope 66522083-19 or approved equal.
 - d. Provide Type 105 hinged label holder: Commscope 60892015-01 or approved equal.
 - 3. Patch Cables to be provided for testing only.

PART 3 – EXECUTION

3.1 EQUIPMENT PROTECTION

- A. Comply with all requirements of Specification Section 270500.
 - 1. Examine all physical and environmental conditions, equipment and device locations, auxiliary system connectivity requirements impacting the installation of all network systems and report any unsatisfactory conditions in writing to The Owner and the Design Professional.

3.2 WORK PERFORMANCE

- A. In addition to all requirements as specified by Specification Section 270500 the network communications systems shall also be provided in accordance with the following requirements:
 - 1. Prior to the final commissioning and/or programming of any network communications components, the Contractor shall conduct a review with The Owner and the Design Professional addressing all network integrations, programming, and related operational connectivity.
 - a. Failure to provide this review and get final sign-off prior to programming shall result in any costs related to changes requested by The Owner and the Design Professional as not being charged to the project.

3.3 EQUIPMENT/CABLE INSTALLATION AND REQUIREMENTS

- A. In addition to all requirements as specified by Specification Section 270500 the network communications systems shall also be provided in accordance with the following requirements:
 - 1. All system cabling shall be of the type, size and specification as required by all contract documents as well as stipulated by all codes and standards as specified by Specification Section 270500.
 - 2. All network communications cabling shall be installed in accordance with the requirements of Specification Section 270500. All network cabling bundles shall not contain any

AC carrying conductors or non-associated network communications cables within the cable raceways/conduits or cable bundles.

- a. In addition, all structured cabling associated with the installation of any network communications system shall comply with all requirements of TIA standards for the proper installation, termination, and testing of all fiber optic and UTP cabling.
- b. Contractor shall provide all equipment, components, devices, hardware, equipment racks\cabinets, patch panels and all appurtenances necessary to provide fully operational network communications systems utilizing a UTP cabling topography. Coordinate all structured cabling with all trades and contractors prior to shop drawing submission.

3.4 ELECTRICAL POWER DISTRIBUTION

- A. Comply with all requirements of Specification Section 270500.
 - 1. All system power supplies serving system components or devices on the exterior of the facility shall be provided with the appropriate transient surge and suppression protection on both the line side as well as the load side. Refer to specification section 27 05 00 for additional requirements.
 - 2. Installation of all equipment and devices that pertain to other work in the contract shall be closely coordinated with the appropriate trade contractors.

3.5 TRANSIENT VOLTAGE SUPPRESSION

A. Comply with all requirements of Specification Section 270500.

3.6 GROUNDING AND BONDING

A. Comply with all requirements of Specification Section 270500.

3.7 EQUIPMENT IDENTIFICATION

A. Comply with all requirements of Specification Section 270500.

3.8 MAINTENANCE & SERVICE

A. Comply with all requirements of Specification Section 270500.

3.9 WARRANTY

- A. Comply with all requirements of Specification Section 270500
- B. Provide all manufacturer's extended cable warranties based on matching wire to component compatibility requirements. All cable warranties shall be in effect for a period of not less than 20 years.
- C. The warranty must include the following statements regarding the cabling system:
 - 1. "That all communications networks have been certified and will support and conform to ANSI/TIA-568-C specifications covering any current or future application which supports transmission over a properly constructed and horizontal cabling system premises network which meets the channel and/or basic link performance as described in ANSI/TIA-568-C."
 - 2. "That all communications networks are free from defects in material or faulty workmanship."

3.10 FIELD SERVICES

A. Comply with all requirements of Specification Section 270500

3.11 TRAINING

- A. Comply with all requirements of Specification Section 270500.
- B. Documentation:
 - 1. Contractor shall provide documentation to include all test results and as-built drawings, test results shall be computer generated and shall include all trace reports indicating each pair tested in accordance with all requirements of Specification Section 270500.

- a. One Hard Copy shall also be provided to The Owner and the Design Professional. Software for viewing the test results shall also be provided in the soft copy package.
- C. Final Acceptance
 - 1. Acceptance of all network communications systems, by The Owner shall be based on the results of testing, functionality, and the receipt of documentation. The testing of all UTP cabling, fiber segments and all security and data network cables must meet the criteria established in Specification Sections 270500.
 - 2. The Contractor must demonstrate to The Owner and the Design Professional that 1000 Mbps data signals can be successfully transmitted, bi-directionally, from the communications room terminations to and from a minimum of 10% of individual data drops on each floor. 100% of data drop locations shall be tested. With regard to documentation, all required documentation shall be submitted to The Owner and the Design Professional.
- D. As-Built Documentation:
 - 1. Contractor shall provide clean copies of the technology drawings depicting all as-built conditions for all data drop locations, cable routing and identification, patch panel, data switch port terminations, component layouts and all information as required by Division 01 specification section.

END OF SECTION

SECTION 274100

AUDIOVISUAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Division 1 Specifications, General and Supplemental Requirements apply to this section with additions and modifications specified herein.
- B. Instructions to Bidders, Bidding Forms, Forms of Agreement between Owner and Contractor, Contract Award Date, Starting and Completion Dates, Conditions of the Contract, Insurance Requirements, and other Owner Requirements will be furnished separately by the Owner. These documents, as well as any addenda issued, shall form a part of these Specifications, and this Contractor shall consult them in detail for instructions pertaining to his work.
- C. Each trade contractor shall receive all drawings and specification sections issued as part of the overall bid package. All contractors are to receive, review, and coordinate all of their work as shown or referenced on the other trade documents. All work shown or referenced on the other trade documents shall be included as part of the overall project scope for that particular discipline and trade.
- D. All other Division 27 Specifications.

1.2 SUMMARY

- A. These specifications and accompanying drawings are intended to cover the furnishing of all labor, material, and equipment and superintendence of the Audiovisual (AV) Systems.
- B. It is the intent and purpose of this specification and accompanying drawings to cover and include each item, all materials, machinery, apparatus, and labor necessary to properly install, equip, adjust, and put into perfect operation the respective portions of the installations specified and to so interconnect the various items or sections of the work as to form a complete and properly operating whole.
- C. Any equipment, apparatus, machinery, material, and small items not mentioned in detail, and labor not hereinafter specifically mentioned, which may be found necessary to complete or perfect any portion of installation in a substantial manner, and in compliance with the requirements stated, implied, or intended in these specifications shall be furnished without extra cost. This shall include all materials, devices, or methods peculiar to the machinery, equipment, apparatus, or systems furnished and installed as part of the AV Systems work.
- D. Drawings and this Section outline the performance requirements of the AV system. The Drawings are diagrammatic in nature and are meant to convey the performance intent of the system. Contractor shall develop a solution for each portion of the AV system and submit detailed shop drawings and product datasheets to indicate the proposed approach.
- E. The following major system components may be specified under this section:
 - 1. Signal Switching Transport
 - 2. Controllers and Control Interfaces
 - 3. IP encoders, decoders, and network hardware to support AV systems.
 - 4. Signal Processing Systems
 - 5. Signal Recording and Storage
 - 6. Cabling and Connectors
 - 7. Racks and Connection Panels
 - 8. Displays
 - 9. Projectors and Projection Screens
 - 10. Collaboration Systems and Appliances
 - 11. Collaboration and Event Cameras
 - 12. Wireless Presentation System
 - 13. Wired and Wireless microphone system
 - 14. Loudspeakers
1.3 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Refer to Audiovisual drawings for equipment noted as furnished but not installed.

1.4 PRODUCTS INSTALLED BUT NOT FURNISHED UNDER THIS SECTION

- A. Products installed but not furnished includes all Owner Furnished Equipment (OFE) items which shall be configured and installed as part of a complete and working system as identified in the section summary.
- B. Refer to the 274100 Appendix A Audiovisual Systems Equipment list for equipment identified as OFE.
- C. All Owner Furnished Equipment, with the exception of Room PCs imaged with Owner's standard user desktop profile, shall be maintained as part of the labor portion of the system warrantee.
 - 1. Contractor shall assist in initial troubleshooting of Owner Furnished Equipment and if necessary, manage the equipment replacement process within the existing manufacturer warrantee period.
- D. New OFE Items
 - 1. Contractor shall take receipt of any new equipment procured by the Owner for this project, including Room PCs, Mini PCs, CATV Tuners, etc. as indicated in the Audiovisual Systems Equipment list.
 - a. If necessary for shop fabrication and testing, Contractor shall take receipt of equipment at Contractor's system staging location and transport the complete AV assemblies to the project site.

1.5 WORK NOT INCLUDED IN SCOPE

- A. Contractor shall coordinate with associated trades providing all work outside of this scope which may be necessary for a complete and working system.
- B. Work not included in scope includes:
 - 1. AV empty conduit, junction boxes, floor boxes, poke-thrus and other pathways for AV low voltage cabling unless otherwise specified in this section.
 - 2. Display in-wall boxes.
 - 3. Power receptacles supporting AV equipment.
 - 4. AV furniture including tables, lecterns, and credenzas.
 - 5. Table hatches or table connectivity enclosures
 - a. Contractor to coordinate and provide all hatch and enclosure faceplates, connectors, and cabling.
 - 6. Architectural or event lighting control interfaces
 - a. Contractor to coordinate and provide all cabling between AV and lighting controllers.
 - 7. Owner network horizontal cabling and ports between an AV device and the Owner's IDF/MDF/Network rack.
 - a. Contractor to coordinate and provide all patch cabling between Owner network drop termination points and AV devices including.
 - 1) Includes patch cabling run in glass front extrusions for use with room scheduling devices.
 - b. Contractor to coordinate and provide all network drops between AV devices or between an AV device and contractor provided network switch.

1.6 PRICE PROCEDURES

- A. Unit Pricing
 - 1. Contractor shall provide unit and system pricing as part of their bid submission and maintain unit pricing throughout the contract term.

1.7 LAWS, REGULATIONS AND CODES:

- A. Perform all work in strict compliance with all laws, regulations, and/or codes applying, including all Federal, State, and local codes and any other authority having jurisdiction. Wherever drawings or specifications conflict with such regulations they shall be made to conform, and approval of the Design Professional obtained on such changes as may be involved.
- B. All electrical and telecommunications work shall comply with the requirements of the National Electrical Code, latest accepted revision.

1.8 PERMITS, FEES, AND CERTIFICATES OF APPROVAL:

A. Unless stated otherwise in General Conditions or Division 1, obtain, and pay for all permits, fees, and licenses required, including those of utilities and Agencies. Provide copies to Design Professional in the quantity requested. "Fees" shall include connection charges construction costs, and other such charges by utility companies or service providers. Ascertain such charges during bidding period and include bid price.

1.9 REFERENCES

- A. The publications list below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.
- B. Specific reference in specifications to codes, rules, regulations, standards, manufacturer's instructions, or requirements of regulatory agencies shall mean the latest printed edition of each in effect at the date of contract unless the document is shown dated.
- C. Conflicts:
 - 1. Between referenced requirements: Comply with the one establishing the more stringent requirements.
 - 2. Between referenced requirements and contract documents: Comply with the one establishing the more stringent requirements.
- D. References:
 - 1. General: The system shall comply with all applicable codes, ordinances and standards as interpreted and enforced by the local authority having jurisdiction.
 - 2. Avixa (Audiovisual and Integrated Experience Association, previously InfoComm) standards including:
 - a. Display Image Size for 2D Content in Audiovisual Systems
 - b. Cable Labeling for Audiovisual Systems
 - c. Audio Coverage Uniformity in Listener Areas
 - d. Standard Guide for Audiovisual Systems Design and Coordination Processes
 - e. Projected Image System Contrast Ratio
 - f. Audiovisual Systems Energy Management
 - g. AV Systems Performance Verification
 - h. Audio, Video and Control Architectural Drawing Symbols Standard
 - i. Electronic Symbol Files Audio, Video and Control Architectural Drawing Symbols
 - 3. American Society for Testing and Materials (ASTM)
 - 4. ANSI standards including:
 - a. ANSI/TIA/EIA-568-B.1 Commercial Building Telecommunications Cabling Standard, Part 1: General Requirements
 - b. ANSI/TIA/EIA-568-B.3 Commercial Building Telecommunications Cabling Standard, Part 3: Optical Fiber Cabling Components Standard
 - c. ANSI/TIA/EIA-569-B Commercial Building Standard for Telecommunications Pathways and Spaces
 - d. ANSI/TIA/EIA-606-A The Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
 - e. J-STD-607-A Commercial Building Grounding and Bonding Requirements for Telecommunications

- f. ANSI/TIA/EIA-526-7 Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant
- g. ANSI/TIA/EIA-526-14A Measurement of Optical Power Loss of Installed Multimode Fiber Cable Plant
- 5. BICSI -- Telecommunications Distribution Methods Manual
- 6. BICSI -- Cabling Installation Manual
- 7. Underwriters Laboratories Listed, UL Certified
- 8. National Electrical Code Articles 770 and 800.
- 9. NFPA 780 2005 or newer.
- 10. RUS Standards (formerly REA)
- 11. Local State Uniform Fire Prevention and Building Code.
- 12. Local State Department of Labor Rules and Regulations
- 13. Local State Department of Health
- 14. Code of Federal Regulations (CFR) [Telecommunications] Title 47 Part 90
- 15. Code of Federal Regulations (CFR) [Telecommunications] Title 47 Part 15

1.10 DEFINITIONS

- A. The term "Furnish" shall mean to obtain and supply to the job site. The term "Install" shall generally mean to fix in position and connect for use. Where language indicates that one party or trade is to "install", and another is to "connect", the term "install" shall mean only to fix in position, and "connect" shall mean to make electrical connections. The term "Provide" shall mean to furnish and install.
- B. ANSI American National Standards Institute
- C. AV Audio / Visual, audiovisual, audio visual
- D. Avixa Audiovisual and Integrated Experience Association, formerly InfoComm
- E. HTML HyperText Markup Language
- F. IP Internet Protocol
- G. ISO International Organization for Standardization
- H. NEC National Electrical Code
- I. NEMA National Electrical Manufacturing Association
- J. SNMP Simple Network Management Protocol
- K. TCP Transmission Control Protocol
- L. TIA Telecommunications Industry Association
- M. UL Underwriters Laboratories
- N. VLAN Virtual Local Area Network
- O. VoIP Voice over Internet Protocol
- P. VPN Virtual Private Network

1.11 RECORD DRAWINGS:

- A. During construction keep an accurate record of all deviations of the work as shown on the drawings and that which is actually installed.
- B. Secure from the Design Professional a complete set of prints of the AV drawings and note changes thereon. Make a complete record in a neat and accurate manner, of all changes and revisions to original design which exist in completed work, in the file format originally received.
- C. The cost of furnishing above drawing files and preparing these record drawings shall be borne by the Contractor. When all revisions showing the work as finally installed are made, the corrected prints and drawings files shall be submitted for review and approval by the Design Professional.

D. Record drawings shall be delivered to Owner within 30 days after acceptance of completed project by Owner.

1.12 OPERATING INSTRUCTIONS:

- A. Provide to the Owner three bound copies of complete written instruction on the operation, care and maintenance of each piece of equipment and the installation as a whole. Include frequency of inspection, cleaning and adjusting and other attention as may be required in accordance with manufacturer's instructions. Material shall be manufacturer's brochures, catalog cuts, parts lists, wiring diagrams, etc. Also supply Owner with three complete sets of approved shop drawings.
- B. Furnish qualified personnel to instruct the Owner's personnel in the maintenance and operation of all equipment and systems. Instructing personnel shall remain on the job continuously during working hours until such instruction is complete, but not less than 16 hours.

1.13 PERFORMANCE REQUIREMENTS

- A. Provide a complete, fully functional installation of the AV System and associated components including:
 - 1. Engineering and installation services aligning to the published project schedule.
 - 2. Coordination with the Owner, Architect, Design Professionals, General Contractor and all associated trades.
 - 3. Creation, submission, and revision to the point of receiving approval of an AV Systems Submittals package.
 - 4. Equipment procurement.
 - 5. Equipment delivery to the site and removal of all trash.
 - 6. Provide all installation tools and materials necessary to complete all equipment installation tasks including ladders, scaffolding and lifts.
 - 7. Equipment installation.
 - 8. Systems setup, configuration, and commissioning.
 - 9. Systems demonstration to Owner and Design Professional.
 - 10. Remediation of any systems identified by Owner and Design Professional as not meeting published equipment specifications or the requirements as set out in this scope of work.
 - 11. As-built documentation.
 - 12. End User Training.
 - 13. AV Systems Warrantee.
- B. Provide all equipment accessories, manuals, mounting hardware, remotes and other ancillary pieces furnished by the manufacturer but not required for installation.
- C. Provide all AV low-voltage cabling, connectors, connector plates, patch bays and patch cables.
 - 1. Confirm cable types and verify required length of all installed and portable premanufactured cables and assemblies prior to order.
- D. Terminate and test all AV low-voltage field connections.
 - 1. Provide all connectorized plates, connectors, cable labels and plate labels.
 - 2. Confirm finish of all plates and labels with Design Professionals.
- E. Install and configure Owner Furnished Equipment.
- F. Confirm color selection of all exposed AV equipment with Owner prior to order.
- G. Confirm required openings, recesses, and mounting locations of all AV equipment to meet manufacturer requirements. Verify onsite prior to completion of wall framing and electrical rough-in.
- H. Contractor to include manufacturer onsite oversight labor including commissioning services and end user training for any systems which Contractor does not have staff with relevant manufacturer training and any available manufacturer certifications.
- I. Provision all video conferencing, wireless presentation and other collaboration hardware endpoints with Owner's network and collaboration system registration information.

- J. Coordinate AV equipment blocking requirements with the General Contractor prior to installing AV equipment.
 - 1. All wall or ceiling mounted equipment to be provided with hardware sized for a 5:1 safe working load limit.
 - 2. All ceiling mounted equipment to be provided with a safety cable or redundant support system attached to building structure and sized for the equipment by the equipment manufacturer.
- K. Install all AV rack hardware including rack bases and wall supports.
 - 1. Confirm that all AV rack locations will allow proper clearances.
 - 2. Coordinate with the General Contractor location of all AV rack power receptacles, data jacks, CATV jacks and empty AV low voltage junction boxes.
 - 3. Confirm sufficient heat exhaust and cooling systems have been provided to meet systems demand loads.
 - 4. Request of the General Contractor a normally-closed fire alarm mute contact for all event systems as identified in the Audiovisual Drawings.
 - 5. Provide rack hardware, cable management hardware and rack accessories as necessary to meet rack and equipment manufacturer recommended configurations.
- L. Provide all necessary copper and fiber patch cables for making all device interconnections. Patch cable type and color shall be coordinated with the structured cabling package to match project standards.
- M. Provide an AV equipment network coordination submittal for Owner completion. Configure all AV equipment with the confirmed network settings and test operation on the Owner network.
- N. Loudspeakers
 - 1. Coordinate location of all wall and ceiling speaker systems including location of low voltage and power infrastructure.
 - 2. Review all ceiling speaker mounting conditions and provide ceiling speakers with a tile bridge or other relevant manufacturer support system.
 - 3. Where indicated in the specification, paint all exposed speaker grills with a custom color as confirmed by Owner.
- O. Furniture
 - 1. Coordinate with furniture providers all AV equipment installation requirements including cutout sizes, connector/plate openings, wiring openings, raceways, methods of affixing cables and equipment.
 - a. All equipment and cabling shall be installed in a neat and professional manner with the intention of limiting visibility of supporting hardware and cabling.
 - b. All table cabling shall be secured to the table or hidden in a plinth, cloth wrap or articulating cable manager.
 - 2. For all technical furniture provided under this scope of work, coordinate equipment layouts, and finishes with Owner and Design Professional prior to ordering.
- P. Wireless Systems
 - 1. Coordinate wireless frequency selection based on a site survey and relevant government agency requirements. Address any wireless channel conflicts prior to equipment ordering.
 - a. For meeting or event space wireless microphone and in-ear monitor systems, provide the Owner with a system capable of adjusting wireless frequency as necessary to maintain reliable system operation in the installed environment.
 - 2. Coordinate placement of wireless antennas and provide antenna splitting, combining and amplification as necessary to operate within manufacturer required signal strength ranges.
- Q. Control Systems

- 1. Coordinate with the General Contractor the location of all external system interfaces including lighting, shades, occupancy, BMS as required.
 - a. Provide cabling between AV controllers and external system interfaces.
- 2. Provide custom AV control system code development as necessary to operate all AV equipment user controls per specification.
 - a. Manage a control interface confirmation process with Owner and Design Professional as outlined in the AV submittal requirements.
- 3. Configure all digital signal processors, content management systems, scheduling systems and other processor-based platforms to optimize to the spaces and systems being served.

1.14 QUALITY ASSURANCE

- A. Comply with the requirements of the following codes and/or standards:
 - 1. ANSI.
 - 2. ANSI.
 - 3. UL.
 - 4. NEMA.
 - 5. NFPA.
 - 6. NEC.
 - 7. IBC 2009.
 - 8. BICSI.
 - 9. ANSI/TIA 568-D Series.
 - 10. ANSI/TIA 569-E.
 - 11. ANSI/TIA 606-C.
 - 12. ANSI/TIA 607-D.
- B. All packaged equipment shall be independently Third Party labeled as a system for its intended use by a Nationally Recognized Testing Laboratory (NRTL) in accordance with the OSHA Federal Regulations 29CFR1910.303 and .399, as well as NFPA Pamphlet #70 and National Electric Code (NEC), Article 90-7.
- C. The contractor shall be certified by the manufacturer of the products, adhere to the engineering, installation and testing procedures, and utilize the authorized manufacturer components and distribution channels in provisioning this Project.
- D. All members of the installation team shall be certified by the manufacturer as having completed the necessary training to complete their part of the installation. Resumes of the entire team shall be provided along with documentation of completed training courses. Submit resume and copy of technician's license including:
 - 1. A Technical resume of the Contractor's Project Manager and Field Supervisor documenting a minimum of five (5) years of experience installing similar size projects.
 - 2. Matching documentation for any Sub-Contractor who will assist the Contractor in performance of this work.
- E. All hardware, software, firmware, and/or operating system requirements given are the minimum requirements. The Contractor's product shall meet or exceed these requirements. The product selected shall meet the operational, functional, and performance requirements specified herein. Additionally, due to the rapid advancement and antiquation of technology related products, the supplied product shall be the "contemporary technical equivalent" of that specified. "Contemporary technical equivalent" shall be based on a comparison of technology at the time of publication of specification to the technology at the time of the first product submittal. Final product approval is at the sole discretion of the Owner.
- F. Manufacturer: Where Contractor has the ability to select a preferred manufacturer for items not specifically covered in the Appendix A Audiovisual Systems Equipment list, the manufacturing company selected shall have a minimum of five years of experience in producing the products.

1.15 SUBMITTALS

- A. Contractor must receive approval from the Owner or Design Professional of a submittal before procuring equipment or performing services related to the submittal.
- B. All submittals shall be provided in electronic format.
 - 1. Provide one full size paper submittal if requested by Owner.
 - 2. Confirmation of the submittal schedule and submission format must be obtained by Owner prior to creating individual submissions.
- C. Revised submittals shall include clouding or other method to indicate revisions since the prior submission.
- D. Project Status Report
 - 1. A project status report shall be sent to the Owner and Design Professional weekly starting within two weeks of award. The project status report shall be used as the basis for Contractor coordination meetings and shall include:
 - a. Team member contact information
 - b. Project overall schedule
 - 1) Highlight changes to the schedule since last issuance.
 - 2) Identify critical schedule items.
 - 3) Identify opportunities to improve on the current schedule.
 - c. Action items from prior coordination meeting and status of each item
 - d. Installation schedule and status for each unique space or system in the project.
 - e. Outstanding Owner coordination items.
 - f. Outstanding Design Professional coordination items.
 - g. Change Order Status
 - h. Submittal Approval Status
- E. Within five business days of award, submit an installation schedule including major milestone dates for construction phasing based on overall project construction schedule (along with separate phases where applicable), system and device configuration, testing and training. Include the following milestones:
 - 1. Separate milestones for each submittal.
 - 2. Signage content and system configuration coordination session.
 - 3. Required date for receipt of all OFE equipment per project phase or equipment type.
 - 4. Required data for receipt of any Owner furnished signage content.
 - 5. AV project manager onsite.
 - 6. Delivery of all Furnished but not Installed equipment to site.
 - 7. Cable pulls start and complete.
 - 8. Mount and speaker installation start and complete
 - 9. Equipment installation start and complete
 - 10. Systems configuration and testing start and complete.
 - 11. Systems ready for checkout and punch list
 - 12. Owner training
 - 13. As-built submission
- F. Within 30 business days of award submit an AV infrastructure review memo confirming infrastructure shown on the AV, Architectural, Telecom, Mechanical and Electrical design packages meets AV equipment installation requirements or identifying specific adjustments necessary to support the specified AV equipment.
 - 1. Verify AV conduit sizing and pathways.
 - 2. Verify architectural recesses and ADA clearances.
 - 3. Verify data drops to support AV network connectivity.
 - 4. Verify AV power receptacles and multi-discipline shared services device requirements (inwall boxes, floor boxes, poke-thrus.
 - 5. Verify AV enclosure cooling/exhaust.

- 6. Verify ceiling device layouts and clearances, projector, and projection screen orientation.
- G. Qualifications: The Contractor shall submit qualification data sheets for firms and persons as specified in the "Quality Assurance: section of this specification to demonstrate their capabilities and experience.
- H. Submit proposed product data sheets: The Contractor shall submit catalogue cut-sheets that include manufacturer, trade name, and complete model number for each product specified or selected for use in the project.
 - 1. Model number shall be highlighted to indicate exact selection per system type.
 - 2. Product data sheets shall be organized with separate folders per system type with a master equipment list broken into three sections:
 - a. System types and quantities of systems
 - b. Equipment and equipment quantities per system type
 - c. Master project equipment list and quantities
 - 3. Confirm manufacturer master quote numbers and the accuracy of the master quotes against the specified equipment.
- I. Submit shop drawings detailing proposed system architecture and interconnectivity.
 - 1. All shop drawings sheets shall be sized to match the project architects drawing format.
 - 2. Shop drawings shall include the following drawing information.
 - a. Scaled floorplans indicating the area of work and room types.
 - b. Enlarged plans indicating equipment locations, mounting requirements, clearances, infrastructure requirements, and cable routing.
 - 1) Provide projector and projection screen throw distance calculations.
 - 2) Provide display elevations and sections.
 - 3) Identify any details which do not meet minimum ADA clearance requirements.
 - 4) Identify equipment centerline coordinated with furniture and main display wall.
 - c. Device details indicating mounting requirements for each unique equipment type in the project.
 - All overhead equipment details must identify the safe working load and manufacturer provided safety hardware. Where a custom mounting detail is required using fabricated components or components provided by multiple manufacturers a structural detail, reviewed and stamped by a Structural Engineer license in the project state, must be provided.
 - 2) Copies of manufacturer cut sheet details shall not be considered sufficiently coordinated.
 - d. Rack elevations and mounting details with clearances and infrastructure requirements
 - e. System flow diagrams with cable labels and corresponding cable schedule indicating wiring interconnections between all AV devices and Owner's network.
 - f. Wiring termination details.
 - 1) Include cable labelling standards and materials.
 - g. Panel details showing all prefabricated and custom connector panels, connector types, labels and required backbox.
 - h. Technical Furniture details indicating the location, required openings and cable management of all AV equipment in furniture and millwork regardless of what scope the furniture is provided under.
- J. Control Systems

- 1. Owner or Design Professional approval of all Control Systems submittals is required prior to installation. Failure to secure approval shall not be grounds for project schedule delay or Contractor change order.
- 2. Submit button panel layouts with labelling/engraving and sequence of operations.
- 3. Submit audio DSP configuration files.
- 4. Submit an initial and up to two revised set of touch panel user interface submittals.
 - a. Contractor shall lead a user interface review session with Owner and Design Professional prior to start of touch panel user interface design. Contractor shall provide up to three design samples in advance of the user interface session for Owner and Design Professional review.
 - b. User interface layouts shall follow the best practices laid out in the InfoComm Dashboard for Controls
 - c. The overall user interface design process shall reflect the current draft Avixa UX 701.01 *User Experience Design for AV* recommendations.
 - d. User interfaces shall include the following basic features:
 - 1) Control of all local AV equipment addressable parameters required during the specified use cases.
 - 2) Call controls, transport controls, source selection, volume controls as appropriate.
 - 3) Standard controls formatted to match industry standard applications (knobs, sliders, buttons, interactive menus, etc.)
 - 4) A password protected advanced section allowing for control of individual device parameters (power, channel level controls, input selection, etc.)
 - 5) Utilize stock manufacturer pages and capabilities where possible. Custom scripting shall be avoided unless where required as part of this specification.
- K. Network Coordination Submittal
 - 1. Submit a detailed list of all network enabled AV devices detailing:
 - a. MAC address
 - b. IP Address (for Owner to complete)
 - c. Subnet (for Owner to complete)
 - d. Wired and Wireless VLans
 - e. DHCP requirement
 - f. Unique network requirements including firewall exceptions, port forwarding and Qos
 - 2. Lead an AV network coordination session with the Owner and Design Professional to confirm overall project AV network requirements and set a schedule for completion and return of the Network Coordination Submittal by the Owner.
- L. Owner Training Plan
 - 1. Identify specific systems to be trained on and training durations.
 - 2. Identify required project stakeholders.
 - 3. Identify training status and provide training sign-off sheets.
 - 4. Provide training materials and user one-page operations sheets for each system types.
- M. Operations and Maintenance Manuals:
 - 1. This Section requires complete documentation of the AV System for the purpose of system operation and maintenance during and after the Warranty period. It is intended that the operation and maintenance manuals be exhaustive in the coverage of the system to the extent that they may be used as the sole guide to the troubleshooting, identification, and repair of defective parts. All documentation, as described here-in shall be submitted to the Owner for approval sixty (60) days prior to final submission.
 - 2. Scope: These manuals shall include basic wiring diagrams, schematics, and functional details such that any component, wire, or piece of equipment in the system may be easily

identified by going to the actual equipment and making reference to this manual. It is required that everything in the system be neatly labeled and easily identifiable. Every terminal, wire, component, or piece of equipment, and other such items shall have a number or letter designation. All of these identification characteristics shall be included in the maintenance and operation manuals.

- 3. The maintenance manual requirement of this Section is in addition to Shop Drawing requirements. Maintenance manuals and Drawing sets shall be compiled after system fabrication and testing and shall incorporate any changes made after Shop Drawing submittal. The maintenance manuals and drawing books shall be permanently bound in hard plastic covers.
- 4. Maintenance Manuals, Manufacturer's Literature: Provide manufacturer's standard literature, covering all equipment included in the system. The maintenance manuals shall contain specifications, adjustment procedures, circuit schematics, component location diagrams, and replacement parts identification. All references to equipment not supplied on this Project shall be crossed out.
- 5. System Administrator Documentation: This documentation shall provide complete information on the configuration, business rules, operation, maintenance, and trouble-shooting of the system.
- N. Testing Plan
 - 1. Submit a systems testing and verification plan for approval by Owner and Design Professional.
 - 2. The approved Testing Plan shall be completed and provided to the Owner and Design Professional prior to commencement of Owner testing and punch list efforts.
- O. As-Built Documentation
 - 1. Submit an updated version of all submittals revised to match installed conditions.
 - 2. Submit the native version of all drawing, control programming, digital signal processing and other systems configuration files.
- P. Warranty
 - 1. Within 30 business days of award, provide a summary of the systems warrantee including all optional services for final Owner confirmation.
 - 2. At time of as-built documentation submission provide two physical copies of the hardware and software warranty certifying that the final as-built installation is fully warranted by the manufacturer.

1.16 GENERAL WARRANTY

- A. The system warranty shall commence on the date of Substantial Completion unless otherwise provided for in the Contract.
- B. The system warranty shall be for an initial period of one year.
- C. Hardware Warranty:
 - 1. Contractor shall warrant that all components meet or exceed the specifications provided in the product data submittal.
 - 2. The Contractor shall warrant that the proposed merchandise will conform to its description and any applicable specifications and shall be of good quality for the known purpose for which it is intended.
 - 3. The warranty shall cover material and labor for the replacement or repair of defective products.
 - 4. Regardless of manufacturer warranties expiring before the full system warranty period, Contractor shall be responsible for extending any manufacturer warranties for the full length of the system warranty.
- D. Software Warranty:

- 1. The warranty shall allow for replacement or repair at the discretion of the Owner. All software necessary to compile, modify, and maintain software developed for this specification shall be included in this warranty.
- 2. The warranties shall include the price of all software upgrades during the warranty period. If a new version of the system software becomes available during the warranty period, it shall be upgraded as part of the warranty.

1.17 MAINTENANCE AND SUPPORT SERVICES

- A. Description of Work: During the warranty period provide customer service for subscriber issues Monday – Friday, 8am – 5pm local time. Provide quarterly system inspections, checks and updates during the warranty and maintenance period.
- B. Personnel: Service personnel shall be certified in the maintenance and repair of similar types of equipment and qualified to accomplish work promptly and satisfactorily. Service personnel shall hold a valid Airport security credential. The Owner or Owner's Designated Representative shall be advised in writing of the name of the designated service representative, and of any change in personnel.
- C. Schedule of Work: The Contractor shall perform quarterly inspections of the installed system. Inspections shall be in accordance with manufacturer and Contractor recommendations. The adjustment and repair of the system shall include visual checks of installed equipment and inspection of system health logs and software. Recommended software updates shall be applied on the system at these pre-defined quarterly periods.
- D. Scheduled Work: Scheduled work shall be performed during regular working hours, Monday through Friday, excluding holidays.
- E. Emergency Service: The Owner will initiate service calls when the system is not functioning properly. Qualified personnel shall be available to provide service to the complete system repair. The Owner shall be furnished with a telephone number where the service supervisor can be reached at all times. Service personnel shall be at site within 4 hours after receiving a request for service. The system shall be restored to proper operating condition within 8 hours after service personnel arrive onsite.
- F. Records and Logs: The Contractor shall keep records and logs of each task, and shall organize cumulative records for each component, and for the complete system chronologically. A continuous log shall be maintained for all devices. The log shall contain all initial settings. Complete logs shall be kept and shall be available for inspection on site, demonstrating that planned and systematic adjustments and repairs have been accomplished for the system.
- G. Work Requests: The Contractor shall separately record each service call request, as received. The form shall include the serial number identifying the component involved, its location, date and time the call was received, specific nature of trouble, names of service personnel assigned to the task, instructions describing what has to be done, the amount and nature of the material to be used, the time and date work started, and the time and date of completion. The Contractor shall deliver a record of the work performed within 5 days after work is accomplished.
- H. System Modifications: The Contractor shall make any recommendations for system modification in writing to the Owner. System modifications shall not be made without prior approval of the Owner. Any modifications made to the system shall be incorporated into the operation and maintenance manuals, and other documentation affected.

1.18 SERVICE LEVEL AGREEMENT (SLA)

A. The Contractor shall provide with the bid a firm fixed pricing option(s) to provide continued warranty service and maintenance of the system for additional years two and three. The SLA shall mirror that of the warranty and maintenance requirements during the warranty period as outlined in the Warranty and Maintenance articles above.

1.19 DELIVERY, STORAGE, AND HANDLING

A. Contractor shall coordinate secure storage onsite with the General Contractor and is responsible for the safe delivery, storage and handling of all equipment covered in this scope of work through substantial completion of the work.

1.20 PROJECT CONDITIONS

- A. Environmental Limitations: System components shall be equipped and rated for the environments where installed.
- B. Environmental Conditions: Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:
- C. Interior, Controlled Environment: System components shall be rated for continuous operation in ambient conditions of 2 to 40 deg C dry bulb and 20 to 90 percent relative humidity, noncondensing.
- D. Interior, Uncontrolled Environment: System components installed in non-air-conditioned interior environments shall be rated for continuous operation in ambient conditions of 0 to 122 deg F (minus 18 to plus 50 deg C) dry bulb and 20 to 90 percent relative humidity, noncondensing.
- E. Verify that field measurements are as shown on Drawings; no media, fiber, or copper, shall be installed in lengths surpassing Standards based length requirements.
- F. Wire and cable routing shown on Drawings is approximate unless dimensioned. Route wire and cable as required to meet Project conditions.
- G. Where wire and cable routing is not shown, and destination only is indicated, determine exact routing and lengths required. Record actual routing on as-builts for all conduit larger than one inch.

1.21 PROJECT COORDINATION

- A. Determine required separation between cable and other work.
- B. Coordinate cable routing to avoid interference with other work disciplines.
- C. Coordinate grounding and bonding with Section 270527 Contractor.
- D. Coordinate use of fiber optic cabling infrastructure with Section 271310 Contractor.
- E. Coordinate network configuration requirements with Section 272000 Contractor.

PART 2 - PRODUCTS

2.1 APPENDIX A – AUDIOVISUAL SYSTEMS EQUIPMENT LIST

- A. Refer to the attached 27 41 00 Appendix A Audiovisual Systems Equipment List for product information and manufacturer quotes.
- B. The Appendix A shall be used as the basis for Contractor pricing. A native excel version of the appendix shall be filled out by the Contractor and returned with the bid response.
- C. Contractor shall verify any existing manufacturer quotes, including those listed in the Appendix A, match the project requirements.
 - 1. Contractor shall be responsible for addressing any discrepancies between manufacturer quotes and project requirements.

2.2 SUBSTITUTIONS

- A. Any proposed alternate equipment choices should be requested in writing by the contractor prior to the proposal submission for approval. Each item on the alternate equipment list must be accompanied by catalog cut sheets and technical specifications.
- B. Any and all submissions of alternate equipment will be the financial responsibility of the company that submitted. This includes but is not limited to laboratory testing, equipment demonstrations, etc. The Owner shall not incur any costs in these tests. No substitution shall be allowed without written approval of the Owner or Design Professional.

PART 3 - EXECUTION

3.1 GENERAL

- A. Contractor shall install all system components including furnished equipment, and appurtenances in accordance with the manufacturer's instructions, and shall furnish all cables, connectors, terminators, interconnections, services, and adjustments required for a complete and operable system.
- B. Grounding shall be installed as necessary to preclude ground loops, noise, and surges from adversely affecting system operation.
- C. Contractor shall adhere to the following during installation of the system:
 - 1. Underwriters Laboratories (UL) listing for restricted access installations in business and customer premises applications. This listing is required by the National Electric Code for customer premise installations.
 - 2. Fire resistance requirements specified by Underwriters Laboratories in UL 1459, 2nd edition.
- D. Where undefined by codes and standards, Contractor shall apply a safe working load of at least five (5) times the rated load to all fastenings and supports of system components.
- E. The Contractor shall adhere to the installation schedule of the General Contractor and should attend all construction meetings scheduled by the General Contractor.
- F. Contractor shall place materials only in those locations that have been previously approved. Any other locations shall be approved, in writing, by the Owner.
- G. All wiring and cables shall be properly dressed and/or bundled with Velcro straps. Twisted wire, tape, rope, twine, phone wire and similar bits of debris usually available on site are not acceptable substitutes for proper securing hardware. All inter-rack cables and wiring must be properly routed, and where available, run in cable trays. Overhead cables must be easily removed or reworked within the cable trays. Proper care must be taken to ensure that new cables added to the trays are not stressed or intertwined with existing cables. Overhead cables may not cross perpendiculars or be suspended in mid-air without supports. No supports may be installed without prior approval from the Owner. All long cable runs must be properly identified at each end and every 100 feet indicating the carried frequency and communication room of origin. All cabling within the building must be cut to proper length.
- H. The Contractor shall obtain written permission from the Owner before proceeding with any work which requires cutting into or through any part of the building structures such as, but not limited to, girders, beams, concrete, carpeted or tiled floors, partitions or ceilings. The Contractor shall also consult with the General Contractor before cutting into or through any part of the building structures where fireproofing or moisture proofing could be impaired.

3.2 INSTALLATION

- A. System equipment shall not be installed until the environment is free of dust. A dust-free environment shall be considered one in which all construction work has been completed and the air handling system for the area has been operated continuously for at least two weeks with a filter change after one week. During and following installation of the system equipment, relay assemblies and equipment cabinets, the air handling system shall be kept operational continuously and shall be adjusted to maintain a positive pressure relative to building spaces outside the areas of installation. Openings into the installation spaces shall be kept closed, filters shall be changed at frequent intervals, equipment enclosures shall be kept closed, covers shall be installed and any other provisions for keeping the equipment, assemblies, and cabinets clean and free of dust and deliver shall be employed.
- B. Verify exact location and sizes of all conduit runs and back boxes prior to rough-in.
- C. All switches, connectors, outlets, etc. shall be clearly, logically, and permanently labeled during installation.

- D. All items of equipment related to the AV system shall be installed in the designated positions as defined on the drawings.
- E. All wiring terminations shall be trimmed to the required length for proper system operation and neatly dressed. No excess wire loops shall remain in the final system unless required for maintenance access. Each system wire and cable shall be clearly marked at each end.
- F. All audio and video interconnections shall use the highest quality signal path available.

3.3 WIRING

- A. Wiring within equipment enclosures shall be neatly grouped or tied or run in plastic snapcover wireway sections. All connections to panel mounted devices shall employ compression attached full 360° ring type or 'push-on' type terminators securely fastened to the device terminals. Wiring shall run behind the panel in a manner that is not visible from the operator's position. A 3" termination loop shall be formed immediately adjacent to each terminal.
- B. Terminal strips shall be fully insulated but allow insertion of test equipment probes. Each terminal segment shall be numbered to correspond with the drawings and conductor identification numbers.
- C. All wire and cable shall extend to each outlet location with complete electrical continuity and without any shorts or grounds. Cables shall run uninterrupted and un-spliced to each remote device.
- D. Cables shall be routed so as to maintain a separation of at least 2 feet from all heat sources and from ballasts, transformers, dimmers and all other sources of electromagnetic interference.
- E. Care shall be exercised during installation not to damage the cable insulation. Damaged cables shall be removed and replaced.
- F. Each cable termination shall be tagged and labeled.
- G. Wire color coding for all AV cabling shall be at the option of the Contractor, but each individual conductor shall be the same color throughout its entire length.
- H. After testing is complete, audio levels on all systems shall be set to levels satisfactory to the Owner.

3.4 SYSTEM CONFIGURATION

- A. Contractor shall provide for configuration of all devices and software into a complete and fully operational AV System.
 - 1. All configuration files shall be provided to the Owner as part of the close-out package.
 - a. Contractor shall maintain ownership of any custom software files.
 - b. Contractor shall extend to the Owner a perpetual license for use and modification of any custom software files when used with systems provided as part of this scope of work.
- B. During the installation phase of the project, the Contractor shall work with the Owner to establish the baseline configuration requirements for the different AV elements.

3.5 CONFIGURATION REQUIREMENTS

- A. An IP Addressing Plan shall be coordinated, developed, and finalized with the Owner and submitted for approval prior to implementation.
- B. VLAN(s) shall be configured to support the LAN and as identified during Owner network coordination efforts.
- C. Configure AV devices for centralized management via an Owner provided workstation connected to the network. Configuration and management software for the various network components shall be installed on the workstation. Training shall include management of the AV devices via the management workstation.

3.6 TESTING

- A. Project Testing: The overall Audio Visual Systems shall not be considered complete until On-Site Testing is completed. The purpose is to test the complete system and demonstrate that all specified features and performance criteria are met. All requirements of the specification shall be tested.
- B. Contractor shall follow the Avixa/ANSI 10:2013 *Audiovisual Systems Performance Verification* testing and documentation process and submit a completed testing plan prior to final Owner and Design Professional testing.
 - 1. Design Professional may elect to request retesting of individual rooms following the Avixa/ANSI 10:2013 standard until satisfied that systems are properly installed and configured.
- C. For any system or equipment types not covered in the Avixa/ANSI 10:2013 standard, Contractor shall provide the proposed test plan/procedures for each testing phase for review by the Owner or Design Professional. The test plan for each phase of testing shall detail the objectives of all tests. The tests shall clearly demonstrate that the system and its components fully comply with the requirements specified herein. The submission of Test Plans shall adhere to the following:
 - 1. A draft test plan shall be presented to the Owner at least forty-five (45) days prior to the scheduled start of each test.
 - 2. A workshop for reviewing comments shall be conducted with the Owner at least thirty (30) days prior to the scheduled start of each test.
 - 3. A final test plan shall be submitted to the Owner at least fourteen (14) days prior to the scheduled start of each test.
 - 4. Test plans shall contain at a minimum:
 - a. Functional procedures including use of any test or sample data.
 - b. Test equipment is to be identified by manufacturer and model.
 - c. Interconnection of test equipment and steps of operation shall be defined.
 - d. Expected results required to comply with specifications.
 - e. Testing matrix referencing Specification requirements with specific test procedures.
 - f. Record of test results with witness initials or signature and date performed.
 - g. Pass or fail evaluation with comments.
- D. The test procedures shall provide conformity to all Specification requirements. Satisfactory completion of the test procedure is necessary as a condition of system acceptance.
- E. All Test plans must be reviewed by the Owner. To successfully complete a test, the test document must be signed and dated by both the Contractor and the Owner.
- F. The Owner will review, witness and validate the execution of all formal test procedures prepared by the Contractor and deliverable under the contract to assure the tests cover all requirements and that there is a conformity between the conducted test, the test results and Specification requirements.
- G. Documentation verification both interconnects and operationally, shall be part of the test. Where documentation is not in accordance with the installed system interconnect and operating procedures, the system shall not be considered accepted until the system and documentation correlate.
- H. The Contractor shall provide the Owner or Owner representative the opportunity to participate in any or all of tests.
- I. Test Reports: The Contractor shall prepare, for each test, a test report document that shall certify successful completion of that test. Submit to the Owner's representative for review and acceptance within seven (7) days following each test. The test report shall contain, at a minimum:
 - 1. System power measurement results and settings
 - 2. Commentary on test results

- 3. A listing and discussion of all discrepancies between expected and actual results and of all failures encountered during the test and their resolution.
- 4. Complete copy of test procedures and test data sheets with annotations showing dates, times, initials, and any other annotations entered during execution of the test.
- 5. Signatures of persons who performed and witnessed the test.
- 6. Test Resolution: Any discrepancies or problems discovered during these tests shall be corrected by the Contractor at no cost to the Owner. The problems identified shall be corrected and the percentage of the entire system re-tested determined by the Owner before any subsequent testing is performed.

3.7 CLEANING

A. Remove all unnecessary tools and equipment, unused materials, packing materials, and debris from each area where work has been completed unless designated for storage.

3.8 TRAINING

- A. The contractor shall provide a minimum of four hours of onsite training per space type with Owner specified trainees. Training may be broken into two categories with dedicated sessions for each: technical and operational.
 - 1. Technical training includes Owner's technical or administrative staff and is intended to cover overall space functionality, infrastructure, individual equipment operation, preventative maintenance, and troubleshooting.
 - 2. Operational training includes Owner's users or day-to-day administrative staff and is intended to cover overall space functionality, a walkthrough of typical use cases and troubleshooting.
- B. As part of the Contractor shall provide the trainees with detailed as-built information. The training shall provide trainees with a working knowledge of the system design and layout, ability to configure and monitor the system, and troubleshooting methods and techniques. In addition, the training shall cover testing, maintenance, and repair procedures for all equipment and applications, which are provided under this Specification.
- C. Course materials shall be delivered to the Owner. Final delivery of the course materials shall include a master hard copy of all materials and an electronic copy in a format reviewed in advance by the Owner. The Contractor shall supply a video recording of each training course.
- D. All training shall be completed a minimum of two weeks prior to the system becoming operational and utilized by the Owner. Training schedule subject to the Owner's review.

3.9 ACCEPTANCE

- A. Acceptance will be withheld until the following have been completed successfully:
 - 1. Acceptance of all submittals
 - 2. Delivery of final documentation
 - 3. Successful testing
 - 4. Completion of training
 - 5. Demonstrate system to designated Owner personnel as required by applicable sections of these specifications. Use submitted operation and maintenance manual as reference during demonstration and training. Demonstrate as-built records are in format required and can lead troubleshooting technicians to port level of detail in field.

END OF SECTION

SECTION 280000

GENERAL REQUIREMENTS FOR SECURITY SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Division 01 Specifications, General and Supplemental Requirements apply to this section with additions and modifications specified herein.
- B. Instructions to Bidders, Bidding Forms, Forms of Agreement between Owner and Contractor, Contract Award Date, Starting and Completion Dates, Conditions of the Contract, Insurance Requirements, and other Owner Requirements will be furnished separately by the Owner. These documents, as well as any addenda issued, shall form a part of these Specifications, and this Contractor shall consult them in detail for instructions pertaining to his work.
- C. Each trade contractor shall receive all drawings and specification sections issued as part of the overall bid package. All contractors are to receive, review, and coordinate all of their work as shown or referenced on the other trade documents. All work shown or referenced on the other trade documents. All work shown or referenced on the other trade documents are to receive project scope for that particular discipline and trade.

RELATED SECTIONS

D. 280528 - Pathways for Security Systems

COMMISSIONING

E. Each contractor and vendor shall be part of a total building and system commissioning effort as conducted by the Commissioning Agent. Each contractor shall provide a technician and tools required to assist and facilitate the commissioning agent, as outlined by the commissioning plan. Full scope of work and all related responsibilities will be defined in Commissioning documentation.

1.4 SCOPE OF WORK:

- A. These specifications and accompanying drawings are intended to cover the furnishing of all labor, material, and equipment and superintendence of the Security System.
- B. It is the intent and purpose of these specifications and accompanying drawings to cover and include each item, all materials, machinery, apparatus, and labor necessary to properly install, equip, adjust, and put into perfect operation the respective portions of the installations specified and to so interconnect the various items or sections of the work as to form a complete and properly operating whole.
- C. Any equipment, apparatus, machinery, material and small items not mentioned in detail, and labor not hereinafter specifically mentioned, which may be found necessary to complete or perfect any portion of installation in a substantial manner, and in compliance with the requirements stated, implied or intended in these specifications shall be furnished without extra cost. This shall include all materials, devices or methods peculiar to the machinery, equipment, apparatus, or systems furnished and installed as part of the Security work.
- D. The term "Furnish" shall mean to obtain and supply to the job site. The term "Install" shall generally mean to fix in position and connect for use. Where language indicates that one party or trade is to "install" and another is to "connect", the term "install" shall mean only to fix in position, and "connect" shall mean to make electrical connections to. The term "Provide" shall mean to furnish and install.

1.5 LAWS, REGULATIONS AND CODES:

A. Perform all work in strict compliance with all laws, regulations, and/or codes applying, including all Federal, State and local codes and any other authority having jurisdiction. Wherever drawings or specifications conflict with such regulations they shall be made to conform, and approval of the Design Professional obtained on such changes as may be involved.

- B. All electrical and Security work shall comply with the requirements of the National Electrical Code, latest revision.
- C. The Security Systems contractor shall hold and maintain a valid license from the State Board of Examiners. Individuals employed by license holder must obtain a Certificate of Clearance prior to engaging in any work on the Project.

1.6 PERMITS, FEES, AND CERTIFICATES OF APPROVAL:

- A. Unless stated otherwise in General Conditions or Division 01, obtain and pay for all permits, fees, and licenses required, including those of utilities and Agencies. Provide copies to Design Professional in the quantity requested. "Fees" shall include connection charges construction costs, and other such charges by utility companies or service providers. Ascertain such charges during bidding period and include bid price.
- B. As a prerequisite to final acceptance, supply to the Design Professional a Certificate of Inspection from an Electrical Inspection Agency acceptable to the Owner and approved by the local municipality and the utility company serving the project. Certificate shall cover rough wiring, fixtures, and equipment.

1.7 RECORD DRAWINGS:

- A. During construction keep an accurate record of all deviations of the work as shown on the drawings and that which is actually installed.
- B. Secure from the Design Professional, a complete set of prints of the Security drawings and note changes thereon. Make a complete record in a neat and accurate manner, of all changes and revisions to original design which exist in completed work, in CAD file format.
- C. The contractor shall bear the cost of furnishing above CAD files and preparing these record drawings. When all revisions showing the work as finally installed are made, the corrected prints and CAD files shall be submitted for review and approval by the Design Professional.
- D. Record drawings shall be delivered to the Owner within 30 days after acceptance of completed project by Owner.

1.8 OPERATING INSTRUCTIONS:

- A. Provide to the Owner three bound copies of complete written instruction on the operation, care and maintenance of each piece of equipment and the installation as a whole. Include frequency of inspection, cleaning and adjusting and other attention as may be required in accordance with manufacturer's instructions. Material shall be manufacturer's brochures, catalog cuts, parts lists, wiring diagrams, etc. Additionally, supply Owner with three complete sets of approved shop drawings.
- B. Furnish qualified personnel to instruct the Owner's personnel in the maintenance and operation of all equipment and systems. Instructing personnel shall remain on the job continuously during working hours until such instruction is complete, but not less than 16 hours.
- C. In addition, refer to Division 01.

1.9 CORRECTION OF WORK AFTER FINAL PAYMENT AND GUARANTEE:

- A. This article is supplementary to Guarantee Provisions of Division 01 and General Conditions.
- B. Final payment shall not relieve the Contractor of responsibility for faulty equipment, materials, and workmanship, and unless otherwise specified, the contractor shall remedy any defects due thereto and pay for damage to other work resulting therefrom, which shall appear within a period of one (1) year from the date of acceptance.
- C. Include guarantees by the respective equipment manufacturers which shall be subject to the terms and time limits defined under this Article of Specifications.
- D. Guarantees furnished by Subcontractor and/or equipment manufacturers shall be countersigned by the related Prime Contractor for joint and/or individual responsibility for subject item.

E. Manufacturers' equipment guarantees or warranties extending beyond the guarantee period described herein shall be transferred to the Owner along with the Contractor's guarantees.

1.10 QUALITY ASSURANCE:

- A. Comply with the requirements of the following codes and/or standards:
 - 1. American National Standards Institute (ANSI)
 - 2. ASTM International (Formerly American Society for Testing and Materials)
 - 3. Underwriters Laboratories (UL)
 - 4. National Electrical Manufacturers Association (NEMA)
 - 5. National Fire Protection Association (NFPA)
 - 6. National Electric Code (NEC)
 - 7. International Building Code (IBC)
 - 8. Building Industry Consulting Services International (BICSI)
 - 9. ASTM/TIA 568-D Series.
 - 10. ASTM/TIA 569-E.
 - 11. ASTM/TIA 606-C.
 - 12. ASTM/TIA 607-D.
- B. All packaged equipment shall be independently third-party labeled as a system for its intended use by a Nationally Recognized Testing Laboratory (NRTL) in accordance with the OSHA Federal Regulations 29CFR1910.303 and .399, as well as NFPA Pamphlet #70 and National Electric Code (NEC), Article 90-7.

PART 2 - MATERIALS

2.1 MATERIALS AND EQUIPMENT:

- A. All installed materials and equipment shall be new and the best of their kind and shall conform to the grade, quality and standards specified herein.
- B. Unless otherwise specifically stated, all materials and equipment offered under these specifications shall be limited to products regularly produced and recommended by the manufacturer for the service intended. This material and equipment shall have capacities and ratings that are sufficient to meet the requirements of the project amply. The capacities and ratings shall be in accord with engineering data or other comprehensive literature made available to the public by the manufacturer and in effect at the time of opening of bids.
- C. Equipment shall be installed in accordance with manufacturer's instructions for type and quality of each piece of equipment used. These instructions shall be obtained from the manufacturer and shall be considered part of these specifications. Type, capacity and application of equipment shall be guaranteed suitable to operate satisfactorily. No experimental material or equipment shall be permitted.

2.2 WORK DESCRIPTION:

- A. In general, the work shall consist of but not necessarily be limited to the following:
 - 1. Install Owner's pre-purchased equipment as required.
 - 2. Rough in and make final connections to equipment furnished by Owner or by other Trades.
 - 3. Installation of pathways for access control and video surveillance systems and devices.

2.3 WORK INCLUDED:

- A. In addition to work described above under WORK DESCRIPTION, the work shall include but not necessarily be limited to the following:
 - 1. Rigging of equipment and materials related to the Security Work.
 - 2. Install all Security racks and cabinets, if applicable.
 - 3. Provide and install horizontal and vertical cable management.
 - 4. Miscellaneous steel and hangers required to support Security equipment and cabling.

2.4 CHASES AND OPENINGS:

A. Provide information to the appropriate trades regarding size and location of all openings and chases as required for the installation of this Security Work.

2.5 CUTTING AND PATCHING:

- A. Provide all cutting and patching required for work performed under this Contract. No holes may be cut or drilled in structural members without prior approval by General Contractor. Cutting shall be done by mechanics skilled in their respective trades.
- B. No cutting that may impair the strength of the building construction shall be done. No holes may be drilled in, or attachments welded to the beams or other structural members without prior approval from the General Contractor. All work shall be done by mechanics skilled in their trade.
- C. All patching shall be done in a manner to match appearances and quality of existing surfaces.
- D. Provide sleeves for conduits passing through poured concrete decks, footings, walls, etc. Cut all openings for conduits passing through precast concrete or existing concrete masonry. Such holes shall be cut with core drill or similar equipment. Sleeves shall not be cut with hammer or chisel, or with any power tool depending on impact for its cutting power.

2.6 SUBSTITUTIONS:

- A. Equipment may be shown or specified in several ways:
 - 1. Manufacturer and catalog or model number with the words "no substitutions," "no equal," "(manufacturer) only," or words of similar respect. Contractor shall furnish the specified item.
 - 2. Several manufacturers and model numbers listed; or one manufacturer and model number, followed by "equals by (mfr A), (mfr B), (mfr C)," or words of similar respect.
 - a. If one of the manufacturers is listed on the drawings, that manufacturer shall be considered the basis of design. If none is so listed, the first manufacturer named in the Specification shall be considered the basis of design.
 - b. Where manufacturer's or supplier's name, style and catalog numbers are mentioned in the description of material and equipment in the specifications or on the drawings, it is to be understood that they are for the purpose of setting a standard.
 - c. If Contractor elects to furnish equipment other than the basis of design, he shall verify capacities, physical size, weight, electrical requirements, methods of connection to other parts of the system, and all other relevant data.
 - d. Contractor shall be responsible for informing the Design Professional of all changes required to other equipment, spaces, structure or systems in order to install the substituted equipment. He shall furnish all required shop drawings or sketches required for Design Professional to evaluate the required changes and shall be responsible for all costs associated with such changes, including costs of design or engineering, if such are necessary, and costs of other trades.
 - 3. Where manufacturer's or supplier's names are listed in conjunction with the manufacturer or supplier that is basis of design, they are given to approve the firm name only. Equipment or material submitted by such firms must meet the detailed technical specifications written for the respective item. Contractor shall be responsible for verifying capacities, physical sizes, weights, electrical requirements, methodology for connections to other parts of the system, etc. Contractor shall furnish all required shop drawings for equipment, and for its connection and installation.
- B. If any substituted items are submitted after contracts have been awarded, and there is any question of equality of such items, samples may be required to be submitted both for the item specified and that to be substituted, or, further proof of equality may be required to the entire satisfaction of the Design Professional. In no case shall additional remuneration be allowed because of the rejection of a substitute.

- C. When the equipment is relocated to a place other than that shown on the drawings, or when equipment other than that specified is used, the Contractor shall pay any extra cost of required revisions such as structural steel, concrete, electrical, piping, etc.
- D. The Design Professional's costs to evaluate substitutions and to revise Drawings and Specifications because of substitutions will be paid by the Contractor.

2.7 SHOP DRAWINGS:

- A. Refer to Division 01 and individual specification sections.
- B. Furnish shop drawings, catalog cuts, performance data and other required data to the Design Professional for approval for all material and equipment specified hereinafter. Sufficient data shall be submitted to show compliance with the requirements of the plans and specifications. All shop drawings submitted shall be first checked and corrected before submitting for approval. Approval of shop drawings by the Design Professional will not relieve the Contractor from responsibility for errors or omissions therein. All such errors or omissions must be made good by the Contractor irrespective of any approval by the Design Professional.
- C. The following applies to all materials and equipment being submitted for this project. Refer to the individual specification sections for additional submittal requirements.
- D. It is the responsibility of the manufacturer's representative and the installing contractor to thoroughly review all shop drawing equipment submittals and state in writing that the products meet or exceed the design specifications and design intent as indicated on the contract documents, prior to submitting them for review by the engineer.
- E. The General Contractor or Construction Manager shall review and stamp all shop drawings noting that the review process has taken place and that shop drawings are in compliance with the design documents, prior to submitting for review by the Design Professional. Any shop drawings found not to be in compliance shall be returned to the contractor stating such, with a copy of the statement (only) forwarded to the Design Professional.
- F. On submissions beyond the initial one, clearly identify changes made from the initial submittal other than those requested by the Design Professional. Design Professional will review only those changes that are requested and those identified by the Contractor.
- G. The Engineer will review three submissions (one original submission and up to two revised submissions) on any single component requested for review. If the contractor and/or vendor fail to comply with the drawings, specifications, and/or review comments, and additional submissions are required, the cost for those submissions will be borne by the contractor.
- H. The design documents are based and coordinated on the scheduled manufacturers. Any substitutions of products or materials (from those approved and listed in the specifications) must be thoroughly coordinated by the submitting contractor. This includes but is not limited to power, space, structural, control and performance requirements.
- I. Shop drawings required shall include, but not necessarily be limited to, the following:
 - 1. Shop drawings, cuts and catalogue information showing appearance, dimensions, performance, weight, etc., of all equipment, fixtures, appurtenances, etc. See respective equipment or system sections for more specific requirements.
 - 2. Schedules of all materials showing type and manufacturer.
 - 3. Wiring diagrams and schematics for equipment.
 - 4. Security cabinets, racks, switchboards, panels, and other protective and distribution equipment.
 - 5. All special equipment and systems.
 - 6. Other shop drawings as may be requested.
- J. Hard copy and facsimile submission of shop drawings will not be accepted as the submittal format. Electronic submittals shall be submitted through the process outlined in Division 01 for review.

- K. Product Data: Include manufacturer's technical literature for each device. Indicate dimensions, capacities, performance characteristics, electrical characteristic, finishes for materials, and installation and startup instructions for each type of product indicated.
- L. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 1. Schematic flow diagrams showing all controlled equipment and control devices.
 - 2. Wiring Diagrams: Power, signal, and control wiring. Differentiate between manufacturerinstalled and field-installed wiring.
 - 3. Details of control panel faces, including controls, instruments, and labeling.
 - 4. Written description of sequence of operation.
 - 5. Trunk cable schematic showing programmable control unit locations and trunk data conductors.
 - 6. Listing of connected data points, including connected control unit and input device.
 - 7. System graphics indicating monitored systems, data point addresses, and operator notations.
 - 8. System configuration showing peripheral devices, batteries, power supplies, diagrams, modems, and interconnections.
- M. Shop Drawings shall be submitted and shall consist of a complete list of equipment and materials, including manufacturer's descriptive and technical literature, catalog cuts, and installation instructions. Shop drawings shall also contain complete wiring, routing, schematic diagrams, tag number of devices, software descriptions, calculations, and any other details required to demonstrate that the system will function properly. Drawings shall show proposed layout and installation of all equipment and the relationship to other parts of the work.
- N. Shop Drawings shall be approved before any equipment is installed. Therefore, shop drawings must be submitted in time for review so that all installations can be completed per the project completion schedule. Ten working days shall be allowed for submittals to be reviewed.
- O. All drawings shall be reviewed after the final system checkout and updated or corrected to provide "as-built" drawings to show exact installation. All shop drawings will be acknowledged in writing before installation is started and again after the final checkout of the system. The system will not be considered complete until the "as-built" drawings have received their final approval. The Contractor shall deliver a complete set of "as-built" drawings.

Shop Drawing Review Comment Definitions

A> No Exception Taken:

The shop drawing or equipment submittal as submitted is approved without exception. No changes or corrections required. The materials, equipment or system submitted can be released for fabrication and construction. No Further Submission Required

B> Make Corrections Noted:

The shop drawing or equipment submittal as submitted is not completely correct but is approved as noted. Make the corrections noted on the shop drawing or submittal. The materials, equipment or system submitted can be released for fabrication and construction once the corrections have been made. The submittal must be corrected and resubmitted for record unless noted by "E: Resubmit". See "E: Resubmit definition below.

C> Submit Specified Item:

The shop drawing or equipment submittal as submitted is missing a component of the system that it represents or is not of the approved and specified manufacturers. Submit the missing or incorrect item. The materials, equipment or system submitted cannot be released for fabrication and construction.

D> No Further Submission Required:

The shop drawing or equipment submittal as submitted is approved as noted. No changes or corrections required. The materials, equipment or system submitted can be released for fabrication and construction. No Further Submission Required.

E> Resubmit:

The shop drawing or equipment submittal as submitted is not approved. The shop drawing or equipment submittal needs significant corrections and does require another submission to verify that the comments and changes have been incorporated. Make the corrections noted on the shop drawing or submittal. The materials, equipment or system submitted cannot be released for fabrication and construction.

F> Rejected:

The shop drawing or equipment submitted is not as specified or a non-approved manufacturer or product and rejected.

G> Resubmit for Record Only:

Make the corrections noted on the shop drawing or submittal. The shop drawing or equipment submittal as submitted is approved with minor exception. Changes or corrections are required. The materials, equipment or system submitted can be released for fabrication and construction.

PART 3 - EXECUTION

3.1 VISIT TO SITE:

A. Before submitting bid, the contractor shall visit the site of the work and be thoroughly familiarized with the conditions affecting the work. No extra payment will be allowed on account of extra work made necessary by failure to do so.

3.2 WORKMANSHIP:

- A. All work shall be installed in a first class, neat and professional manner by tradespeople skilled in the trade involved. All details of the installation shall be mechanically and electrically correct. Should the Design Professional direct removal, change, or installation of any equipment or systems not installed in a neat and workmanlike manner, such charges shall be made by the Contractor at no expense to the Owner.
- B. Equipment shall be installed in strict accordance with manufacturer's instructions for type and capacity of each piece of equipment used. The Contractor shall obtain these instructions from the manufacturer and these instructions shall be considered part of these Specifications.
- C. Drawings and specifications have been prepared with the best knowledge of conditions available at the time of design. If any obscurities or discrepancies exist, they shall be brought to the attention of the Design Professional before bids are submitted. If they are not discovered before bids are submitted, the Design Professional shall be notified and shall render decision. This decision shall be final.
 - 1. Drawings and Specifications are intended to be complementary; items described or shown in one but not both are to be furnished as if fully shown or described in both locations.
 - 2. In case of conflict between provisions of the Specifications, the more stringent requirement shall govern. Where a requirement is applied to a specific product, condition, system, or Specification Section which conflicts with a more general requirement elsewhere, the specific shall supersede the general.
- D. Drawings are generally indicative of the work to be installed, but do not indicate all conduit bends, fittings, boxes, and specialties which may be required, or the exact locations of all conduits and supports. Contractor shall investigate structure and finish conditions affecting his work and arrange his work accordingly; furnishing such fittings as may be required to meet

such conditions. Contractor is responsible for exercising proper judgment to arrange his work and materials so as to avoid interference with other trades.

- 1. Riser diagrams, details, and schematics generally indicate cabling to be used in various systems involved. This information may or may not be duplicated on the plans, but equipment shown on either plans or riser diagrams and schematics shall be provided as if shown on both.
- 2. All grades, elevations, dimensions, and clearances of equipment shown on drawings are approximate and shall be verified at site.
- 3. Where work or equipment is referred to in singular terms, such reference shall be deemed to apply to as many items of work or equipment as required to complete the entire installation.

3.3 FIELD MEASUREMENTS:

A. Before ordering any material or doing any work, verify all measurements at the building and site and be responsible for the correctness of same. No extra compensation will be allowed on account of differences between actual dimensions and measurements and those indicated on the drawings. Any difference which may be found shall be submitted to the Design Professional for consideration before proceeding any further with the work.

3.4 DELIVERY OF EQUIPMENT:

A. Be responsible for delivery of equipment, unload and store in a manner not to interfere with the operation of other trades. Additional expense incurred because of equipment or material delivery delays shall be assumed by the responsible Contractor.

3.5 PROTECTION OF WORK:

A. All work, equipment and materials shall be protected at all times. All raceway openings shall be closed with caps or plugs during the installation. All equipment shall be tightly covered and protected against dirt, water, plaster, paint and other foreign material or mechanical injury during entire progress of installation. Make good all damage caused either directly or indirectly by workmen employed to fulfill requirements of the Electrical Work.

3.6 REMOVAL OF RUBBISH:

A. During the course of construction, periodically remove from the premises all rubbish resulting from work of this trade so as to prevent its accumulation. At the completion of the work completed under these Specifications remove from the building and site all rubbish and accumulated materials of whatever nature not caused by the other trades and leave work, and equipment free of all foreign matter including plaster, cement, and paint and leave in a clean, orderly, acceptable and usable condition.

3.7 COORDINATION WITH OTHER TRADES:

- A. Work in conjunction with each of the other trades to facilitate proper and intelligent execution of work with minimum interference.
- B. Carefully examine all architectural and structural drawings for the building and drawings for electrical trade and mechanical trades and be responsible for the proper fitting of all material and equipment into the building as planned and without interference with other piping, ductwork, conduit or equipment. Proper judgment shall be exercised to secure best possible headroom, door and window clearance, and space conditions throughout; to secure neat arrangement for piping, equipment and conduit, and to overcome all local difficulties and interferences to best advantage. Approval for any and all changes to plans and specifications which may thus be incurred shall be obtained from the Design Professional before proceeding.
- C. Contractor shall prepare preliminary shop drawings suitable for use in coordinating his work with the work of other trades. The HVAC section will prepare and furnish reproducible prints at an appropriate scale with all trades indicating piping, ductwork and conduit in relation to all structural elements of the construction, including floor elevations; steel locations, size, and elevations; partitions locations; door locations and direction of swing; and all other information

required to assure coordination of the electrical, sheet metal and piping trades and fire protection in relation to the Architectural function of the project. Coordination meetings will be held under the supervision of the Owner's Construction Manager and General Contractor. Each trade shall have proper representation at all coordination meetings for the purpose of detailing, on a reproducible print mentioned above, the exact location and routing of their work.

- D. After the conclusion of the coordination at the working meetings, each trade shall sign the coordinated drawing, with copies being distributed by the GC to all contractors and parties concerned, including the Owner. Final shop drawings of all trades shall be in accordance with the coordinated drawing, which final shop drawings shall be submitted for final approval.
- E. If contractor installs work so as to cause interference with work of other trades, he shall make necessary changes in work to correct the condition without extra charge.
- F. Dimensional layout plans of equipment rooms shall be made showing all bases, pads and inertia blocks required for mechanical equipment. Include dimensions of bases, bolt layouts, details, etc.
- G. Contractor shall furnish all necessary templates, patterns, etc. for installing work and for purpose of making adjoining work conform, furnish setting plans and shop details to other trades as required.

3.8 COORDINATION OF SECURITY CHARACTERISTICS:

- A. Security Contractor shall carefully examine the drawings of all other trades for equipment requiring Security connectivity and shall ascertain that all Security characteristics of equipment scheduled thereon matches the service available. If any discrepancies are noted, he shall immediately refer to Design Professional for resolution. If characteristics are correct, Security Contractor is responsible for ascertaining method of connection, "rough-in" dimensions, correct plug and receptacle configurations, etc. While Design Professional has made every effort to provide such information as is known at time of design, Contractor shall obtain final data from shop drawings before proceeding.
- B. For all equipment of other trades which security characteristics are not scheduled on drawings of that trade, the Security Contractor shall assume the responsibility of notifying the Contractor furnishing such equipment as to the characteristics required; Security Contractor will be held responsible for correction of all problems arising from failure to do so.

3.9 FIRESTOPPING:

- A. All penetrations through fire resistance rated floor/ceiling assemblies and roof construction and through fire-resistance-rated walls and partitions shall be fire stopped.
- B. Penetrations to be fire stopped include both empty openings and those containing cables, pipes, ducts, conduits and any other items.
- C. Fire rating of sealed penetrations shall meet or exceed the rating of the assembly being penetrated.
- D. Materials shall be installed in accordance with manufacturer's recommendations and UL listing.

3.10 COMMISSIONING

- A. The installing contractor shall provide a field technician and specialized tools to facilitate a successful site system commissioning and testing for all equipment and systems. This contractor and technician shall be part of the overall commissioning team. Where applicable and required, the contractor shall secure and pay for a factory technician to be part of the startup, testing and commissioning team and efforts.
 - 1. All equipment shall be commissioned, and the operation of that equipment shall be checked by the installing contractor. Specific systems shall be commissioned when more than one contractor is involved in the installation or there is multiple system interface and control involved with that piece of equipment.

- 2. The contractors shall check and verify all equipment nameplate data against the design parameters, prior to installation.
- 3. The contractors shall submit a Spare Parts List for all equipment in the Maintenance and Operations Manuals to include, but not limited to the following:
 - a. Part Numbers
 - b. Part and Equipment Description
 - c. Quantity of Parts Required
 - d. Lubrication Requirements
 - e. Full Warranty Information
 - f. Complete Operation and Maintenance Manuals

3.11 CYBER SECURITY HARDENING MINIMUM REQUIREMENTS

- A. Every new device connected to IP network comes with potential security vulnerabilities. It shall be the responsibility of the security contractor to secure all Access Control, Video Surveillance, Intercom and Intrusion system devices as specified within manufacturer's hardening guides.
- B. Below is a list of minimum required areas of network hardening to be addressed by the security contractor:
 - 1. Change the default Admin password to a long, unique, random string. Do not use common names, dates, common passwords, repeated sequences, and keyboard patterns.
 - 2. Enforce a strong user password policy, including minimum length, complexity, and expiration periods.
 - 3. If available, activate auto-locking of the security workstation after a period of inactivity.
 - 4. Use Windows Active Directory Integration for logon to security systems.
 - 5. Restrict server Admin access to local connections only.
 - 6. Restrict user privileges to minimum required privileges.
 - 7. Keep applications and programs updated to latest (recommended) version available.
 - 8. Keep device's firmware updated to latest (recommended) version.
 - 9. Utilize secure communication between devices and servers.
 - 10. Deactivate unused services and ports on each system (telnet, UPnP, Bonjour, and others)
 - 11. Use system logging for all functions to allow for a record of activity trails.
 - 12. Use valid certificates on all server connections. Replace self-signed certificates with ones from trusted certificate authority.
 - 13. Use only HTTPS for communication between mobile and webserver connections.
 - 14. Disable Audio on cameras that have it ON by default.
 - 15. Encrypt Edge storage devices on all cameras
 - 16. Use NTP to synchronize all clocks in the system.

END OF SECTION

SECTION 280528

PATHWAYS FOR SECURITY CABLING SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Systems, design, equipment, components, cabling, materials, installation, labeling, and testing shall comply with these specifications and associated referenced documents, including the following:
 - 1. ANSI/TIA Standard 569-E, "Commercial Building Standards for Telecommunications Pathways & Spaces", May, 2019.
 - 2. ANSI/TIA Standard 606-C, "Labeling and Administration Standards for Telecommunications Cabling in Commercial Buildings", November, 2015.
 - 3. National Electric Code, ANSI/NFPA 70-2014.
 - 4. BICSI "Telecommunications Distribution Methods Manual", 14th Edition, 2014.
 - 5. BICSI "Electronic Safety and Security Design Reference Manual", 4th Edition, 2014
 - 6. All other applicable electrical and building codes.
- C. 280000 General Requirements for Security Systems

1.2 SUMMARY

- A. Section Includes:
 - 1. Metal conduits and fittings.
 - 2. Surface pathways.
 - 3. Boxes, enclosures, and cabinets.
 - 4. J-Hooks/Cable Supports.

1.3 **DEFINITIONS**

- A. ARC: Aluminum rigid conduit.
- B. GRC: Galvanized rigid steel conduit.
- C. IMC: Intermediate metal conduit.
- D. EMT: Electrical Metallic Tubing.
- E. RNC: Rigid Non-metallic conduit for use as sleeves.

1.4 ACTION SUBMITTALS

- A. Product Data: For surface pathways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Pathway routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
 - 1. Structural members in paths of pathway groups with common supports.
 - 2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.
- B. Qualification Data: For professional engineer.
- C. Source quality-control reports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Allied Tube & Conduit.
 - 3. Alpha Wire Company.
 - 4. Anamet Electrical, Inc.
 - 5. Electri-Flex Company.
 - 6. O-Z/Gedney.
 - 7. Picoma Industries.
 - 8. Republic Conduit.
 - 9. Robroy Industries.
 - 10. Thomas & Betts Corporation.
 - 11. Western Tube and Conation.
 - 12. Wheatland Tube Company.
 - 13. Or approved equal.
- B. General Requirements for Metal Conduits and Fittings:
 - 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 - 2. Comply with ANSI/TIA-569.C.
- C. GRC: Comply with ANSI C80.1 and UL 6.
- D. ARC: Comply with ANSI C80.5 and UL 6A.
- E. IMC: Comply with ANSI C80.6 and UL 1242.
- F. EMT: Comply with ANSI C80.3 and UL 797.
- G. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
 - 1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
 - 2. Fittings for EMT:
 - a. Material: Steel or die cast
 - b. Type: Compression
 - 3. Expansion Fittings: PVC or steel to match conduit type, complying with UL-467, rated for environmental conditions where installed, and including flexible external bonding jumper.
 - 4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.
- H. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 PATHWAYS AND FITTINGS FOR FIBER OPTIC CABLE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Alpha Wire Company.
 - 2. Arnco Corporation.
 - 3. Endot Industries.
 - 4. Ipex.
 - 5. Thomas and Betts/Carlon.
 - 6. Or approved equal.
- B. Description: Comply with UL 2024; flexible-type pathway, approved for plenum installation unless otherwise indicated.

- 1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- 2. Comply with ANSI/TIA-569.E.

2.3 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Hoffman Enclosures.
 - 2. Nema Enclosures.
 - 3. Integra Enclosures.
 - 4. Cooper B-Line.
 - 5. Thomas and Betts/Carlon.
 - 6. Or approved equal.
- B. General Requirements for Boxes, Enclosures, and Cabinets:
 - 1. Comply with ANSI/TIA-569.D.
 - 2. Boxes, enclosures, and cabinets shall be listed for use in the applied environment.
- C. Sheet-Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- D. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- F. Device Box Dimensions: 4 11/16 inches square by 3-1/4 inches deep
- G. Manufacturer specific boxes See Security equipment manufacturer list of available boxes and enclosures for specific devices.
- H. Gangable boxes are permitted
- I. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.
- J. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 - 2. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
 - 3. NEMA 250, Type 3R for damp and wet locations.
- K. Cabinets:
 - 1. NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel. Type 3R boxes will be required for damp or wet locations.
 - 2. Hinged door in front cover with flush latch and concealed hinge.
 - 3. Key latch to match panel boards.
 - 4. Metal barriers to separate wiring of different systems and voltage.

PART 3 - EXECUTION

3.1 PATHWAY APPLICATION

- A. Indoors: Apply pathway products as specified below unless otherwise indicated:
 - 1. Exposed, Not Subject to Physical Damage: EMT or RNC.
 - 2. Exposed, Not Subject to Severe Physical Damage: EMT.
 - 3. Exposed and Subject to Severe Physical Damage: GRC or IMC.
 - 4. Concealed in Ceilings and Interior Walls and Partitions: EMT or innerduct.
 - 5. Damp or Wet Locations: GRC or IMC.
 - 6. Pathways for Optical-Fiber or Communications Cable in Spaces Used for Environmental Air: Plenum-type, communications-cable pathway as applicable for entire length throughout in EMT.

- 7. Boxes and Enclosures: NEMA 250 Type 1, except use NEMA 250 Type 3 in institutional and commercial kitchens and damp or wet locations.
- B. Minimum Pathway Size: 3/4-inch trade size.
 - 1. Pathway size shall be in accordance with the manufacturer's specifications, instructions, and recommendations to maintain minimum bend radius unless otherwise indicated.
 - 2. Pathway quantities and sizes shall be sufficient to accommodate the quantities, sizes, and types of cables indicated on the drawings.
 - 3. Fill calculations shall be performed to determine the quantities and sizes of pathways based upon the indicated cables for the initial installation.
- C. Pathway Fittings: Compatible with pathways and suitable for use and location.
 - 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 - 2. EMT: Use compression steel fittings. Comply with NEMA FB 2.10.
- D. Do not install nonmetallic conduit where ambient temperature exceeds 120 degrees F.

3.2 INSTALLATION

- A. Comply with NECA 1, NECA 101, and ANSI/TIA-569.C for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum pathways. Comply with NFPA 70 limitations for types of pathways allowed in specific occupancies and number of floors.
- B. Keep pathways at least 12 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal pathway runs above water and steam piping.
- C. Complete pathway installation before starting conductor installation.
- D. Install no more than the equivalent of two 90-degree bends in any pathway run. Support within 12 inches changes in direction. Utilize long radius ells for all optical-fiber cables.
- E. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- F. Support conduit within 12 inches of enclosures to which attached.
- G. Stub-ups to Above Recessed Ceilings:
 - 1. Use EMT, IMC, or RMC for pathways.
 - 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- H. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of pathway and fittings before making up joints. Follow compound manufacturer's written instructions.
- I. Install pathways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- J. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
- K. Cut conduit perpendicular to the length. For conduits of 2-inchtrade size and larger, use roll cutter or a guide to ensure cut is straight and perpendicular to the length.
- L. Install pull wires in empty pathways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches slack at each end of pull wire. Cap underground pathways designated as spare above grade alongside pathways in use.
- M. Surface Pathway are not permitted.
- N. Pathways for Optical-Fiber and Communications Cable: Install pathways, metal and nonmetallic, rigid and flexible, as follows:
 - 1. 1-Inch Trade Size and Larger: Install pathways in maximum lengths of 75 feet.

- 2. Install with a maximum of two 90-degree bends or equivalent for each length of pathway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.
- O. Expansion-Joint Fittings:
 - 1. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
 - 2. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
 - 3. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- P. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements.
- Q. Do not install raceway and boxes within existing concrete or masonry walls.
- R. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- S. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- T. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- U. Set metal floor boxes level and flush with finished floor surface.

3.3 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR SECURITY PENETRATIONS

A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Section 280544 "Sleeves and Sleeve Seals for Security Cabling."

3.4 FIRESTOPPING

A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Section 280544, "Sleeves and Sleeve Seals for Security Cabling".

3.5 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage or deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION

SECTION 284600 FIRE DETECTION AND ALARM

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Fire alarm system design and installation, including all components, wiring, and conduit.
- B. Transmitters for communication with supervising station.
- C. Circuits from protected premises to supervising station, including conduit.
- D. Replacement and removal of existing fire alarm system components, wiring, and conduit indicated.

1.02 RELATED REQUIREMENTS

- A. Section 078400 Firestopping: Materials and methods for work to be performed by this installer.
- B. Section 087100 Door Hardware: Electrically operated locks and door holder devices to be monitored and released by fire alarm system.
- C. Section 211300 Fire-Suppression Sprinkler Systems: Supervisory, alarm, and actuating devices installed in sprinkler system.
- D. Section 233300 Air Duct Accessories: Smoke dampers monitored and controlled by fire alarm system.

1.03 REFERENCE STANDARDS

- A. 36 CFR 1191 Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines; current edition.
- B. ADA Standards 2010 ADA Standards for Accessible Design; 2010.
- C. IEEE C62.41.2 IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits; 2002 (Corrigendum 2012).
- D. NFPA 70 National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E. NFPA 72 National Fire Alarm and Signaling Code; Most Recent Edition Cited by Referring Code or Reference Standard.

1.04 SUBMITTALS

- A. See Section 013000 Administrative Requirements, for submittal procedures.
- B. Evidence of designer qualifications.
- C. Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, and description of operation:
 - 1. Copy (if any) of list of data required by authority having jurisdiction.
 - 2. NFPA 72 "Record of Completion", filled out to the extent known at the time.
 - 3. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A-7-5-2.2(9), and complete listing of software required.
 - 4. System zone boundaries and interfaces to fire safety systems.
 - 5. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.
 - 6. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.
 - 7. List of all devices on each signaling line circuit, with spare capacity indicated.
 - 8. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.

- 9. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.
- 10. Certification by either the manufacturer of the control unit or by the manufacturer of each other component that the components are compatible with the control unit.
- 11. Certification by the manufacturer of the control unit that the system design complies with Contract Documents.
- 12. Certification by Contractor that the system design complies with Contract Documents.
- 13. Do not show existing components to be removed.
- D. Evidence of installer qualifications.
- E. Evidence of instructor qualifications; training lesson plan outline.
- F. Evidence of maintenance contractor qualifications, if different from installer.
- G. Inspection and Test Reports:
 - 1. Submit inspection and test plan prior to closeout demonstration.
 - 2. Submit documentation of satisfactory inspections and tests.
 - 3. Submit NFPA 72 "Inspection and Test Form," filled out.
- H. Operating and Maintenance Data: See Section 017800 for additional requirements; revise and resubmit until acceptable; have one set available during closeout demonstration:
 - 1. Complete set of specified design documents, as approved by authority having jurisdiction.
 - 2. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
 - 3. Contact information for firm that will be providing contract maintenance and trouble callback service.
 - 4. List of recommended spare parts, tools, and instruments for testing.
 - 5. Replacement parts list with current prices, and source of supply.
 - 6. Detailed troubleshooting guide and large scale input/output matrix.
 - 7. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to Owner.
 - 8. Detailed but easy to read explanation of procedures to be taken by non-technical administrative personnel in the event of system trouble, when routine testing is being conducted, for fire drills, and when entering into contracts for remodeling.
- I. Project Record Documents: See Section 017800 for additional requirements; have one set available during closeout demonstration:
 - 1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
 - 2. "As installed" wiring and schematic diagrams, with final terminal identifications.
 - 3. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.
- J. Closeout Documents:
 - 1. Certification by manufacturer that the system has been installed in compliance with manufacturer's installation requirements, is complete, and is in satisfactory operating condition.
 - 2. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.

1.05 QUALITY ASSURANCE

- A. Designer Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer, Contractor, or installer, with experience designing fire alarm systems in the jurisdictional area of the authorities having jurisdiction.
- B. Installer Qualifications: Firm with minimum 3 years documented experience installing fire alarm systems of the specified type and providing contract maintenance service as a regular part of their business.

- 1. Authorized representative of control unit manufacturer; submit manufacturer's certification that installer is authorized; include name and title of manufacturer's representative making certification.
- 2. Installer Personnel: At least 2 years of experience installing fire alarm systems.
- 3. Supervisor: NICET level III or IV (3 or 4) certified fire alarm technician; furnish name and address.
- C. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.
- D. Instructor Qualifications: Experienced in technical instruction, understanding fire alarm theory, and able to provide the required training; trained by fire alarm control unit manufacturer.

1.06 WARRANTY

- A. Provide control panel manufacturer's warranty that system components other than wire and conduit are free from defects and will remain so for 1 year after date of Substantial Completion.
- B. Provide installer's warranty that the installation is free from defects and will remain so for 1 year after date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Fire Alarm Control Units and Accessories:
 - 1. Honeywell Security & Fire Solutions/Vista; _____: www.security.honeywell.com/#sle.
 - 2. Provide control units made by the same manufacturer.
- B. Initiating Devices and Notification Appliances:
 - 1. Same manufacturer as control units.

2.02 FIRE ALARM SYSTEM

- A. Fire Alarm System: Provide a new automatic fire detection and alarm system:
 - 1. Provide all components necessary, regardless of whether shown in Contract Documents or not.
 - 2. Protected Premises: Entire building shown on drawings.
 - 3. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
 - a. ADA Standards.
 - b. The requirements of the local authority having jurisdiction , which is _____.
 - c. Applicable local codes.
 - d. Contract Documents (drawings and specifications).
 - e. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.
 - 4. Evacuation Alarm: Multiple smoke zones; allow for evacuation notification of any individual zone or combination of zones, in addition to general evacuation of entire premises.
 - 5. Voice Notification: Provide emergency voice/alarm communications with multichannel capability; digital.
 - 6. General Evacuation Zones: Each smoke zone is considered a general evacuation zone unless otherwise indicated, with alarm notification in all zones on the same floor, on the floor above, and the floor below.
 - 7. Program notification zones and voice messages as directed by Owner.
 - 8. Fire Command Center: Location indicated on drawings.
 - 9. Fire Alarm Control Unit: New, located at fire command center.
- B. Supervising Stations and Fire Department Connections:
 - 1. Public Fire Department Notification: By on-premises supervising station.
 - On-Premises Supervising Station: Existing proprietary station operated by Owner, located at _____.

3. Means of Transmission to On-Premises Supervising Station: Directly connected noncoded system.

C. Circuits:

- 1. Initiating Device Circuits (IDC): Class B, Style A.
- 2. Signaling Line Circuits (SLC) Within Single Building: Class B, Style 0.5.
- 3. Notification Appliance Circuits (NAC): Class B, Style W.
- D. Spare Capacity:
 - 1. Initiating Device Circuits: Minimum 25 percent spare capacity.
 - 2. Notification Appliance Circuits: Minimum 25 percent spare capacity.
 - 3. Speaker Amplifiers: Minimum 25 percent spare capacity.
 - 4. Fire Alarm Control Units: Capable of handling all circuits utilized to capacity without requiring additional components other than plug-in control modules.

E. Power Sources:

- 1. Primary: Dedicated branch circuits of the facility power distribution system.
- 2. Secondary: Storage batteries.
- 3. Capacity: Sufficient to operate entire system for period specified by NFPA 72.
- 4. Each Computer System: Provide uninterruptible power supply (UPS).

2.03 EXISTING COMPONENTS

- A. Existing Fire Alarm System: Remove existing components indicated and incorporate remaining components into new system, under warranty as if they were new; do not take existing portions of system out of service until new portions are fully operational, tested, and connected to existing system.
- B. On-Premises Supervising Station: Include as part of this work all modifications necessary to existing supervising station to accommodate new fire alarm work.
- C. Clearly label components that are "Not In Service."
- D. Remove unused existing components and materials from site and dispose of properly.

2.04 FIRE SAFETY SYSTEMS INTERFACES

- A. Supervision: Provide supervisory signals in accordance with NFPA 72 for the following:
 - 1. Sprinkler water control valves.
 - 2. Dry-pipe sprinkler system pressure.
 - 3. Dry-pipe sprinkler valve room low temperature.
 - 4. Elevator shut-down control circuits.
- B. Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:
 - 1. Sprinkler water flow.
 - 2. Elevator lobby, elevator hoistway, and elevator machine room smoke detectors.
 - 3. Duct smoke detectors.
- C. Elevators:
 - 1. Elevator lobby, hoistway, and machine room smoke detectors: Elevator recall for fire fighters' service.
 - 2. Elevator Machine Room Heat Detector: Shut down elevator power prior to hoistway sprinkler activation.
 - 3. Sprinkler pressure or waterflow: Shut down elevator power prior to hoistway sprinkler activation.
- D. HVAC:

1. Duct Smoke Detectors: Close dampers indicated; shut down air handlers indicated.

- E. Doors:
 - 1. Smoke Barrier Door Magnetic Holders: Release upon activation of smoke detectors in smoke zone on either side of door, upon alarm from manual pull station on same floor, and upon sprinkler activation on same floor. Refer to Section 087100.

2. Electromagnetic Door Locks on Egress Doors: Unlock upon activation of any alarm initiating device or suppression system in smoke zone that doors serve as egress from. Refer to Section 087100.

2.05 COMPONENTS

- A. General:
 - 1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.
 - 2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.
- B. Fire Alarm Control Units: Analog, addressable type; listed, classified, and labeled as suitable for the purpose intended.
- C. Master Control Unit:
- D. Addressable Modules:
 - 1. Provide addressable modules suitable for connection to fire alarm control unit signaling line circuits.
 - 2. Unless otherwise indicated, use addressable modules only in clean, dry, indoor, nonhazardous locations.
 - 3. Monitor Modules: Unless devices are explicitly permitted to be connected together as zone, provide separate addressable monitor module for each conventional dry-contact input device in order to be individually identifiable by addressable fire alarm control unit.
 - 4. Control Modules: Provide as indicated or as required for selective control of notification appliances.
 - 5. Releasing Control Modules: Provide as indicated or as required for control of listed solenoids in releasing applications.
- E. Initiating Devices:

1.

- Addressable Systems:
 - a. Addressable Devices: Individually identifiable by addressable fire alarm control unit.
 - b. Provide suitable addressable interface modules as indicated or as required for connection to conventional (non-addressable) devices and other components that provide a dry closure output.
- F. Notification Appliances:
- G. Circuit Conductors: Copper or optical fiber; provide 200 feet (60 m) extra; color code and label.
- H. Surge Protection: In accordance with IEEE C62.41.2 category B combination waveform and NFPA 70; except for optical fiber conductors.
- I. Locks and Keys: Deliver keys to Owner.
- J. Instruction Charts: Printed instruction chart for operators, showing steps to be taken when a signal is received (normal, alarm, supervisory, and trouble); easily readable from normal operator's station.
 - 1. Frame: Stainless steel or aluminum with polycarbonate or glass cover.
 - 2. Provide one for each control unit where operations are to be performed.
 - 3. Obtain approval of Owner prior to mounting; mount in location acceptable to Owner.
 - 4. Provide extra copy with operation and maintenance data submittal.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and Contract Documents.
- B. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.
- C. Obtain Owner's approval of locations of devices, before installation.
- D. Install instruction cards and labels.

3.02 INSPECTION AND TESTING FOR COMPLETION
- A. Notify Owner 7 days prior to beginning completion inspections and tests.
- B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.
- C. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.
- D. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.
- E. Provide all tools, software, and supplies required to accomplish inspection and testing.
- F. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.
- G. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.
- H. Diagnostic Period: After successful completion of inspections and tests, Operate system in normal mode for at least 14 days without any system or equipment malfunctions.
 - 1. Record all system operations and malfunctions.
 - 2. If a malfunction occurs, start diagnostic period over after correction of malfunction.
 - 3. Owner will provide attendant operator personnel during diagnostic period; schedule training to allow Owner personnel to perform normal duties.
 - 4. At end of successful diagnostic period, fill out and submit NFPA 72 "Inspection and Testing Form."

3.03 OWNER PERSONNEL INSTRUCTION

- A. Provide the following instruction to designated Owner personnel:
 - 1. Hands-On Instruction: On-site, using operational system.
 - 2. Classroom Instruction: Owner furnished classroom, on-site or at other local facility.
- B. Administrative: One-hour session(s) covering issues necessary for non-technical administrative staff; classroom:
 - 1. Initial Training: 1 session pre-closeout.
- C. Basic Operation: One-hour sessions for attendant personnel, security officers, and engineering staff; combination of classroom and hands-on:
 - 1. Initial Training: 1 session pre-closeout.
- D. Furnish the services of instructors and teaching aids; have copies of operation and maintenance data available during instruction.

3.04 CLOSEOUT

- A. Closeout Demonstration: Demonstrate proper operation of all functions to Owner.
 - 1. Be prepared to conduct any of the required tests.
 - 2. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.
 - 3. Have authorized technical representative of control unit manufacturer present during demonstration.
 - 4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.
 - 5. Repeat demonstration until successful.

3.05 MAINTENANCE

- A. See Section 017000 Execution and Closeout Requirements, for additional requirements relating to maintenance service.
- B. Perform routine inspection, testing, and preventive maintenance required by NFPA 72, including:
 - 1. Maintenance of fire safety interface and supervisory devices connected to fire alarm system.

- 2. Repairs required, unless due to improper use, accidents, or negligence beyond the control of the maintenance contractor.
- 3. Record keeping required by NFPA 72 and authorities having jurisdiction.
- C. Provide trouble call-back service upon notification by Owner:
 - 1. Provide on-site response within 2 hours of notification.
 - 2. Include allowance for call-back service during normal working hours at no extra cost to Owner.
 - 3. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.
- D. Provide a complete description of preventive maintenance, systematic examination, adjustment, cleaning, inspection, and testing, with a detailed schedule.
- E. Maintain a log at each fire alarm control unit, listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced. Submit duplicate of each log entry to Owner's representative upon completion of site visit.
- F. Comply with Owner's requirements for access to facility and security.

END OF SECTION

SECTION 310000

EARTHWORK

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Cutting, proofrolling, filling and grading to required lines, dimensions, contours and elevations for proposed improvements as shown on the Contract Drawings.
- B. Excavation for utilities, foundations, retaining wall foundations, slabs, etc.
- C. Removal, storage and disposal of material deemed by Geotechnical Engineer to be geotechnically-unsuitable for reuse as on-site fill, to ensure proper preparation of areas for the proposed improvements.
- D. Segregation and stockpiling of excavated soils.
- E. Scarifying, compaction, moisture content control of final subgrade and fill materials.
- F. Requirements of the Construction Contract.
- G. Construction of building perimeter drainage system where indicated on Contract Drawings.

1.02 RELATED SECTIONS AND DOCUMENTS

- A. Geophysical Investigation Report, dated 1 April 2024 by American Geophysics, Inc.
- B. Section 311100 Site Clearing
- C. Section 311400 Site Preparation
- D. Section 312316 Trench Excavation and Backfill for Utilities
- E. Section 312319 Dewatering
- F. Section 312500 Soil Erosion and Sediment Control
- G. Section 315000 Temporary Excavation Support and Protection
- H. The applicable provisions of the New Jersey Edition of the International Building Code 2006, or latest edition.

1.03 REFERENCE STANDARDS

- A. American Society for Testing and Materials (ASTM) latest edition
 - 1. D422 Method for Particle Size Analysis of Soils
 - 2. D698 Laboratory Compaction Characteristics of Soil Using Standard Effort
 - 3. D1557 Test for Moisture-Density Relations of Soils Using 10-lb (4.5 Kg) Hammer and 18-inch (457 mm) Drop (Modified Proctor)
 - 4. D2216 Laboratory Determination of Moisture Content of Soil
 - 5. D2487 Classification of Soils for Engineering Purposes
 - 6. D2922 Tests for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
 - 7. D3017 Test for Moisture Content of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth)
 - 8. D4318 Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- B. American Association of State Highway and Transportation Officials (AASHTO) latest Edition
 - 1. T88 Mechanical Analysis of Soils

1.04 QUALITY ASSURANCE

- A. Provide at least one supervisory person who shall be present at all times during execution of the work and who is thoroughly familiar with the type of work being performed and its best methods for completion. This person shall have the authority to act on behalf of Contractor.
- B. Comply with any provisions of all applicable Federal, State, and Local requirements, codes, regulations and standards.
- C. An inspection agency selected and paid by the College, will be retained to perform construction observation on-site based on density testing, visual observation, and judgment. Such observation shall not relieve Contractor from its responsibility to complete the work in accordance with the plans and specifications. Visual field confirmation and density testing of subgrade preparation and fill placement procedures will be performed by the inspection agency as part of the construction testing requirements. Geotechnical Engineer will be responsible for determining what geotechnically unsuitable material is.

- D. All costs related to re-testing due to failures shall be paid for by Contractor at no additional expense to the College. Provide free access to site for inspection activities.
- E. Laboratory testing of on-site and off-site materials proposed for use in the project shall be performed by the Contractor and provided to the Geotechnical Engineer for review. In addition, samples of off-site materials should be provided to the Geotechnical Engineer for review.
- F. In areas to receive pavement, California Bearing Ratio (CBR) tests shall be performed by the Contractor for each type of material that is imported from off-site. CBR value shall be equal to or above the values as referenced in the Geotechnical Summary Report.
- G. Following test shall be performed by the Contractor on each type of on-site or imported soil material used as compacted fill.
 - 1. Moisture and Density Relationship: ASTM D698.
 - 2. Mechanical Analysis: AASHTO T88 or ASTM D422.
 - 3. Plasticity Index: ASTM D4318.

1.05 SUBMITTALS

- A. Contact all utility companies and identify any requirements that may impact work of this section. Submit written confirmation of the status of all utility construction to the College and Architect no later than two weeks prior to mobilization of equipment and materials to the site.
- B. At least two weeks prior to mobilization of equipment and materials to the site, submit to the College and Architect a schedule detailing the sequence and time of completion of all phases of work under this section.
- C. At least two weeks in advance of imported fill delivery to the site for proposed use, submit the following laboratory test data to the College and Architect for each type of imported soil/gravel material to be used as compacted fill.
 - 1. Moisture and Density Relationship: ASTM D1557
 - 2. Mechanical Analysis: AASHTO T88 or ASTM D422

Together with the above test data, submit a 25-pound sample of each type of proposed off-site fill material in an airtight container for the review and approval by the College and Engineer. Submit the name and details of the source for the proposed material. Any change in source or soil type throughout the job requires approval of the College and Engineer. Certification of environmental compliance for each type of proposed off-site fill material shall be submitted by Contractor in accordance with the requirements of this section.

- D. At least two weeks prior to mobilization of equipment and materials to the site, submit to the College and Architect evidence substantiating its experience and qualifications as required herein.
- E. At least two weeks prior to mobilization of equipment and materials to the site, submit to the College and Architect a Health and Safety Plan.

1.06 QUALIFICATIONS

A. Contractor for work of this section shall be of one specializing in performing earthwork operations of the magnitude of this project with a minimum of five (5) years satisfactory experience.

1.07 GEOTECHNICAL ENGINEERING INVESTIGATION

A. Prior to commencement of any work, consult the records for existing structures and utilities, and note all conditions and limitations which might affect the work required under this section. The locations of any utilities shall be verified in the field by the Contractor prior to performing any earthwork.

1.08 ENVIRONMENTAL CONSIDERATIONS

- A. Maintain erosion control measures in the sequence shown on the plans to protect adjacent properties and water resources from erosion and sediment damage.
- B. All excavation, handling, hauling, on-site storage, and disposal of soil and other materials, and dewatering performed at the site shall be in accordance with any environmental requirements established for the site and as required by the Contract Drawings and Technical Specifications.

1.09 PROTECTION OF ADJACENT STRUCTURES AND PROPERTY

- A. Contractor is advised that academic and non-academic facilities exist at the site. Extensive subsurface utilities also exist at the site. Prior to commencement of any work, consult the records for existing structures and utilities and note all conditions and limitations which might affect the work required under this section. Notify utility locator service for area where project is located prior to excavation and earthwork. Any damage to utilities, permanent or temporary structures, and trees, slopes, and vegetated areas designated to remain undisturbed, as a result of Contractor's procedures/operation shall be Contractor's sole responsibility and shall be immediately reported to the College and respective utility Owner(s).
- B. All benchmarks and monuments shall be protected during construction. If disturbed or destroyed, they shall be replaced in original position by a Professional Land Surveyor licensed in the State of New Jersey at Contractor's expense.

- C. The responsibility and cost for repair for any damage to buildings, structures, utilities, sidewalks, pavement, and other facilities in the vicinity resulting from Contractor's operations shall be entirely his, and he shall take whatever measures are necessary to prevent the same. Any damage resulting from Contractor's work shall be repaired to the satisfaction of respective Owners.
- D. Provide and install temporary excavation support, shoring, bracing, and fencing and such other protection as required to insure against any damage to existing roadways, pavement, other structures, and utilities when excavation work occurs adjacent to or below same. Shoring and bracing shall be installed in accordance with Federal OSHA requirements as well as the requirements of all State and Local authorities having jurisdiction.
- E. Provide barricades, warning lights, and barriers to prevent accidents, to avoid all necessary hazards and protect the public, the work, and the property at all times, including Saturdays, Sundays and Holidays. Minimize interference of vehicular and pedestrian traffic with adjoining roads, streets, walks, and other adjacent occupied or used facilities during all operations. Protect fences, structures, sidewalks, paving, curbs, etc. to remain from equipment and vehicular traffic.
- F. Dust and Dirt Control:
 - 1. Use all means necessary to control dust on or near work.
 - 2. Thoroughly moisten all surfaces as required to prevent dust being a nuisance to the public, neighbors and performance of other work on the site.

3. Provide vehicle wheel cleaning to prevent tracking of soil, dirt, etc., onto public streets.

- G. Safety at the site, as it relates to earthwork operations, is the sole responsibility of the Contractor.
- H. Stabilize stockpiles and areas where stockpiles are placed. Stockpile materials in a manner so as not to compromise the stability or cause damage to or loss of support to existing structures, surfaces, and embankments.

1.10 PROJECT RECORD DOCUMENTS

- A. Accurately record and promptly inform the College and Architect of actual locations of all subsurface utilities, structures and obstructions encountered.
 - B. Accurately record any as-built variation from the construction plans and specifications. Provide as-built drawings to the College and Architect within 30 days of project completion.
 - C.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. On-Site Fill:
 - 1. Excavated material containing rock greater than 6 inches in its largest dimension is unacceptable as backfill at pavement subgrade elevation.
 - 2. Rock or stone less than 6 inches in its largest dimension may be mixed with suitable material and used as fill at the discretion of Geotechnical Engineer. The fill shall be mixed, placed and compacted such that voids will not exist.
 - 3. Rock may be broken and / or crushed on-site such that:
 - a. The particle size distribution is well-graded
 - b. Less than 15 percent by weight rock fragments larger than 3 inches with no particle size exceeding 6 inches, less than 30 percent by weight larger than the ³/₄ inch and less than 30 percent smaller than the No. 200 sieve
 - 4. Prior to placement, on-site fill shall not contain:
 - a. Debris
 - b. Timber or Railroad Ties
 - c. Organic Soils
 - d. Other deleterious materials such as steel rails, rebar, trash, etc.
 - 5. Excavated on-site fill containing deleterious materials, debris, and other materials deemed geotechnically unsuitable for reuse as on-site fill by Geotechnical Engineer shall be segregated from usable material for the duration of construction and disposed of off-site upon the completion of construction in accordance with all applicable regulations.
 - 6. Asphalt millings generated by milling of existing asphalt pavement should be completely removed from the site and disposed of per all applicable regulations.
- B. Off-Site Imported Fill
 - 1. If necessary, off-site fill shall be obtained and provided by Contractor.
 - 2. Fill shall be clean, well graded granular and free-draining soil which is non-expansive and non-collapsible and shall have less than 15 percent by weight rock larger than 3 inches with no particle size exceeding 6 inches, less than 30 percent by weight larger than the ³/₄ inch and less than 30 percent smaller than the No. 200 sieve. The portion passing the No. 200 sieve shall be non-plastic.

- 3. A sample of any off-site fill material shall be provided to the College and Engineer along with laboratory testing results and approval by the College and Engineer shall be obtained prior to delivery of any proposed imported fill to the site.
- 4. Imported fill shall be free of all hazardous substances as listed by the New Jersey Department of Environmental Protection in New Jersey Administrative Code, Title 7; Chapter 1E, Appendix A. Certification of compliance and, if requested, test results substantiating compliance shall be furnished to the College and Architect by Contractor not less than two weeks prior to its delivery to the site and intended use.
- 5. The fill material shall be free of organics and other deleterious materials and shall have a maximum particle size no greater than 6 inches.
- 6. The College reserves the right to test off-site fill material for conformance with these Specifications.
- C. Free Draining Granular Material Clean washed ³/₄ inch crushed stone (ASTM 57, NJDOT 57).
- D. Dense Graded Aggregate (DGA) meeting gradation requirements of the State of New Jersey Department of Transportation Standard Specifications for Roads and Bridges Construction (Section 901.08). Recycled Concrete Aggregate (RCA) shall not be used in place of DGA.
- E. Acceptable filter/drainage fabrics:
 - 1. Mirafi 100X (or equivalent as approved by the College and Architect)

2.02 EQUIPMENT

- A. Compactor Minimum 10-ton static steel drum weight vibratory smooth drum roller compactor as approved by the College and Engineer.
- B. Compactor Bomag BW75 (or equivalent, as approved by the College and Architect) double drum walk behind roller for areas where access or maneuverability is limited.
- C. Compactor Wacker BS500 (or equivalent, as approved by the College and Architect) jumping jack compactor for backfilling of very narrow trenches.
- D. Compactor 10-ton total weight sheep/pad-foot roller for cohesive soils.

PART 3 – EXECUTION

3.01 GENERAL

- A. Identify required lines, levels, contours and datum to bring site grades to the proposed subgrade conditions inferred from the drawings.
- B. Do not allow or cause any of the work performed or installed to be covered by work of this section prior to all inspections, tests and approvals.
- C. By submitting its bid, Contractor represents that it has reviewed the information provided and investigated the site to determine type, quantity, quality, and character of excavation work to be performed.
- D. Perform excavation using capable, well-maintained equipment and methods acceptable to the College and governing agencies.
- E. Material with deviations from the above requirements may be used as suitable fill if acceptable to Geotechnical Engineer; Geotechnical Engineer will be the sole judge of the suitability of all materials, whether from on-site excavations or off-site sources.
- F. When performing grading operations during periods of prolonged wet or dry weather, provide adequate measures for surface drainage and groundwater control, and moisture control of soils (i.e., wetting or drying by discing) so as to place and compact the soil at plus or minus 2 percentage points of the material's optimum water content. Any disturbed areas shall be sealed using a smooth drum roller at the end of each day.
- G. Shoring, bracing, and fencing shall be installed in accordance with Federal OSHA requirements as well as the requirements of all State and Local authorities having jurisdiction.
- H. Protect persons and property from damage and discomfort caused by dust. Water as necessary to quell dust.
- H. All underground installation of pipes, conduit, etc. in the area to be paved shall be completed prior to placement of any asphalt or concrete paving.
- I. Allow no debris to accumulate on-site. Haul debris away from the site and dispose of at no additional cost to the College in accordance with the College requirements.
- J. Any abandoned structures or abandoned utilities encountered during excavation shall be removed and disposed of or abandoned in-place by complete filling with grout or sand, subject to review and approval by Geotechnical Engineer on a case-by-case basis.

K. Stockpile excess soil on-site, at the location designated on the Project Drawings and in accordance with the approved Soil Erosion and Sediment Control Certification and accompanying drawings, notes and details.

3.02 PREPARATION

- A. Prior to all work of this section, become thoroughly familiar with the available geotechnical information, as well as the site, site conditions, and all portions of the work falling within this section.
- B. Refer to the soil erosion and sediment control plans for staging of earthwork operations and for erosion control measures to be implemented prior to commencement of earthwork.
- C. Locate and identify existing utilities that are to remain and protect them from damage.
- D. Notify utility companies to allow removal and/or relocation of any utilities that are in conflict with the proposed improvements.
- E. Protect fences, structures, sidewalks, paving, curbs, etc. to remain from equipment and vehicular traffic.
- F. Protect benchmarks, property corners and all other survey monuments from damage or displacement. If a marker needs to be removed/relocated it shall be referenced by a licensed land surveyor and replaced, as necessary, by the same at no additional cost to the College.
- G. Stockpile at designated locations, material encountered in grading operations that, in the opinion of the College, Geotechnical Engineer, or Architect, is unsuitable or undesirable for backfilling in pavement subgrade areas and utility areas. The material is to be disposed of off-site.

3.03 EXCAVATION

A. Where existing grades are above proposed subgrade elevation, excavate materials to the lines and grades shown on the Construction Drawings. The work covered under this section shall include excavation for footings, building slabs, and pavement subgrade.

3.04 COMPACTION OF PAVEMENT SUBGRADE SURFACES

- A. Thoroughly compact the exposed ground surface following asphalt removal and any required excavation with a minimum of five overlapping passes of the above specified compactor/roller and obtain at least 98 percent of the material's maximum dry density as determined by ASTM D698, Standard Proctor Test.
- B. Proof-roll subgrade by performing a minimum of two passes (in each perpendicular direction) of a loaded tandem-axle dump truck with a total weight of 20 tons.

- C. Any soft areas exhibiting excessive weaving or unsatisfactory material identified during excavation, fill placement, compaction and proof rolling shall be removed, replaced with suitable fill, and compacted as specified above.
- D. Prior to preparing the subgrade in low lying areas, perform the following procedures:
 - 1. Drain standing water by gravity or with a pump. Perform and coordinate dewatering, as necessary.
 - 2. After drainage of low area is complete, remove mulch, mud, debris, and other unsuitable material using equipment and methods that will minimize disturbance to the underlying soils.
 - 3. Thoroughly compact subgrade as specified in Section 3.4 A.

3.05 BACKFILLING AND COMPACTION

- A. The Stratum I soil has a high percentage of fines and are expected to be difficult to handle, place, and compact if they become wet. Make provisions to dry materials as necessary by discing/air drying to facilitate fill placement and compaction.
- B. No fill materials shall be placed during unfavorable weather conditions. When work is interrupted by heavy rains, fill operations shall not be resumed until all saturated surficial soils are returned to satisfactory moisture content as determined by ASTM D698.
- C. Place and compact approved fill materials in 8 inch maximum loose lifts (4 inch loose lifts where hand-operated compaction equipment is required) and obtain at least 98 percent of the material's maximum dry density as determined by ASTM D698, Standard Proctor Test.
- D. Visual confirmation of fill quality, lift thickness and compaction procedures, together with density testing, shall determine the acceptability of fill. Any unsatisfactory material or soft areas exhibiting excessive weaving shall be immediately removed, replaced and recompacted as stated above to the satisfaction of Geotechnical Engineer.
- E. No fill material shall be placed in areas of standing water, in areas of frozen or thawing ground, or in areas that have not been approved by Inspection Agency.
- F. At a minimum 1 compaction test per 500 square feet shall be performed in paver areas.

3.06 MAINTENANCE OF SUBGRADE

- A. Finished subgrades shall be verified by Contractor to ensure proper elevation and conditions for construction above subgrade.
- B. Protect subgrade from excessive construction traffic and wheel loading including concrete and dump trucks.
- C. Remove areas of finished subgrade judged to be unsatisfactory by Inspection Agency to the depth necessary and replace in a manner that will comply with compaction requirements by use of material equal to or better than the best subgrade material onsite. Surface of subgrade after compaction shall be hard, uniform, smooth, stable, and true to grade and cross-section.

3.07 FINISH ELEVATIONS AND LINES

- A. For setting and establishing finish elevations and lines, secure the services of a licensed land surveyor acceptable to the College and Engineer.
- B. Provide elevation grade stakes and any other surveying necessary for the layout of the work. Conduct work in such a manner that survey stakes will be protected as long as their need exists. Grade stakes, which are damaged or stolen, shall be replaced by Contractor's surveyor at Contractor's expense.
- C. Graded areas shall be uniform, hard and smooth, free from rock, debris, or irregular surface changes. Finished subgrade surface shall not be more than 0.10 feet above or below the design finished subgrade elevation; any deviation shall not result in changes in drainage areas or ponding. All ground surfaces shall vary uniformly between indicated elevations.
- D. Areas having drainage slopes of one-quarter inch per foot or more shall have grade stakes, set with an instrument, at grid intervals of fifty (50) feet.
- E. Areas having drainage slopes of one-quarter inch per foot or less shall have grade stakes, set with an instrument, at grid intervals of twenty-five (25) feet.

END OF SECTION 310000

SECTION 311100

SITE CLEARING

PART 1 – GENERAL

1.01 DESCRIPTION OF WORK

- A. Work of this section includes all labor, materials, equipment and services necessary to provide site clearing within the contract limits, or within other limits if indicated, including, but not necessarily limited to the following:
 - 1. Protection of improvements to remain.
 - 2. Removal of trees and other vegetation.
 - 3. Topsoil stripping and stockpiling.
 - 4. Clearing and grubbing. Clearing and grubbing includes complete removal of below grade roots and organic materials.
 - 5. Removal of at-grade, below-grade, and above-grade improvements if so indicated on the plans, or encountered within limits of disturbance.
 - 6. Saw cut existing bituminous asphalt and/or concrete pavements at limits to remain.

1.02 RELATED SECTIONS AND DOCUMENTS

- A. Section 311400 Site Preparation
- B. Section 312500 Soil Erosion and Sediment Control
- C. Geophysical Investigation Report, dated 1 April 2024 by American Geophysics, Inc.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 GENERAL

A. Comply with governing erosion control ordinances. Do not begin earthmoving activities until erosion control measures are in place.

3.02 PROTECTION OF EXISTING IMPROVEMENTS

- A. Provide covering, other types of protection necessary to prevent damage to existing improvements not scheduled for removal.
- B. Protect improvements on adjoining properties as well as on public right-of-ways.

C. Restore damaged improvements to their same condition as at start of work as acceptable to Owner of damaged improvements.

3.03 REMOVAL

- A. Removal of at-grade, below-grade and above-grade improvements: Remove concrete walks, bituminous pavements, and utility systems as identified on the plans, or as may be encountered, and other existing improvements in way of new work and elsewhere as specifically indicated. Saw cut existing pavements to remain. Remove only to the limits required for the installation of proposed improvements, unless specifically indicated otherwise. Include removal of crushed stone, gravel, other bases, and other work removed under this requirement.
- B. Fill depressions caused by work of this section as indicated on the plans.

3.04 DISPOSAL OF WASTE MATERIALS

- A. Remove waste materials from public property and dispose of off-site in legal manner.
- B. Burning of waste materials on public property is not permitted.

END OF SECTION 311100

SECTION 311400

SITE PREPARATION

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Cleaning site of debris, grass, trees, and other plant life in preparation for site or building earthwork.
- B. Protection of existing structures, trees, or vegetation indicated in Contract Documents to remain.
- C. Stripping topsoil, if necessary, from areas that are to be incorporated into limits of project and where so indicated on Construction Drawings.
- D. Stripping/milling asphalt, if necessary, from areas that are to be incorporated into limits of project and where so indicated on Construction Drawings.

1.02 RELATED SECTIONS AND DOCUMENTS

- A. Section 311100 Site Clearing
- B. Section 312500 Soil Erosion and Sediment Control
- C. Geophysical Investigation Report, dated 1 April 2024 by American Geophysics, Inc.

1.03 REFERENCE STANDARDS

- A. New Jersey Soil Erosion and Sediment Control (SESC) Manual
- B. SESC Project Permit and Conditions

1.04 PROJECT CONDITIONS

- A. Conditions existing and described by Owner at time of inspection for bidding purposes will be maintained by Owner in so far as practical.
- B. Variations to conditions or discrepancy in actual or described as proposed conditions as they apply to site preparation operations are to be brought to attention of Owner prior to commencement of site work.

PART 2 – PRODUCTS

2.1 Off-site materials shall be transported to project using well maintained and operating vehicles. Once on-site, transporting vehicles shall stay on designated haul roads and shall at no time endanger improvements by rutting, overloading, or pumping.

PART 3 – EXECUTION

3.01 PREPARATION

A. Verify existing plant life that is to remain and any clearing limits are clearly tagged, identified, and marked in such manner as to insure their safety throughout construction operations.

3.02 PROTECTION

- A. Locate and identify existing utilities that are to remain and protect from damage.
- B. Protect trees, plant growth and features not designated for removal.
- C. Conduct operations with minimum interference to public or private accesses and facilities. Maintain ingress and egress at all times and clean or sweep roadways daily as required by the College. Dust control shall be provided with sprinkling systems or equipment provided by the Contractor.
- D. Protect retaining walls, benchmarks, property corners, and other survey monuments from damage or displacement. If marker needs to be removed it shall be referenced by a licensed land surveyor and replaced, as necessary, by same at Contractor's cost.
- E. Provide traffic control as required, in accordance with the U.S. Department of Transportation's "Manual on Uniform Traffic Control Devices", New Jersey Department of Transportation, Local and County requirements, and College requirements.

3.03 CLEARING

- A. Clear areas required for execution of work.
- B. Unless otherwise indicated on Construction Drawings, remove trees, shrubs, grass, other vegetation, improvements, or obstructions interfering with installation of new construction. Removal includes digging out stumps, roots, and organic materials. Depressions caused by clearing and grubbing operations are to be filled to subgrade elevation to avoid ponding of water. See Section 311100 Site Clearing for detailed specifications.
- C. Remove grass, trees, plant life, stumps, and other construction debris from site to dump site that is suitable for handling such material according to state laws and regulations.

3.04 TOPSOIL EXCAVATION

- A. Topsoil shall consist of organic surficial soil found in depth of not less than 6 to 8 inches. Satisfactory topsoil is reasonably free of subsoil, clay lumps, stones and other objects over 2-in. in diameter, weeds, roots, and other objectionable material.
- B. Cut heavy growths of grass from areas before stripping and remove cuttings with remainder of cleared vegetative material.
- C. Strip topsoil from areas that are to be filled, excavated, landscaped, or re-graded to such depth that it prevents intermingling with underlying subsoil or questionable material.
- D. Stockpile topsoil in storage piles in areas as directed by the College. Construct storage piles to freely drain surface water. Cover storage piles as necessary to prevent windblown dust. Dispose of unsuitable topsoil in accordance with state and federal requirements, unless otherwise specified by Owner. Excess topsoil shall not be taken off campus unless directed by Owner.
- E. Stockpiled topsoil shall be reused as general fill in landscaped areas as permitted by Owner's Geotechnical Engineer.

END OF SECTION 311400

SECTION 312316

TRENCH EXCAVATION AND BACKFILL FOR UTILITIES

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Excavating trenches for the installation of utilities.
- B. Provision of all temporary excavation support necessary to facilitate trench excavation, utility installation and backfilling in accordance with this Specification, and in coordination with work required by Section 315000 – Temporary Excavation Support and Protection.
- C. Removal and disposal of material deemed by Owner's Engineer to be geotechnically unsuitable for reuse as on-site fill.
- D. Segregation and stockpiling of excavated soils.
- E. Dewatering as necessary to facilitate excavation, construction of utilities and compacted fill placement in the dry, and in coordination with Section 312319 Dewatering.
- F. Backfilling trench with bedding material as specified and finish filling trenches with suitable material to proposed subgrade.
- G. Compacting subgrade, bedding, and backfill materials in an acceptable manner.

1.02 RELATED SECTIONS AND DOCUMENTS

- A. Section 310000 Earthwork
- B. Section 312319 Dewatering
- C. Section 315000 Temporary Excavation Support and Protection
- D. Section 330100 Protection of Existing Utilities
- E. The applicable provisions of the New Jersey Edition of the International Building Code 2012 (NJIBC 2012), or latest edition.
- F. Construction Plans and Specifications where the Contract requirements are more stringent than the requirements as specified herein.

1.03 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM) Latest Edition

- 1. D422 Standard Test Method for Particle-Size Analysis of Soils
- 2. D1557 Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³)
- 3. D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- 4. D2487 Standard Practice for Classification of Soils for Engineering Purposes (Unified Soils Classification System)
- 5. D6938 Standard Test Method for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth)
- B. American Association of State Highway and Transportation Officials (AASHTO) latest edition
 - 1. T88 Standard Method of Test for Particle Size Analysis of Soils

1.04 QUALITY ASSURANCE

- A. Provide at least one supervisory person who shall be present at all times during execution of the work and who is thoroughly familiar with the type of work being performed and its best methods for completion. This person shall have the authority to act on behalf of Contractor.
- B. Comply with any provisions of all applicable Federal, State, and Local requirements, codes, regulations and standards.
- C. A testing agency hired by the College will perform construction observation and testing of backfilling operations as specified in Section 310000 Earthwork of these Technical Specifications and as stated herein. Owner's Engineer will perform density testing and visual observation. This observation shall not relieve Contractor from its responsibility to complete the work in accordance with the plans and specifications. Owner's Engineer will be solely responsible for determining geotechnically unsuitable material.
- D. All costs related to re-testing due to failures shall be paid for by Contractor at no additional expense to Owner. Free access to the site for Owner's Engineer's activities shall be provided.

1.05 SUBMITTALS

A. Contact all utility companies and identify any requirements that may impact work of this section. Submit written confirmation of the status of all utility construction to Owner no later than two weeks prior to mobilization of equipment and material to the site.

- B. At least two weeks prior to mobilization of equipment and material to the site, submit to Owner and Owner's Engineer a schedule detailing the sequence and time of completion of all phases of work under this section.
- C. At least two weeks prior to mobilization of equipment and material to the site, submit to Owner and Owner's Engineer its proposed excavation means and methods, and equipment to be utilized for such work. Include proposed method of temporary excavation support to be utilized to facilitate proposed utility excavation and installation, and backfilling at the site in accordance with the Contract Drawings and Technical Specifications.
- D. At least two (2) weeks in advance of imported fill delivery to the site for proposed use, submit the following laboratory test data to Owner's Engineer for each type of imported material to be used as compacted fill.
 - 1. Moisture and Density Relationship: ASTM D1557
 - 2. Mechanical Analysis: AASHTO T-88 or ASTM D422

Together with the above test data, submit a 25-pound representative sample of each type of proposed fill material in an air tight container for the review and approval by Owner's Engineer. Also submit the name and details of the source for the proposed material, and any necessary environmental certificates. Any change in source of imported fill material type throughout the job requires approval of Owner's Engineer. Certification of environmental compliance for each type of proposed off-site fill material shall be submitted by the Contractor in accordance with the requirements of Section 310000 – Earthwork.

- E. At least two weeks prior to mobilization of equipment and materials to the site, submit proposed dewatering means and methods and equipment to be utilized for such work for review by Owner's Engineer.
- F. At least two weeks prior to mobilization of equipment and materials to the site, submit to Owner and Owner's Engineer evidence substantiating qualifications as required herein.

1.06 QUALIFICATIONS

A. Contractor for work of this section shall be of one specializing in performing trench excavation and backfill for utilities of the size and depth as required for this project with a minimum of five (5) years satisfactory experience.

1.07 ENVIRONMENTAL CONSIDERATIONS

- A. Maintain erosion control measures installed as specified on the Contract Drawings to protect adjacent properties and water resources from erosion and sediment damage.
- B. All excavation, handling, hauling, on-site storage, and disposal of soil and other materials, and dewatering performed at the site shall be in accordance with any

environmental requirements established for the site and as required by the Contract Drawings and Technical Specifications.

C. Perform all work of this section in accordance with the most recently adopted and applicable general industry (29 CFR 1910) and construction (29 CFR 1926) standards of the Federal Occupational Safety and Health Administration (OSHA), U.S. Department of Labor, as well as any other Federal, State, or Local applicable statutes or regulations.

1.08 PROTECTION OF ADJACENT STRUCTURES AND PROPERTY

- A. Prior to commencement of any work, consult the records for existing structures and utilities and note all conditions and limitations which might affect the work required under this section. Notify utility locator service for area where project is located prior to excavation and earthwork. Any damage to utilities, permanent or temporary structures, and trees, slopes, and vegetated areas designated to remain undisturbed, as a result of Contractor's procedures/operation shall be Contractor's sole responsibility, and shall be immediately reported to Owner and respective utility Owner(s).
- B. All benchmarks and monuments shall be protected during construction. If disturbed or destroyed, they shall be replaced in original position by a Professional Land Surveyor licensed in the State of New Jersey at Contractor's expense.
- C. The responsibility and cost for repair for any damage to buildings, structures, utilities, sidewalks, pavement, and other facilities in the vicinity resulting from Contractor's operations shall be entirely its, and it shall take whatever measures are necessary to prevent the same. Any damage resulting from Contractor's work shall be repaired to the satisfaction of the respective Owners.
- D. Provide and install temporary excavation support, shoring, bracing, and fencing and such other protection as required to insure against any damage to existing streets, pavement, other structures, and utilities when excavation work occurs adjacent to or below same. Shoring and bracing shall be installed in accordance with Section 315000 Temporary Excavation Support and Protection and in accordance with Federal OSHA requirements as well as the requirements of all State and Local authorities having jurisdiction.
- E. Provide barricades, warning lights, and barriers to prevent accidents, to avoid all necessary hazards and protect the public, the work, and the property at all times, including Saturdays, Sundays and Holidays. Minimize interference of vehicular and pedestrian traffic with adjoining roads, streets, walks, and other adjacent occupied or used facilities during all operations. Protect fences, structures, sidewalks, paving, curbs, etc. to remain from equipment and vehicular traffic.
- F. Dust and Dirt Control:
 - 1. Use all means necessary to control dust on or near work.
 - 2. Thoroughly moisten all surfaces as required to prevent dust being a nuisance to the public, neighbors and performance of other work on the site.

- 3. Provide vehicle wheel cleaning to prevent tracking of soil, dirt, etc., onto public streets and adjacent access drive areas.
- G. Safety at the site as it relates to trench excavation and utility installation operations shall be the sole responsibility of the Contractor.

1.09 PROJECT RECORD DOCUMENTS

- A. Accurately record and promptly inform Owner and Owner's Engineer of actual locations of all subsurface utilities, structures and obstructions encountered.
- B. Accurately record any as-built variation from the construction plans and specifications. Provide as-built drawings within 30 days of project completion.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Bedding Material:
 - 1. AASHTO No. 67 processed sand and gravel free from debris, clay lumps, organic, or other deleterious material, and complying with the following gradation requirements:

U. S. Sieve Size	Percent Passing (by weight)
1 inch	100
3/4 inch	90-100
3/8 inch	20-55
No. 4	0-10
No. 8	0-5

Alternate bedding material shall be subject to review and approval by Owner's Engineer.

- B. On-site fill for backfilling of utility excavations shall meet the requirements for onsite fill as identified in Section 310000 – Earthwork.
- C. Off-site imported fill material for backfilling of utility excavations shall meet the requirements for off-site fill or dredged material as identified in Section 310000 Earthwork.

D. Filter/drainage fabric: Mirafi 140N (or equivalent as approved by Owner's Engineer).

2.02 EQUIPMENT

A. Compactor – Minimum 5 ton static drum weight vibratory smooth drum and sheepsfoot rollers as approved by Owner's Engineer.

- B. Compactor Wacker RT-82SC (or equivalent, as approved by Owner's Engineer) double drum walk behind roller for areas where access or maneuverability is limited.
- C. Compactor Wacker BS500 (or equivalent, as approved by Owner's Engineer) jumping jack compactor for backfilling of very narrow trenches.

PART 3 – EXECUTION

3.01 GENERAL

- A. Set all lines, elevations, and grades for utility and drainage system work and maintain for the duration of work. Provide careful maintenance of benchmarks, property corners, monuments, or other reference points.
- B. Protect and maintain in operating condition existing utilities encountered during utility installation. Repair any damage to surface or subsurface improvements shown on Contract Drawings.
- C. Verify location, size, elevation, and other pertinent data required to make connections between existing utilities and drainage systems, and proposed construction indicated on Drawings. Coordinate all utility connection locations and elevations with site-civil plans. Comply with all Local codes and regulations.
- D. Perform dewatering in accordance with requirements of Section 312319 -Dewatering to facilitate utility construction and placement and compaction of bedding and backfill materials.
- E. Over-excavate and properly prepare areas of subgrade that are not capable of supporting the proposed systems. These areas shall be stabilized by using acceptable backfill materials and/or additional bedding material placed and compacted as specified to the satisfaction of Owner's Engineer.

3.02 EXCAVATION

- A. Contact Local utility companies and the College before excavation begins. Dig trenches at proper width and depth for laying pipe, conduit, or cable and in accordance with utility company requirements. Cut trench banks for safety and remove stones as necessary to avoid point-bearing.
- B. All trench excavation side walls shall be sloped, shored, sheeted, braced or otherwise supported by means of sufficient strength to protect the workmen within them in accordance with the applicable rules and regulations established for construction by the Department of Labor, Occupational Safety and Health Administration (OSHA), and by Local ordinances. Temporary excavation support shall be provided in accordance with the requirements of Section 315000 – Temporary Excavation Support and Protection.
- C. Trench width requirements below the top of the pipe shall not be less than 12 inches nor more than 2 feet wider than outside surface of any pipe or conduit that is to be installed. All other trench width requirements for pipe, conduit, or cable shall

be the minimum practical width that will allow for proper compaction of trench backfill and satisfy safety and utility company regulations.

- D. Accurately grade trench bottom to an elevation 6 inches below the pipe, per bedding details in Contract Drawings. Provide uniform bearing and support for each section of pipe on bedding material at every point along the entire length, except where necessary to excavate for bell holes, pipe joints, or other required connections. Dig bell holes and depressions for joints after trench bottom has been graded. Dig no deeper, longer, or wider than needed to make the joint connection properly.
- E. During excavation, stockpile excavated material suitable for backfilling in an orderly manner far enough from the trench to avoid overloading, slides, or cave-ins.
- F. Stockpile excavated materials deemed by Owner's Engineer to be geotechnically unsuitable for backfill, as indicated in Section 310000 Earthwork of these Technical Specifications.
- G. Any abandoned structures, utilities or debris discovered during excavation shall be removed and disposed of, abandoned in place by complete filling with grout or sand, or capped subject to review and approval by Owner's Engineer on a case-by-case basis. Under no circumstances shall abandoned structures, utilities, or debris discovered during excavation within the proposed building footprints be abandoned in place. For these instances, the structure, utility, or debris must be removed and backfilled with suitable fill material approved by the Owner and Geotechnical Engineer.
- H. Utility alignments have been designed to avoid expected obstructions wherever possible. If unanticipated significant obstructions are encountered during utility installation work immediately notify Owner and Engineer.
- Prevent surface water from flowing into trenches or other excavations by temporary grading or other methods, as required. Remove accumulated water in trenches or other excavations by pumping or other acceptable methods. Dewatering shall be performed in accordance with the requirements of Section 312319 – Dewatering. Coordinate dewatering with any established dewatering effluent limitations.
- J. Utility installation shall meet the following minimum pipe installation depths, or applicable codes and ordinances, measured from finished grade or the paved surface.
 - 1. Storm Sewer: Elevations and grades as shown on Contract Drawings.

3.03 PIPE BEDDING

A. Accurately cut trenches for pipe or conduit to designated line and grade 6 inches below the bottom of the pipe or as otherwise indicated on the Contract Drawings, to width as specified previously. Compact trench bottoms to a minimum of 95% of the material's maximum dry density as determined by ASTM D1557, Modified Proctor Test.

- B. Over-excavate unstable soil from trench bottom to provide a suitable base for continuous and uniform bedding. The maximum depth of over-excavation shall be 2 ft below proposed utility subgrade elevation, or as otherwise approved by Owner's Engineer.
- C. Place bedding material and compact in 8 inch loose lifts to obtain at least 95% of the material's Modified Proctor maximum dry density. Accurately shape bedding material to conform to lower portion of pipe barrel. After pipe installation, place and compact bedding material around the pipe as specified above in maximum 8 inch loose lifts to the springline of the pipe.

3.04 BACKFILLING

- A. After pipe or conduit has been installed, bedded and tested as necessary, backfill trench to finish grade in 12 inch thick loose lifts using fill soils approved by Owner's Engineer, compacting each lift as specified above and in accordance with requirements of Section 310000 Earthwork of these Technical Specifications. Thinner lifts shall be used where smaller compaction equipment (i.e. walk-behind roller or jumping jack) is used.
- B. Dewatering shall be performed as necessary to facilitate placement and compaction of fill.
- C. Systematically backfill to allow maximum time for natural settlement. Do not backfill over porous, wet, frozen or spongy subgrade surfaces. Should these conditions exist, the areas shall be removed, replaced and re-compacted in accordance with the requirements of Section 310000 Earthwork of the Technical Specifications.
- D. For cases where groundwater is encountered within a utility excavation, and only with prior approval by Owner's Engineer, backfilling shall be done using 3/4-inch clean crushed stone to a level 6 inches above the encountered groundwater level and then using approved compacted fill.

3.05 COMPACTION

A. All off-site materials used for backfill shall be tested in accordance with Section 310000 – Earthwork of these Technical Specifications.

B. Exercise proper caution when compacting immediately over top of pipes or conduits.

C. Maintain optimum moisture content of fill materials to attain required compaction density.

D. Compaction of backfill shall be performed in accordance with the requirements of Section 310000 – Earthwork.

END OF SECTION 312316

SECTION 312319

DEWATERING

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, services, equipment, and other necessary items required for construction dewatering operations and to construct proposed site improvements shown on the Contract Documents. This shall include, but not be limited to, the following:
 - 1. Excavate for, maintain, and backfill on-site seepage pits for temporary storage and disposal of dewatering discharge.
- B. Obtain all applicable permits required for work described herein.

1.02 RELATED SECTIONS AND DOCUMENTS

- A. Section 310000 Earthwork
- B. Section 312316 Temporary Excavation and Backfill for Utilities
- C. Section 312500 Soil Erosion and Sediment Control
- D. Section 335000 Temporary Excavation Support and Protection
- E. Geophysical Investigation Report, dated April 1, 2024 by American Geophysics, Inc.

1.03 REFERENCE STANDARDS

- A. N.J.A.C. 7:9A Standards for Individual Subsurface Sewage Disposal Systems, latest edition
- B. N.J.A.C. 7:9D New Jersey Well Construction, Maintenance, and Sealing of Abandoned Wells
- C. N.J.A.C. 7:14A New Jersey Pollutant Discharge Elimination System
- D. N.J.A.C. 7:19 New Jersey Water Supply Allocation Rules
- E. The New Jersey Association of Conservation Districts, Standards for Soil Erosion and Sediment Control in New Jersey, latest edition

1.04 QUALITY ASSURANCE

- A. Codes and Standards:
 - 1. Perform work specified herein and shown on the Contract Drawings in compliance with applicable requirements of all Federal, State and Local authorities having jurisdiction.
- B. Provide at least one supervisory person who shall be present at all times during execution of the work and who is thoroughly familiar with the type of work being performed and its best methods for completion. This person shall have the authority to act on behalf of Contractor.
- C. Perform dewatering as necessary to prevent hydrostatic uplift forces acting on utility structures, pipes, foundations, and other appurtenances associated with below grade construction.
- D. Evaluate the pre-construction groundwater elevations and in-situ permeability rates characteristic of the site soils.
- E. Contractor for work and/or of its Subcontractor shall be one specializing in the installation and operation of dewatering equipment and shall submit evidence substantiating a minimum of five (5) years satisfactory experience in the installation and maintenance of such systems. These criteria shall not disqualify Contractor provided that it submits sufficient evidence of experience deemed acceptable by Owner's Engineer upon request.

1.05 SUBMITTALS

A. Submit to Owner and Owner's Engineer, a minimum of two (2) weeks prior to the start of work, an excavation dewatering plan and methods to Owner and Owner's Engineer for review. The Plan and methods shall include a description of the proposed on-site seepage pits and dewatering procedures to be used. Proposed procedures and methods for disposal of water shall prevent damage to existing structures, roadways and utilities, and shall conform to all applicable Federal, State, and Local requirements.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Pumping equipment shall be determined by the Contractor in accordance with his submitted dewatering plan and methods, and reviewed by the Owner's Engineer.

PART 3 – EXECUTION

3.01 GENERAL REQUIREMENTS

- A. Dewatering shall be performed as needed for the period of excavation and installation of below grade work (utilities, drainage, etc.)
- B. Water shall be discharged in accordance with all applicable Federal, State, and Local requirements.

3.02 CLEANING/PROTECTION/ADJUSTMENT

- A. Patch, repair, or replace any improvements, or work of other sections, damaged or cut by work of this section, subject to approval by Owner or other applicable party.
- B. At termination of pumping activities, remove from the site all equipment and installations of the dewatering system.

3.03 DRAINAGE AND PUMPING

- A. It is Contractor's responsibility to furnish, operate and maintain sufficient drainage and pumping facilities to dewater the site and its underlying soil so that the excavation can proceed while maintaining stable slopes and without disturbing the bearing subgrades for existing structures, utilities, pavement, or other features.
- B. Dewatering of groundwater shall be performed to maintain the groundwater level at all times at a level which properly facilitates installation of proposed work.
- C. Discharges of the pumped water shall be performed in strict accordance with all applicable Federal, State, and Local regulatory agency requirements and directives.
- D. The dewatering shall be performed in such a manner as to avoid the movement of fines or loss of ground support and loss of support from below the bearing level for existing and new utilities and shall not compromise the stability of surrounding areas and structures to remain.
- E. Owner and Owner's Engineer shall be notified immediately if oil, free product, or other gross liquid contamination is found in the excavations being dewatered. Oil and other liquid contaminants shall be pumped into holding tanks, drums, or other containers suitable for off-site disposal.

3.04 SURFACE RUNOFF MANAGEMENT

A. Surface water on and around the site is to be collected into local sumps by means of trenches, pipes, etc. The surface water runoff shall be discharged by Contractor in accordance with the approved Soil Erosion and Sediment Control Plan for the Project.

- B. Surface erosion, ponding and softening of slopes and berms shall be minimized.
- C. Surface water shall not be directed into the storm water system and not permitted to enter the excavation.
- D. Temporarily grade exposed soil subgrade areas to facilitate run-off of surface water. Exposed soil subgrade areas shall be sealed using a smooth drum roller at the end of each day to facilitate run-off of stormwater.

3.05 DISPOSAL OF CONSTRUCTION DEWATERING DISCHARGE TO ON-SITE SEEPAGE PITS

- A. Prior to start of construction, identify proposed seepage pit locations. The seepage pits shall be located on-site within the limits of disturbance show on the Contract Drawings. Areas outside of the specified work limits should only be used with prior written approval from the Owner and the Owner's Engineer.
- B. The seepage pit design shall include berms or other features around the pit to prevent surface runoff from entering the pit.
- C. If at any time during the work, the seepage pits cannot accept the dewatering discharge flow rate, immediately notify Owner and Owner's Engineer for authorization to utilize alternate methods of managing dewatering discharge. Alternate methods may include additional seepage pit construction, or temporary holding tanks.
- D. It shall be Contractor's responsibility to evaluate and maintain the stability of seepage pit side sloes and surrounding areas. Under no circumstances shall deterioration or instability of seepage pit side slopes that will result in discharge of construction dewatering affluent to surface water or to the existing site storm drainage system be allowed.
- E. At the conclusion of construction, backfill any seepage pit in accordance with the backfilling and compaction requirements provided in Section 310000 Earthwork.
- F. Under no circumstances shall Contractor allow the dewatering affluent to discharge to the storm drainage system, the sanitary sewer, or to surface water bodies without written approval from Owner.

END OF SECTION 312319

SECTION 312500

SOIL EROSION AND SEDIMENT CONTROL

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Temporary and permanent soil erosion control systems.
- B. Slope Protection Systems.

1.02 RELATED SECTIONS

A. Construction Drawings and Soil Erosion and Sediment Control Permit (and permit conditions).

1.03 REFERENCE STANDARDS

A. The New Jersey Association of Conservation Districts, Standards for Soil Erosion and Sediment Control in New Jersey, January 2014, last revised July 2017, or latest edition.

1.04 QUALITY ASSURANCE

- A. Implement soil erosion controls in a timely manner.
- B. Carefully adhere to the construction sequence that is shown on the Construction Drawings.
- C. Follow Soil Erosion and Sediment Control Notes that are shown on the Construction Drawings and which are dictated by the Mercer County Soil Conservation District (609-586-9603).
- D. Make frequent inspection of temporary soil erosion controls and maintain them in working order until permanent soil erosion controls are established.

1.05 ENVIRONMENTAL REQUIREMENTS

- A. Protect adjacent properties and water resources from soil erosion and sediment damage throughout construction.
- B. Discharge from dewatering operations shall not be directed to surface waters.

PART 2 – PRODUCTS

2.01 MATERIALS

A. Sod as specified on the Construction Drawings.

- B. Temporary mulches such as loose hay, straw, netting, wood cellulose or agricultural silage.
- C. Fencing for siltation control as specified on the Construction Drawings.
- D. Fence stakes shall be metal stakes a minimum of 4 feet in length and be either metal stakes or 2 in by 2 in hardwood stakes driven 2'-0" into the ground.
- E. Filter fabric as specified on the Construction Drawings.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Review site conditions and sediment control plans.
- B. Review the soil erosion and sediment control plans as they apply to current conditions. Any proposed deviation from the plans must be submitted to the College and the Engineer in writing 48 hours prior to commencing that work.
- C. Notify Mercer County Soil Conservation District, 590 Hughes Drive, Hamilton Square, NJ, 08690 by fax (609) 586-1117 at least 48 hours prior to initial land disturbance in accordance with the Construction Drawings.

3.02 SOIL EROSION CONTROL AND SLOPE PROTECTION IMPLEMENTATION

- A. Place soil erosion control systems in accordance with the staging and features shown on the sediment control plans prior to any earthwork construction and immediately following the construction of any storm drainage devices.
- B. Limit the surface area of erodible earth material exposed by clearing and grubbing, excavation, borrow and embankment operations by following construction phasing in the sediment control plans.
- C. Incorporate all permanent soil erosion control features into the project at the earliest practical time to minimize the need for temporary controls. Cut slopes shall be permanently seeded and mulched as the excavation proceeds to the extent considered desirable and practical. Equip catch basins with filter fabric inlet protection immediately upon construction.
- D. The temporary soil erosion control systems installed shall be maintained as directed by Engineer to control siltation at all times during the life of the contract. Respond to any maintenance or additional work ordered by Engineer within a 48-hour period.
- E. Slopes that erode easily shall be temporarily seeded as the work progresses with quickgrowing grasses as specified on the Construction Drawings.

- F. All soil erosion control measures shall be maintained until all permanent improvements to the site are complete unless otherwise directed by Engineer.
- G. Upon completion of all earth disturbance activities and the successful implementation of permanent stabilization measures, obtain the District issued statement of compliance.

END OF SECTION 312500

SECTION 315000

TEMPORARY EXCAVATION SUPPORT AND PROTECTION

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Provision of all temporary excavation support necessary to facilitate proposed construction at the site required by the Contract Drawings and Technical Specifications. Supply all materials, equipment and labor required to furnish, install, maintain, and remove an excavation support and protection system capable of supporting excavation sidewalls, and of resisting soil and hydrostatic pressure.
- B. Protection of adjacent structures, utilities, parking lot areas, and roadways which are to remain. Install, maintain, and (where required) remove its temporary excavation support and protection system so as not to damage any existing utilities that are to remain.

1.02 RELATED SECTIONS AND DOCUMENTS

- A. Geophysical Investigation Report, dated 1 April 2024 by American Geophysics, Inc.
- B. Section 310000 Earthwork
- C. Section 312316 Trench Excavation and Backfill for Utilities
- D. Section 312319 Dewatering
- E. The applicable provisions of the New Jersey Edition of the International Building Code 2012 (NJIBC 2012), or latest edition.
- F. Construction Plans and Specifications where the Contract requirements are more stringent than the requirements outlined herein.

1.03 REFERENCE STANDARDS

A. Federal Occupational Safety and Health Administration (OSHA), U.S. Department of Labor general industry (29 CFR 1910) and construction (29 CFR 1926) standards, latest adopted version.

1.04 QUALITY ASSURANCE

A. Provide at least one supervisory person who shall be present at all times during execution of the work and who is thoroughly familiar with the type of work being performed and its best methods for completion. This person shall have the authority to act on behalf of Contractor.

- B. Comply with any provisions of all applicable Federal, State, and Local requirements, codes, regulations and standards.
- C. The method and adequacy of temporary excavation support system shall be the sole responsibility of the contractor.
- D. Coordination of work with Geotechnical Engineer to assure that all tests and procedures required by the Contract Documents are properly provided shall be the sole responsibility of the Contractor.

1.05 SUBMITTALS

- A. Unless otherwise indicated, transmit all submittals to the College and Geotechnical Engineer. Acknowledgement for concepts and details shown shall be received by the Contractor. Such acknowledgement shall be of the concept only and shall not in any way diminish or relieve Contractor of sole responsibility for the adequacy of his procedures and the satisfactory performance of his excavation support and protection system.
- B. Submit satisfactory proof of qualifications for performing the work specified herein, at least two weeks prior to the delivery of any equipment or materials to the site.
- C. Submit excavation support and protection plan and methods a minimum of two weeks prior to the start of work and shall include the following:
 - 1. Details, arrangement, and method of assembly of proposed system components.
 - 2. Location of the excavation support system installation.
 - 3. Typical cross-section, including:
 - a. Full excavation depth.
 - b. Elevation for the bottom of the excavation.
 - c. Elevation for the top and toe of the support system.
 - d. Minimum embedment below the bottom of the excavation.
 - e. Location of any necessary bracing.
 - 4. Calculations signed and sealed by a Professional Engineer licensed in New Jersey. The component members of the system shall be designed for earth pressures, unrelieved hydrostatic pressures, and any construction or vehicle surcharges.
 - 5. The materials and procedures Contractor intends to use for installing and, where necessary, removing the temporary excavation support.
- D. Review of Contractor's plans and methods of construction does not relieve Contractor of the responsibility for the adequacy and performance of his temporary excavation support system.

1.06 QUALIFICATIONS

A. Contractor for work of this section shall specialize in the use of temporary excavation support for deep excavations and shall submit evidence substantiating a minimum of five (5) years satisfactory experience.

1.07 ENVIRONMENTAL CONSIDERATIONS

- A. Maintain erosion control measures installed as specified on the Contract Drawings to protect adjacent properties and water resources from erosion and sediment damage.
- B. All excavation, handling, hauling, on-site storage, and disposal of soil and other materials, and dewatering performed at the site shall be in accordance with any environmental requirements established for the site and as required by the Contract Drawings and Technical Specifications.
- C. Perform all work of this section in accordance with the most recently adopted and applicable general industry (29 CFR 1910) and construction (29 CFR 1926) standards of the Federal Occupational Safety and Health Administration (OSHA), U.S. Department of Labor, as well as any other Federal, State, or Local applicable statutes or regulations.

1.08 PROTECTION OF ADJACENT STRUCTURES AND PROPERTY

- A. Prior to commencement of any work, consult the records for existing structures and utilities and note all conditions and limitations which might affect the work required under this section. Notify utility locator service for area where project is located prior to excavation and earthwork. Any damage to utilities, permanent or temporary structures, as a result of Contractor's excavation support procedures/operation shall be Contractor's sole responsibility, and shall be immediately reported to Owner and respective utility Owner(s).
- B. Protect structures, underground utilities, and other construction from damage caused by work of this section. Any damage to adjacent structures and/or utilities to remain as a result of Contractor's work of this section shall be Contractor's sole responsibility, and shall be immediately reported to respective Owners. All costs associated with repairing any damage shall be Contractor's sole responsibility, and such repairs shall be made to the satisfaction of respective Owners.

PART 2 – PRODUCTS

2.01 EXCAVATION SUPPORT SYSTEM

A. Materials comprising or used to fabricate the excavation support system shall by determined by Contractor.
PART 3 – EXECUTION

3.01 GENERAL

- A. Install and maintain an excavation support and protection system capable of supporting excavation sidewalls, and of resisting soil, hydrostatic, surcharge, and construction loads.
- B. Proceed with caution in the vicinity of existing utilities. Expose them by hand excavation or other methods necessary so as to prevent damage to subject utilities. If existing utilities interfere with proposed method of support, notify the Owner and Owner's Engineer.
- C. Coordinate work of this section with any dewatering requirements in accordance with Section 312319 Dewatering.

3.02 EXCAVATION SUPPORT SYSTEM

- A. Furnish and construct a temporary excavation support system in accordance with its submitted and reviewed plans.
- B. Maintain the temporary excavation support system as necessary to facilitate the work.
- C. The excavation support system shall be removed in a manner which permits compaction of the backfill as specified in Section 310000 – Earthwork and Section 312316 – Trench Excavation and Backfill for Utilities, and results in filling of voids (if any).
- D. The temporary excavation support system shall be left in place only with prior written permission of Owner.

END OF SECTION 315000

SECTION 32 1300

PORTLAND CEMENT CONCRETE PAVING

PART 1 – GENERAL

1.01 SCOPE OF WORK

A. Concrete, loading areas, curbs, and pads.

1.02 RELATED SECTIONS AND DOCUMENTS

- A. Section 31 1100 Site Clearing
- B. Section 32 1600 Curb and Sidewalks
- C. New Jersey Department of Transportation (NJDOT) Standard Specifications
- E. Construction Drawings

1.03 REFERENCE STANDARDS

- A. ACI 301 Specifications for Structural Concrete for Buildings
- B. ACI 304 Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete
- C. ANSI/ASTM A185 Welded Steel Wire Fabric for Concrete Reinforcement
- D. ANSI/ASTM A497 Welded Deformed Steel Wire Fabric for Concrete Reinforcement
- E. ANSI/ASTM D1751 Preformed Expansion Joint Fillers for Concrete Paving and Structural construction
- F. ANSI/ASTM D1752 Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
- G. ASTM A615 Deformed and Plain Billet-Steel for Concrete Reinforcement
- H. ASTM C33 Concrete Aggregates
- I. ASTM C94 Ready Mix Concrete
- J. ASTM C150 Portland Cement
- K. ASTM C260 Air-Entraining Admixtures for Concrete

L. ASTM C309 - Liquid Membrane-Forming Compounds for Curing Concrete TCNJ Roscoe Hall Lower 321300 - 1 Portland Cement Concrete Level Renovation Paving

- M. ASTM C494 Chemical Admixtures for Concrete
- N. FS TT-C-800 Curing Compound, Concrete, for New and Existing Surfaces

1.04 PERFORMANCE REQUIREMENTS

A. Maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize temporary striping, flagmen, barricades, warning signs, and warning lights as required.

1.05 QUALITY ASSURANCE

- A. Submit the required submittals to the Owner or the Owner's Engineer at least one week prior to the start of construction for approval.
- B. The Owner will retain an independent testing agency to perform the required tests. Provide any necessary assistance to the testing agency and provide the testing agency with the intended construction schedule at least one week prior to the start of construction.
- C. The Owner's Geotechnical Engineer shall randomly core the pavement at a minimum rate of one core per 20,000 square feet of pavement, with a minimum of 3 cores from heavy-duty areas and 3 cores from standard duty areas. Core shall be tested for thickness and quality of aggregate distribution. Core holes shall be patched immediately with Portland cement concrete conforming to Section 2.2 and shall be finished to provide a level surface conforming to Section 3.3 A & 3.3 B.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects. Use flexible spring steel forms or laminated boards to form radius bends as required. Coat forms with nonstaining type coating that will not discolor or deface surface of concrete.
- B. Welded Wire Mesh: Welded plain cold-drawn steel wire fabric, ASTM A 185. Furnish in flat sheets, not rolls, unless otherwise acceptable to Owner.
- C. Reinforcing Bars: Deformed steel bars, ASTM A 615, Grade 40.
- D. Concrete Materials: Comply with requirements of applicable structural concrete specifications for materials, admixtures, bonding materials, curing materials, and others as required. Concrete shall have a minimum 28-day compressive strength of 4,500 psi.
- E. Joint Fillers: Resilient premolded bituminous impregnated fiberboard units complying with ASTM D 1751 FS HH-F-341, Type II, Class A; or AASHTO M 153, Type I.

F. Joint Sealants: Non-priming, pourable, self-leveling polyurethane. Acceptable sealants are Sonneborn "Sonolastic Paving Joint Sealant" Sonneborn "Sonomeric CT 1 Sealant", Sonneborn "Sonomeric CT 2 Sealant", Mameco "Vulken 45", or Woodmont Products "Chem-Caulk".

2.02 MIX DESIGN AND TESTING

- A. Design mix to produce normal weight concrete consisting of Portland cement, aggregate, water-reducing admixture, air-entraining admixture, and water to produce the following properties:
 - 1. Compressive Strength: 4,500 psi, minimum at 28 days, unless otherwise indicated on the Construction Drawings.
 - 2. Slump Range: 3 inch 5 inch at time of placement.
 - 3. Air Entrainment: 5 percent to 8 percent.

2.03 SUBMITTALS

A. Unless otherwise specified, submit any required submittals at least two weeks prior to the start of construction for review and approval.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Prior to the construction of concrete pavement, the subgrade must be approved by the inspecting engineer. Pavement constructed without subgrade approval shall be removed and reconstructed after the subgrade is approved at no additional cost to the Owner.
- B. Proof-roll prepared base material surface to check for unstable areas. The paving work shall begin after the unsuitable areas have been corrected and are ready to receive paving. Compaction testing for the base material shall be completed prior to the placement of the paving.
- C. Surface Preparation: Remove loose material from compacted base material surface to produce a firm, smooth surface immediately before placing concrete.

3.02 INSTALLATION

- A. Form Construction
 - 1. Set forms to required grades and lines, rigidly braced and secured.
 - 2. Install sufficient quantity of forms to allow continuance of work and so that forms remain in place a minimum of 24 hours after concrete placement.
 - Check completed formwork for grade and alignment to following tolerances:
 a. Top of forms not more than 1/8" in 10'-0".

- b. Vertical face on longitudinal axis, not more than 1/4" in 10'-0".
- 4. Clean forms after each use, and coat with form release agent as often as required to ensure separation from concrete without damage.
- B. Reinforcement: Locate, place and support reinforcement per Construction Drawings. Reinforcement must be inspected and approved by the Engineer prior to concrete pour.
- C. Concrete Placement
 - 1. Do not place concrete until base material and forms have been checked for line and grade. Moisten base material if required to provide uniform dampened condition at time concrete is placed. Concrete shall not be placed around manholes or other structures until they are at the required finish elevation and alignment.
 - 2. Place concrete using methods which prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Consolidate with care to prevent dislocation of reinforcing, dowels, and joint devices.
 - 3. Deposit and spread concrete in continuous operation between transverse joints, as far as possible. If interrupted for more than ½ hour, place construction joint.
 - 4. Concrete placement shall be conducted between 40 degrees and 90 degrees Fahrenheit. Concrete placement in severe weather conditions must be preapproved by the Engineer and shall be conducted in accordance with related ACI recommended procedures.
- D. Joint Construction: Construct doweled expansion and contraction joints, tied construction joints, thickened edge expansion joints, isolation joints, and construction joints straight with face perpendicular to concrete surface. Construct transverse joints perpendicular to centerline, unless otherwise detailed.
 - 1. Provide Doweled Expansion and Contraction joints as indicated on Construction Drawings. Provide joint filler for the entire depth of the slab section and not less than 1 inch below finished surface so as to allow for joint sealer.
 - 2. Provide tied construction joints as indicated on Construction Drawings. Construct control joints for depth equal to 1/4 of the concrete thickness or 1 inch, whichever is deeper. For construction of Control Joints:
 - a. Form tooled joints in fresh concrete by grooving top portion with recommended tool and finishing edges with jointer.
 - b. Form sawed joints using powered saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut joints into hardened concrete as soon as surface will not be torn, abraded, or otherwise damaged by cutting action.
 - 3. Construction Joints: Place construction joints at end of placements and at locations where placement operations are stopped for period of more than ½ hour, except where such placements terminate at expansion joints. Construct joints using standard metal keyway-section forms as shown on the contract drawings.
 - 4. Isolation Joints: Locate isolation joints as indicated on Construction Drawings. Provide premolded joint filler for expansion joints abutting concrete curbs, catch basins, manholes, inlets, structures, walks, and other fixed objects.
 - 5. Provide thickened edge expansion joint as indicated on Construction Drawings.

- E. Joint Fillers: Extend joint fillers full-width and depth of joint, and not less than ½" or more than 1" below finished surface where joint sealer is indicated. Furnish joint fillers in one-piece lengths for full width being placed, wherever possible. Where more than one length is required, lace or clip joint filler sections together.
- F. Joint Sealants: All joints shall be sealed with approved exterior pavement joint sealants and shall be installed per manufacturer's recommendations.

3.03 CONCRETE FINISHING

- A. After striking off and consolidating concrete, smooth surface by screeding and floating. Adjust floating to compact surface and produce uniform texture. After floating, test surface for trueness with 10'-0" straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide continuous smooth finish.
- B. Work edges of slabs, gutters, back top edge of integral curb, and formed joints with an edging tool, and round to ½" radius. Eliminate tool marks on concrete surface. After completion of floating and troweling when excess moisture or surface sheen has disappeared, complete surface finishing, as follows:
 - 1. Inclined Slab Surfaces: Provide coarse, nonslip finish by scoring surface with stiffbristled broom perpendicular to line of traffic.
 - 2. Paving: Provide coarse, nonslip finish by scoring surface with stiff-bristled broom perpendicular to line of traffic.
- C. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point up any minor honeycombed areas. Remove and replace areas or sections with major defects, as directed.
- D. Protect and cure finished concrete paving using acceptable moist-curing methods, more particularly described in the "water-curing" section of ACI 308-81.

3.04 CLEANING AND ADJUSTING

- A. Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just prior to final inspection.
- B. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials.

END OF SECTION 32 1300

SECTION 321600

CURBS AND SIDEWALKS

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Combination concrete curb and gutter
- B. Concrete Curb
- C. Concrete Sidewalk
- D. Bituminous Concrete Sidewalk
- E. TCNJ Standard Sidewalk with Brick Paver Band

1.02 RELATED SECTIONS AND DOCUMENTS

- A. New Jersey Department of Transportation (NJDOT) Standard Specifications, latest edition
- B. Section 32 1300 Portland Cement Concrete Paving

1.03 REFERENCE STANDARDS

- A. ACI 304 Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete
- B. ANSI/ASTM D1751 Preformed Expansion Joint Fillers for Concrete Paving and Structural construction
- C. ANSI/ASTM D1752 Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction
- D. ASTM C33 Concrete Aggregates
- E. ASTM C94 Ready Mix Concrete
- F. ASTM C150 Portland Cement
- G. ASTM C260 Air-Entraining Admixtures for Concrete
- H. ASTM C309 Liquid Membrane-Forming Compounds for Curing Concrete
- I. ASTM C494 Chemical Admixtures for Concrete
- J. FS TT-C-800 Curing Compound Concrete for New and Existing Surfaces

K. ANSI/ASTM A185 Welded Steel Wire Fabric for Concrete

1.04 PERFORMANCE REQUIREMENTS

A. Maintain access for vehicular and pedestrian traffic as required for other construction activities. Utilize temporary striping, flagmen, barricades, warning signs, and warning lights as required.

1.05 QUALITY ASSURANCE

- A. Submit the required submittals to the Owner or the Owner's Engineer at least one week prior to the start of construction for approval.
- B. The Owner will retain an independent testing agency to perform the required tests. Provide any necessary assistance to the testing agency and provide the testing agency with the intended construction schedule at least one week prior to the start of construction.
- C. Sweep concrete pavement and wash free of stains, discolorations, dirt, and other foreign material just prior to final inspection.
- D. Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects. Use flexible spring steel forms or laminated boards to form radius bends as required. The forms shall be of a depth equal to the depth of curbing or sidewalk, and so designed as to permit secure fastening together at the tops. Coat forms with nonstaining type coating that will not discolor or deface surface of concrete.
- B. Joint Fillers: Resilient premolded bituminous impregnated fiberboard units complying with ASTM D 1751 FS HH-F-341, Type II, Class A; or AASHTO M 153, Type I.
- C. Joint Sealers: Non-priming, pourable, self-leveling polyurethane. Acceptable sealants are Sonneborn "Sonolastic Paving Joint Sealant" Sonneborn "Sonomeric CT 1 Sealant", Sonneborn "Sonomeric CT 2 Sealant", Mameco "Vulken 45", or Woodmont Products "Chem-Caulk".

2.02 MIX DESIGN AND TESTING

A. Concrete mix design and testing shall comply with requirements of applicable local requirements.

- B. Design mix to produce normal weight concrete consisting of Portland cement, aggregate, water-reducing admixture, air-entraining admixture, and water to produce the following properties:
 - 1. Compressive Strength: 4,500 psi, minimum at 28 days, unless otherwise indicated on the Construction Drawings.
 - 2. Slump Range: 3-inch maximum.
 - 3. Air Entrainment: 4 percent to 7 percent.

2.03 SUBMITTALS

A. Unless otherwise specified, submit any required submittals at least two weeks prior to the start of construction for review and approval.

PART 3 – EXECUTION

3.01 PREPARATION

- A. Proof-roll prepared base material surface to check for unstable areas. The paving work shall begin after any unsuitable areas have been corrected and are ready to receive paving. Compaction testing for the base material shall be completed prior to the placement of the paving.
- B. Surface Preparation: Remove loose material from compacted base material surface to produce a firm, smooth surface immediately before placing concrete.

3.02 INSTALLATION

- A. Form Construction
 - 1. Set forms to required grades and lines, rigidly braced and secured.
 - 2. Install sufficient quantity of forms to allow continuance of work and so that forms remain in place a minimum of 24 hours after concrete placement.
 - 3. Check completed formwork for grade and alignment to following tolerances:
 - a. Top of forms not more than 1/8 inch in 10'-0".
 - b. Vertical face on longitudinal axis, not more than 1/4 inch in 10'-0".
 - 4. Clean forms after each use, and coat with form release agent as often as required to ensure separation from concrete without damage.
 - 5. Support wire on metal wire chairs to ensure that wire stays mid-depth of sidewalk section during concrete pour.
- B. Concrete Placement
 - 1. Do not place concrete until base material and forms have been checked for line and grade. Moisten base material if required to provide uniform dampened condition at time concrete is placed. Concrete shall not be placed around manholes or other structures until they are at the required finish elevation and alignment.
 - 2. Place concrete using methods which prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator.

Keep vibrator away from joint assemblies, reinforcement, or side forms. Consolidate with care to prevent dislocation of dowels, and joint devices.

- 3. Deposit and spread concrete in continuous operation between transverse joints, as far as possible. If interrupted for more than 1/2 hours, place construction joint. Automatic machine may be used for curb and gutter placement at Contractor's option. Machine placement must produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete. If results are not acceptable, remove and replace with formed concrete as specified.
- 4. Concrete placement shall be conducted between 40 degrees and 90 degrees Fahrenheit. Concrete placement in severe weather conditions must be preapproved by the Engineer and shall be conducted in accordance with related ACI recommended procedures.
- C. Joint Construction
 - 1. Contraction Joints: Concrete curb, concrete gutter or concrete curb and gutter, where specified on the plans, shall be constructed in uniform sections of the length specified on the plans. The joints between sections shall be formed either by steel templates 1/8 inch in thickness, of a length equal to the width of the gutter and/or curb, and with a depth which will penetrate at least 2 inches below the surface of the curb and/or gutter; or with ³/₄-inch thick preformed expansion joint filler cut to the exact cross section of the curb and/or gutter; or by sawing to a depth of at least 2 inches while the concrete is between 4 to 24 hours old. If steel templates are used, they shall be left in place until the concrete has set sufficiently to hold its shape, but shall be removed while the forms are still in place.
 - 2. Longitudinal Construction Joints: Concrete curb, concrete gutter or combination concrete curb and gutter, where specified on the plans, shall be tied to concrete pavement with ½ inch round deformed reinforcement bars of the length and spacing shown on the plans. Joint spacing as specified on the plans.
 - 3. Transverse Expansion Joints: Transverse expansion joint in curb, curb and gutter, gutter or sidewalk shall have the filler cut to the exact cross section of the curb, curb and gutter, gutter or sidewalk. The joints shall be similar to the type of expansion joint used in the adjacent pavement. Joint spacing as specified on the plans.
- D. Joint Fillers: Extend joint fillers full-width and depth of joint, and not less than 2" or more than 1" below finished surface where joint sealer is indicated. Furnish joint fillers in one-piece lengths for full width being placed, wherever possible. Where more than one length is required, lace or clip joint filler sections together.
- E. Joint Sealants: All joints shall be sealed with approved exterior pavement joint sealants and shall be installed per manufacturer's recommendations.

3.03 CONCRETE FINISHING

- A. After striking off and consolidating concrete, smooth surface by screening and floating. Adjust floating to compact surface and produce uniform texture. After floating, test surface for trueness with 10'-0" straightedge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide continuous smooth finish.
- B. Work edges of sidewalks, gutters, back top edge of integral curb, and formed joints with an edging tool, and round to ½" radius. Eliminate tool marks on concrete surface. After

completion of floating and troweling when excess moisture or surface sheen has disappeared, complete surface finishing, as follows:

- 1. Inclined Slab Surfaces: Provide coarse, nonslip finish by scoring surface with stiffbristled broom perpendicular to line of traffic.
- 2. Curbs, gutters, and sidewalks: Broom finish by drawing fine-hair broom across surface perpendicular to line of traffic. Repeat operation as necessary to produce a fine line texture.
- C. Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point up any minor honeycombed areas. Remove and replace areas or sections with major defects, as directed.
- D. Protect and cure finished concrete paving using acceptable moist-curing methods, more particularly described in the "water-curing" section of ACI 308-81.

3.04 BACKFILL

A. After the concrete has set sufficiently, the spaces in front and back of the curb and gutter or sidewalk shall be refilled to the required elevation with suitable material, which shall be compacted until firm and solid and neatly graded.

END OF SECTION 32 1600

SECTION 32 9113

PLANTING SOILS

PART 1 - GENERAL

1.01 SUMMARY

- A. General: Furnish planting soils in accordance with requirements of the Contract Documents.
- B. Related work
 - 1. Section 31 000 "Earthwork"

1.02 REFERENCES

- A. Comply with applicable requirements of:
 - 1. American Association of Nurserymen, American Standards for Nursery Stock, (ANSI Z60.1), latest edition, published by the American Association of Nurserymen, 1250 I Street, N.W., Suite 500 Washington, D.C. 20005.
 - 2. ASTM: American Society of Testing Materials.
 - 3. ANSI: American National Standards Institute.
 - 4. AOAC: Association of Official Agricultural Chemists.
 - 5. USDA: United Stated Department of Agriculture.

1.03 SUBMITTALS

- A. Submittals: In accordance with Section 01-1300 Submittal Procedures
- B. Product Data: Provide most recent printed information from manufacturer.
 - 1. Organic Amendment Materials: identify the material(s) from of which is it composed and identify the location where material was composted.
 - 2. Fertilizers
 - 3. Ground Limestone
 - 4. Superphosphate

- C. Samples: Submit 1 gallon planting soil samples in two phases. Submit samples concurrent with horticultural soil test reports in both phases. Submit as phase one, planting soil base components for approval. Only after approval of phase one components, submit as phase two, soil blend mixes / mediums for approval.
 - 1. Phase One Submittals of Planting Soil Base Components:
 - 2. Base Topsoil
 - 3. Organic Amendment Materials
 - 4. Sand for Root Zone Medium
 - 5. Phase Two Submittals of Planting Mediums and surface material: Mixing and batching of mediums to be prepared in the same manner as bulk soils will be prepared prior to delivery to site.
 - a. Planting Bed Medium
 - b. Lawn Root Zone Medium
 - c. Light Weight Planting Medium
- D. Horticultural Soil Test Reports: Submit reports in two phases. Submit reports concurrent with samples in both phases. Submit as phase one, reports for planting soil base components above for approval. Only after approval of phase one components, submit as phase two, reports for soil blend mixes /mediums for approval.

Submit reports for each of the above samples: Submit sample from each proposed source for testing and approval. Deliver samples to both the testing laboratory and the project soil scientist and pay costs. Send report directly to Owner's Representative.

- 1. Testing for Base Topsoil, Planting Bed Medium, and Lawn Root Zone Medium.
 - a. Inform testing agency soil test is for both tree and shrub planting and lawn applications.
 - b. Mechanical and chemical analysis shall be conducted by a public extension service agency or a certified private testing laboratory in accordance with the current "standards" of the Association of Official Agriculture Chemists.
 - c. Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422 after destruction of organic matter by ignition.
 - d. Test for agricultural suitability analysis including:
 - i) particle size and characteristics

- ii) soil pH by water pH and buffer (smp) pH tests.
- iii) percentage organic content
- iv) nitrate nitrogen
- v) ammonium nitrogen
- vi) phosphorus
- vii) potassium
- viii) calcium
- ix) aluminum
- x) magnesium
- xi) manganese
- xii) Micronutrients
- xiii) Toxins including but not limited to lead, cadmium, arsenic and mercury.
- e. Test results: test data and recommendations for soil amendments including but not limited to: nitrogen, phosphorus, potassium and limestone.
- 2. Testing for Organic Amendment Materials
 - a. Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422 after destruction of organic matter by ignition.
 - b. Test for agricultural suitability analysis as defined in Article 2.02 Organic Amendment Materials (Compost).
- 3. Testing for Sand
 - a. Tests shall be by combined hydrometer and wet sieving in compliance with ASTM D422 after destruction of organic matter by ignition.
 - b. Test for agricultural suitability analysis including:
 - i) particle size and characteristics

1.04 QUALITY ASSURANCE

A. Soils Testing Laboratory: to be approved by Owner's Representative. Lab shall have ability to make tests and provide soil recommendations.

- B. Qualifications: contractor shall have minimum five years' experience in soil preparation work.
- C. Regulatory Requirements
 - 1. Comply with laws, regulations, and quarantines for agricultural and horticultural products.

1.05 DELIVERY, STORAGE AND HANDLING

- A. Packing and Shipping: deliver materials in unopened containers bearing manufacturer's name and guaranteed statement of analysis. Transport materials without damage. Protect finishes from abrasion, dirt, oils, grease, and chemicals. Pack materials to protect from weather.
- B. Acceptance at Site: verify in writing that delivered materials conform to specifications and approved submittals.
- C. Storage and Protection:
 - 1. Materials shall be uniform in composition, dry and free flowing. Store materials in dry place, on pallets, off the ground; protect from sun. Store materials in a manner which does not diminish their usability and effectiveness.
 - 2. Protect materials from theft, damage, weather, dirt, oils, grease, and construction.

1.06 PROJECT/SITE CONDITIONS

- A. Environmental Requirements: do not deliver or handle soils when dry, wet, or frozen.
 - 1. Field Test
 - a. Form soil in palm of hand, if soil retains shape and crumbles upon touching, the soil may be worked.
 - b. If the soil will not retain shape it is too dry and should not be worked.
 - c. If the soil retains shape and will not crumble, it is too wet and should not be worked.

PART 2 – MATERIALS

2.01 PLANTING SOIL

A. Base Topsoil shall be existing topsoil stripped and stockpiled at the site or shall be imported soil complying with specifications. Stripped topsoil shall be sampled and

tested for grains size distribution and organic content according to tests as specified. Test results shall be reported to the Owner who may make minor adjustments to specified approximate mixing ratios and mix requirements for each mix type. Stripped topsoil which has been contaminated by incorporation of subsoil shall not be acceptable for use and shall be replaced with imported topsoil meeting specification requirements at no cost to be owner.

B. Base Topsoil as required for the work shall be free of subsoil, large stones, earth clods, sticks, stumps, clay lumps, roots or other objectionable, extraneous matter or debris. Base Loam shall also be free of quack-grass rhizomes, Agropyron repens, and the nut-like tubers of nutgrass, Cyperus esculentus, and all other primary noxious weeds. Base Loam shall not be delivered or used for planting while in a frozen or muddy condition. Base Loam for mixing shall conform to the following grain size distribution for material passing the #10 sieve:

Percent Passing

U.S. Sieve Size Number	Minimum	Maximum
10		100
18	85	100
35	70	95
60	50	85
140	36	72
270	32	60
0.002mm	3	20

- 1. Maximum size shall be one inch largest dimension. The maximum retained on the #10 sieve shall be 20% by weight of the total sample.
- 2. The organic content shall be between 4.0 and 8.0 percent.

2.02 ORGANIC AMENDMENT MATERIAL (COMPOST)

- A. Organic Material (Compost) as Amendment for Soil Mixes:
 - 1. Organic Matter (Compost) for amending planting medium: stable, humuslike material produced from the aerobic decomposition of Leaf or Yard Waste Compost which shall be composted for a minimum of two years (24 months), unless otherwise approved by the Owner' Representative. Compost shall be free of debris such as plastics, metal, concrete or other debris and stones larger than 3/8", larger branches and roots and wood chips over 3/8" in length or diameter. Compost shall be a dark brown to black color and be capable of supporting plant growth with appropriate management practices in conjunction with addition of fertilizer and other amendments as applicable, with no visible free water or dust, with no unpleasant odor, and meeting the following criteria as reported by laboratory tests.
 - a. The ratio of carbon to nitrogen shall be in the range of 12:1 to 25:1.

- b. Stability shall be assessed by the Solvita procedure. Protocols are specified by the Solvita manual (version 4.0). The compost must achieve a maturity index of 6 or more as measured by the Solvita scale.
- Organic Content: at least 20 percent (dry weight). One C. hundred percent of the material shall pass a 3/8-inch (or smaller) screen. Debris such as metal, glass, plastic, wood (other than residual chips), asphalt or masonry shall not be visible and shall not exceed one percent dry weight. Organic content shall be determined by weight loss on ignition or H2O2 for particles passing a Number 10 sieve. For loss by ignition, a 50-cc sub-sample of the screened and mixed compost is ground to pass the number 60 sieve. Two to three grams (+ 0.001g) of ground sample, dried to a constant weight at 105 degrees C is placed into a muffle furnace. The temperature is slowly raised (5C/minute) to 450C and maintained for three hours. The sample is removed to an oven to equilibrate at 105C and the weight is taken. Organic matter is calculated as loss on ignition.
- d. pH: between 6.5 to 7.2 as determined from a 1:1 soil-distilled water suspension using a glass electrode pH meter American Society of Agronomy Methods of Soil Analysis, Part 2, 1986.
- e. Salinity: Electrical conductivity of a one to five soil to water ratio extract shall not exceed 2.0 mmhos/cm (dS/m).
- f. Nutrient content: as determined by the Rutgers Soil Testing Laboratory or equivalent laboratory and utilized to evaluate soil required amendments for the mixed soils. Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium, Aluminum, Magnesium, Chromium, Iron, Manganese, Lead, Soluble Salts, Cation Exchange Capacity, soil reaction (pH), buffer pH, and micronutrients.

2.03 SAND FOR ROOT ZONE MEDIUM

A. Sand: for mixing with topsoil to meet specification requirements shall be uniformly graded coarse sand consisting of clean, inert, rounded grains of quartz or other durable rock and free from loam or clay, surface coatings, mica, other deleterious materials with the following gradation.

Percent Passing

U.S. Sieve Size Number	Minimum	Maximum
10	100	-
18	65	90
35	35	60
60	12	24
140	3	8
270	0	3
0.002mm	0	0.5

- 1. Maximum size shall be one inch largest dimension. The maximum retained on the #10 sieve shall be 20% by weight of the total sample.
- 2. The ratio of the particle size for 70% passing (D70) to the particle size for 20% passing (D20) shall be 3.5 or less. (D70/D20 <3.5)

2.04 PLANTING BED MEDIUM

- A. On-site or Imported Topsoil meeting the requirements specified above shall be combined with imported medium to coarse uniformly-graded Sand and Compost in an approximate mix ratio of one part by volume imported sand to one part by volume topsoil to one part by volume compost, each as specified above, to create a uniform blend which meets the following requirements. (1S:1L:1C) Note that the mix ratio required to meet gradation and organic content may vary depending on the specific characteristics of base components.
- B. Gradation for Material Passing the Number 10 Sieve:

%	Passing	bv	Weiaht
		·~)	

U.S. Sieve Size Number	Minimum	Maximum
10	100	-
18	70	90
35	50	74
60	38	56
140	28	42
270	24	34
0.002mm	3	8

- 1. Maximum size shall be one inch largest dimension. The maximum retained on the #10 sieve shall be 20% by weight of the total sample.
- 2. Ratio of the particle size for 80% passing (D80) to the particle size for 30% passing (D30) shall be 6.5 or less. (D80/D30 <7.5)
- 3. Saturated hydraulic conductivity of the mix: not less than 2 inches per hour according to ASTM D5856-95 (2000) when compacted to a minimum of 86% Standard Proctor, ASTM 698.

4. Organic content: between 4.5 and 7.0 percent by weight.

2.05 LAWN ROOT ZONE MEDIUM

% Passing by Weight

- A. On-site Topsoil meeting the requirements specified above shall be combined with imported medium to coarse uniformly-graded Sand and Compost in an approximate mix ratio of two parts by volume imported sand to one part by volume topsoil to one part by volume compost, each as specified above, to create a uniform blend which meets the following requirements. (2S:1L:1C)
- B. Gradation for Material Passing the Number 10 Sieve:

U.S. Sieve Size Number	Minimum	Maximum
10	100	-
18	70	90
35	48	72
60	34	48
140	24	34
270	16	24
0.002mm	3	6

- 1. Maximum size shall be one inch largest dimension. The maximum retained on the #10 sieve shall be 20% by weight of the total sample.
- 2. Ratio of the particle size for 80% passing (D80) to the particle size for 30% passing (D30) shall be 5.5 or less. (D80/D30 <6.5)
- Saturated hydraulic conductivity of the mix: not less than 3 inches per hour according to ASTM D5856-95 (2000) when compacted to a minimum of 88% Standard Proctor, ASTM 698.

2.06 PRE-PLANT FERTILIZER

A. Complete, fertilizer made from all-natural ingredients complying with State and Federal fertilizer laws. Fertilizer shall contain the following available plant food by weight, unless soils test indicate a need for different composition:

	Nitrogen	Phosphorus	Potash
Deciduous Trees and Shrubs	2%	3%	3%
Evergreen Trees and Shrubs	2%	3%	3%

B. Fertilizer to be delivered in original unopened standard size bags showing weigh, analysis ingredients and manufacturer's name.

2.07 FILTER FABRIC

- A. Synthetic geotextile fabric: one of the following:
 - 1. Mirafi 140N manufactured by Mirafi Construction Products, Pendergrass, Georgia 30567.
 - 2. Propex #4545 manufactured by Propex Fabrics, Inc., Austell, Georgia 30168
 - 3. Greenstreak Sheet Drain Filter Fabric manufactured by Greenstreak, Inc., St. Louis, Missouri 63122

2.08 SOIL AMENDMENTS

- A. Follow horticultural soil test report recommendations for soil additives for landscape soils.
- B. Superphosphate: finely ground phosphate rock, commonly used for agricultural purposes and shall contain not less than 20 percent available phosphoric acid.
- C. Ground Limestone: dolomitic limestone and contain not less than 50 percent of total carbonates and 25 percent total magnesium with a neutralizing value of at least 100 percent. Material shall be ground to such fineness that 40 percent will pass 100 mesh U.S. standard sieve and 98 percent will pass through 20 mesh U.S. standard sieve.

2.09 EQUIPMENT

- A. Chisel Plow or disk harrow or bucket of backhoe: for subsoil cultivation.
- B. Rotovator or disk harrow: for planting mixture/soil cultivation.

2.10 WATER

A. Water: furnished by Contractor, unless otherwise specified, and suitable for irrigation and free from ingredients harmful to plant life. Hose and other watering equipment furnished by Contractor.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: in the event field conditions are not as shown on Drawings and outlined in the Specifications, notify Owner's Representative in writing.

- 1. Spot and Invert Elevations: verify field elevations of site improvements such as drainage and utility fixtures, pavements, existing plantings, and subsurface piping conform to drawings.
- 2. Rough grade: verify specified elevations and prior earthwork operations have shaped, trimmed, and finished rough grade.

3.02 PREPARATION

- A. Protection:
 - 1. Contractor required to contact Call Before You Dig (CBYD) prior to doing excavation on site. If work is to be done around underground utilities, appropriate authority of utility must be notified of impending work. Hand excavate areas adjacent to utilities. Contractor shall be responsible for damages done by himself or his personnel to existing utilities, which shall be repaired or paid for by Contractor.
 - 2. Prior to installation field locate and protect from damage site improvements such as drainage and utility fixtures, pavements, and existing plantings.
 - 3. Dust Control: upon acceptance of finish grade provide dust control.
 - 4. Erosion Control: upon acceptance of finish grade provide erosion control.
 - 5. Agricultural Chemicals: protect site improvements from contact with agricultural chemicals, soil amendments, and fertilizers.

3.03 PREPARATION OF PLANTING MEDIUM FOR PLANTING BEDS

- A. Correct deficiencies in soil as directed by soil test results. Thoroughly incorporate amendments into planting mixture to ensure even distribution.
- B. Incorporate pre plant fertilizer at a rate of 30 pounds per cubic yard of planting bed rootzone mix. Amendment rate will be 6 times square foot application rate per cubic yard of planting mixture.

3.04 PREPARATION OF PLANTING MEDIUM FOR LAWN ROOT ZONE

- A. Saturate the lightweight aggregate with water to ensure proper soil component distribution.
- B. Mechanically mix appropriate proportions of remaining ingredients with the saturated aggregate until a uniform distribution is achieved.
- C. When stockpiling the finished mix, cover the pile with a waterproof tarp to prevent drying out or separation of soil components from rain.

3.05 PLACEMENT OF PLANTING BED MEDIUM

- A. After subgrade levels have been reached and immediately prior to placing Planting Bed Medium, the entire subgrade area shall be loosened to a minimum depth of two feet utilizing the bucket of a backhoe or equivalent equipment. After loosening, the bottom of the entire planting bed area shall be compressed with the bucket of the backhoe.
- B. Planting Bed Medium shall then be spread in lifts not greater than twelve inches and compacted to a density between 82 and 85 percent Standard Proctor Maximum Dry Density. The surface area of each lift, including the subgrade after it has been compressed by a backhoe, shall be scarified by raking prior to placing the next lift.
- C. Place and spread planting medium to a depth greater than required such that after settlement, finished grade conforming to the lines, grades and elevations shown on the Drawings. Ensure proper drainage in an uninterrupted pattern free of hollows and pockets.
- D. Remove stiff clods, lumps, brush, roots, stumps, litter and other foreign material and stones over one inch in diameter and dispose of legally off site.

3.06 PLACEMENT OF LAWN ROOT ZONE MEDIUM

- A. After subgrade levels have been reached and immediately prior to placing Lawn Rootzone Medium, the entire subgrade area shall be loosened to a minimum depth of one foot utilizing the teeth on the bucket of a backhoe or equivalent equipment. Areas that have become excessively compacted shall be loosened to a depth of two feet. The entire lawn subgrade area shall then be compressed with two perpendicular passes of the tracks of a small bulldozer, size D-4, D-5 or equivalent.
- B. Lawn Root Zone Medium shall then be spread over the area and shall be compressed with a minimum of two passes of the tracks of a bulldozer size Caterpillar D-4 or D-5 or equivalent to a density of 84 to 86% Standard Proctor maximum dry density. No vibratory compaction of the subgrade or the planting medium shall take place. No rubber-tired equipment or heavy equipment except for a small bulldozer shall pass over soils after they have been loosened or planting medium spread. If the Contractor plans to utilize such areas for any use of heavy equipment, this work should be carried out prior to beginning the process of loosening soils
- C. Place and spread planting mixture and soil to a depth greater than required such that after settlement, finished grade conforming to the lines, grades and elevations shown on the Drawings. Ensure proper drainage in an uninterrupted pattern free of hollows and pockets.
- D. Remove stiff clods, lumps, brush, roots, stumps, litter and other foreign material and stones over one inch in diameter and dispose of legally off site.

3.07 SHALLOW ROCK AREAS

A. In areas where rock is within three feet of final ground surface in planting bed or tree pits areas or within two feet of final ground surface in lawn areas, including but
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 Planting Soils

not limited to areas shown on the plan, a minimum of six inches of sand shall be placed below planting media and the sand extended in a downgradient direction to underdrainage piping or to a minimum of five feet beyond the shallow bedrock areas.

3.08 FIELD QUALITY CONTROL

- A. Tests: after soil preparation operations are complete and prior to planting take soil sample for testing.
- B. Observation: Owner's Representative to review in the field soil preparation operations:
 - 1. Planting Mixture Preparation

3.09 CLEANING

- A. Clean up debris generated under work of this section.
- B. Site Improvements
 - 1. Wash and sweep clean site improvements such as drainage and utility fixtures, pavements, existing plantings, and site furnishings.
 - 2. Clean site furnishings of grout, adhesives, concrete, and other debris.

3.10 PROTECTION

- A. Protect work of this section until Final Acceptance.
- B. Protect prepared soils from compaction by construction traffic and from contamination by construction materials.

END OF SECTION 32 9100

SECTION 330100

PROTECTION OF EXISTING UTILITIES

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Locate, identify and field mark out of all on-site utility lines to remain in operation during construction.
- B. Submission of procedures to be used to ensure the safety of the utility.
- C. Repair of any damage during construction operations.
- D. Conduct test pits at all utility crossings prior to construction.

1.02 RELATED SECTIONS AND DOCUMENTS

- A. Section 024100 Demolition and Debris Removal
- B. Section 311400 Site Preparation
- C. Contract Documents

1.03 PROJECT RECORD DOCUMENTS

A. Accurately record actual locations and inverts of existing and capped utilities and utility lines encountered during construction. Provide the information in map and coordinate form with Northings, Eastings and elevations based upon the survey provided in the Contract Documents.

1.04 REGULATORY REQUIREMENTS

- A. Notify all affected utility companies, agencies, authorities, owners, etc. at least 48 hours prior to the commencement of work and comply with their requirements.
- B. Contact TCNJ for a utility mark-out a minimum of two weeks prior to any excavation.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION

3.01 PREPARATION

A. Field locate all existing utilities which are to remain in service during construction and those which are to be abandoned as shown on the Construction Drawings. Contractor is responsible for a full tone-out performed by an underground subsurface utility locating firm.

3.02 PROTECTION

- A. Flag, barricade or suitably protect existing utilities during construction operations and equipment movement.
- B. Prevent interruption of existing utility service to occupied or used facilities, except when authorized in writing by the College and/or authorities having jurisdiction.
- C. Any communications <u>facilities or</u> cabling damaged, as identified by either physical review or performance testing, shall be replaced in its entirety at the cost of the Contractor. This includes cabling within limits of the project space, as well as cabling within other common facilities incidentally used to support the installation of project elements. <u>Replacement shall be in accordance with the current TCNJ/IT standards for communications cabling, facilities and equipment.</u>

3.03 LATERAL DISCONNECTION

A. Where a utility line is to be disconnected from portions to remain, the lateral pipes shall be cut and removed in accordance with the Contract Documents and applicable utility or agency requirements.

3.04 REPAIRS

A. Any damage to existing, operational utilities by Contractor or its subcontractors during the on-going construction operation shall be immediately repaired to operational standards at Contractor's expense. If the repairs are not immediately addressed by Contractor, utility owner and/or Owner shall contract for the repair at Contractor's expense.

END OF SECTION 330100

SECTION 334000

STORM SEWER SYSTEM

PART 1 – GENERAL

1.01 SCOPE OF WORK

- A. Work under this section shall consist of providing all labor, materials, tools, equipment, shop drawings and supervision necessary and required to install all of the storm drainage facilities as specified in accordance with the Contract Documents. This work shall include but not be limited to:
 - 1. Installation of the drainage system consisting of manholes, catch basins, pipes, and all necessary and required accessory items and operations.
 - 2. Relocation and/or replacement of existing drainage pipes and/or structures.

1.02 RELATED SECTIONS AND DOCUMENTS

- A. Section 312500 Soil Erosion and Sediment Control
- B. Local governing authority, local code requirements, and any necessary construction permits
- C. Construction Drawings

1.03 REFERENCE STANDARDS

- A. AASTHO M294 and M252 Corrugated Polyethylene pipe smooth interior
- B. ASTM C55 Concrete Building Brick
- C. ANSI/ASTM D1557 Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 10 lb (4.54 Kg) Rammer and 18 inch (457 mm) Drop
- D. ASTM D2922 Test Methods for Density of Soil and Soil Aggregate in Place by Nuclear Methods (Shallow Depth)
- E. ASTM C270 Mortar
- F. ASTM C478 Precast Reinforced Concrete Manhole Sections
- G. ASTM C923 Resilient Connectors between Reinforced Concrete Manhole Structures and Pipes

- H. ASTM D3212 Joints for Drain and Sewer Plastic Pipes using Flexible Elastomeric Seals
- I. ASTM F477 Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- J. ASTM D1248 Polyethylene Plastics Molding and Extrusion Materials
- K. ASTM D2321 Pipe Fittings and Accessories
- L. ASTM D3350 Polyethylene Plastics Pipe and Fittings Materials
- M. International Masonry Industry All-Weather Council (IMIAC): Recommended Practices and Guide Specification for Cold Weather Masonry Construction

1.04 QUALITY ASSURANCE

- A. An Engineer, selected and paid by Owner, should be retained to perform construction inspection on-site based on measurement, visual observation, and judgment.
- B. Visual field confirmation shall be performed by field Engineer as part of the construction testing requirements.
- C. All costs related to re-inspection due to failures shall be paid for by Contractor at no additional expense to Owner. The Owner reserves the right to direct any inspection that is deemed necessary. Free access to site for inspection activities shall be provided.

1.05 SUBMITTALS

- A. Product Data: Provide manufacturer's certificate for castings, pipe and accessories to certify that products meet ASTM designations.
- B. Submit shop drawings of the precast structures to Engineer for approval prior to fabrication. Shop drawings shall include dimensions, reinforcing, joint treatment, invert elevations, invert locations and compliance with applicable standards.

1.06 EXISTING CONDITIONS

- A. The existing site conditions, including topographic survey and utilities information, are from a field survey performed by K&W. Vertical datum reference North American Vertical Datum 1988 (NAVD '88).
- B. The conditions of public thoroughfares and roads as to availability, clearances, loads, limits, restrictions, and other limitations affecting transportation to, ingress and egress of the site of the work shall be investigated. All TCNJ, State, and Federal requirements and regulations in regard to the transportation of materials to and from and at the job site shall be met and such permits as may be required shall be secured in advance.
- C. Inform itself as to any restrictions to grading or disturbance identified on the Construction Drawings.

D. The existing site contains extensive underground utilities. The extent of underground utilities is not limited to those shown on the site survey.

1.07 PROJECT RECORD DOCUMENTS

- A. Accurately record actual locations of pipe runs, connections, catch basins, cleanouts, and invert elevations.
- B. Identify and describe unexpected variations to subsoil conditions and location of uncharted utilities.

1.08 COORDINATION

A. Coordinate the termination of the storm sewer connection outside the building with architectural building plans. Also coordinate connections to existing storm sewer system with the proper governing body or agency.

PART 2 – PRODUCTS

2.01 SEWER PIPE MATERIALS AND ACCESSORIES

- A. Corrugated High Density Polyethylene Pipe (HDPE) Smooth Interior: Shall conform to AASHTO Designation M294 and M252. Pipe must be installed in accordance with pipe manufacturer's installation Guidelines for Culvert Storm Drainage Applications. Acceptable manufacturers: Advanced Drainage Systems, Inc. "ADS N-12" and HANCOR, Inc. "Sure-Lok" or approved equal.
- B. Cleanouts:
 - 1. Ancon, Inc.
 - 2. Josam Co.
 - 3. Smith (Jay R.) Mfg. Co.
 - 4. Wade Div.; Tyler Pipe
 - 5. Zurn Industries, Inc.; Hydromechanics Div.
- C. Trench Drain System:
 - 1. ACO Type (preformed channel)or approved equal.
- D. Underground Warning Tapes:
 - 1. Allen Systems, Inc.; Reef Industries, Inc.
 - 2. Brady (W.H.) Co.; Signmark Div.

- 3. Calpico, Inc.
- 4. Carlton Industries, Inc.
- 5. EMED Co. Inc.
- 6. Seton Name Plate Co.
- E. Downspout Boots:
 - 1. Cast Iron 4" x 6" to 6" or 8" round with cleanout
- F. Couplings:
 - 1. Rubber or elastomeric compression gasket, made to match pipe inside diameter or hub and adjoining pipe outside diameter. Gaskets shall be ASTM C 443, rubber for concrete pipe; ASTM C 564, rubber for cast-iron soil pipe. Gaskets for dissimilar or other pipe materials shall be compatible with pipe materials being joined.

2.02 CATCH BASINS, MANHOLES AND COMPONENTS (If necessary)

- A. General: All manholes, catch basins and drain inlets shall be built in accordance with the Details and installed at the locations shown on the Construction Drawings and as specified herein.
 - 1. Structures shall be constructed of precast concrete. Shop drawings shall be submitted to Owner's Engineer for review and approval.
 - 2. No concrete or masonry shall be placed when the temperature is below forty (40) degrees or above 90 degrees Fahrenheit, or when indications are for lower temperatures within twenty-four (24) hours, unless protection of concrete and masonry is approved by Owner's Engineer. Damage to the structure because of freezing shall be corrected by Contractor at its own expense, to the satisfaction of Owner's Engineer.
 - 3. Manholes, catch basins and drain inlets shall be constructed as soon as the pipe laying reaches the location of the structures. Should Contractor continue its pipe laying without making provisions for completion of the structures, Owner's Engineer shall have the authority to stop the pipe laying operations until the structure is completed.
 - 4. Any structure, which is mislocated or oriented improperly, shall be removed and re-built in its proper location, alignment and orientation at Contractor's expense.
 - 5. Precast Concrete Manholes: ASTM C478; Manhole diameter shall be selected to accommodate the inflow and outflow pipe sizes.

- B. Precast Concrete Manholes and Catch Basins: ASTM C478 rated for H20 loading, with minimum concrete strength of 4,000 psi. Inlet size shall be able to accommodate the inflow and outflow pipes.
 - 1. Manhole Barrel: Reinforced precast concrete in accordance with ASTM C478 with rubber gaskets in accordance with ASTM C 443.
 - a. Construct manholes of precast concrete sections as required by Construction Drawings to size, shape, and depth indicated, but never less than 4'-0" inside diameter and 4" thickness.
 - 2. Top Section: Eccentric cone type, unless concentric cone or flat-slab-top type is indicated. Top of cone to match grade rings.
 - 3. Grade Rings: Provide 2 or 3 reinforced concrete rings, of 6" to 9" total thickness and match 24" diameter frame and cover.
 - 4. Pipe Connectors: ASTM C 923, resilient, of size requires, for each pipe connecting to base section.
 - 5. Mortar and Grout: ASTM C 270, Type M. For minor amounts of mortar, packaged material complying with ASTM C 387, Type M, will be acceptable.
 - 6. Brick Transition Reinforcement: Formed steel 8 gage wire with galvanized finish.
 - 7. Concrete Masonry Units: ASTM C 139.
 - 8. Manhole Brick: ASTM C 32, Grade MS.
 - 9. Foundations: All foundations shall rest on firm soil or crushed stone of uniform bearing approved by the Geotechnical Engineer.

Inverts: Smooth concrete invert channels shall be constructed in all manholes and in all catch basins and drain inlets which do not have sumps, to insure a smooth flow of water through the structure. The invert channel shall be constructed to the elevations shown on the Construction Drawings and/or as approved by Owner's Engineer. Channels shall slope smoothly and evenly from the entrance pipe to the outlet pipe.

- 10. Frames, Cover, and Gratings: Frames, Covers and/or gratings for catch basins and drain inlets shall be of the type and size indicated on the Detail Drawings. Frames shall be well bedded in mortar and shall be set accurately to the correct alignment and grade. ASTM A 536, Grade 60-40-18, heavy-duty, ductile iron, 24" inside diameter by 7" to 9" riser with 4" minimum width flange, and 26" diameter cover, indented top design, with lettering "STORM SEWER" cast into cover.
- 11. Ladder Rungs: Cast aluminum with abrasive treads or steel-reinforced plastic. Ladder rungs shall be installed in all manholes, spaced eighteen (18) inches on center vertically. Rungs shall be set securely in place during the construction of the precast units and wide enough for an adult to place both feet on one step and designed to prevent lateral slippage off the step.

- 12. Precast Structures: Precast structures shall be installed only after shop drawings have been approved and shall meet the requirements of ASTM C478.
 - a. The base of the precast structures shall be set in a minimum 2½-inch thick grout pad. Grout around pipes, which protrude through the walls of the structure, and on all joints shall contain "Antihydro", or other approved additive to insure water tightness. Cement grout shall contain two parts cement to one part sand and additive in accordance with manufacturer's recommendations. Mortar shall be applied to the bottom 1/3 of the opening before the pipe is inserted.
 - b. The top grade of the precast concrete corbel section shall be set sufficiently below finished grade to permit a maximum of four (4) and a minimum of two (2) courses of 8-inch brick to be used as risers to adjust the grade of the casting. Manhole frames shall be set on a grout pad as specified hereinabove.
- 13. Bitumastic Coating: The entire exterior surface of all manholes shall be coated with two (2) coats of an approved bitumastic material to produce a dry film thickness of 0.07 inches (7 mils) per coat.
- 14. Provide precast manhole shaft construction with eccentric cone top section and lipped male/female rubber gasket joints or mortar joints.
- 15. Mortar shall conform to ASTM C270, Type M.
- 16. Furnish factory-fabricated ells, tees, reducer; wyes, couplings, increasers, crosses, transitions and end caps of the same type and class of material as the conduit, or of material having equal or superior physical and chemical properties and approved by Engineer.
- 17. Pipe joints for rigid pipes shall be made with mortar, grout, gaskets, or as recommended by the pipe manufacturer.

PART 3 – EXECUTION

3.01 EXAMINATION

A. Verify that trench cut and excavation is ready to receive work and excavations, dimensions, and elevations are as indicated on Construction Drawings.

3.02 PREPARATION

A. Hand trim excavations to required elevations and thoroughly compact. Correct over excavation with fine aggregate.

B. Remove large stones or other hard matter which may damage piping or impede consistent backfilling or compaction.

3.03 GENERAL

- A. All drainage structures and pipe in the locations shown on the Construction Drawings and/or as approved by Owner's Engineer shall be installed. Pipe shall be of the type and sizes specified and shall be laid accurately to line and grade. Structures shall be accurately located and properly oriented such that ladder rung access is oriented to face oncoming traffic. Relocation and re-routing of discovered stormwater drainage pipes discovered during construction to the proposed stormwater system shall be the responsibility of the Contractor. Drawings showing discovered utilities and proposed relocation work shall be submitted to Engineer prior to construction.
 - 1. Storage and Handling of Pipe All pipe shall be protected against impact, shock and free fall, and only equipment of sufficient capacity and proper design shall be used in the handling of the pipe. Storage of pipe on the job shall be in accordance with the pipe manufacturer's recommendations.
 - 2. Damage to Pipe Pipe which is defective from any cause, including damage caused by handling, and determined by Owner's Engineer as unrepairable, shall be unacceptable for installation and shall be replaced at no cost to Owner as directed by Owner's Engineer. Pipe that is damaged or disturbed through any cause prior to acceptance of the work, shall be repaired, realigned or replaced as directed by Owner's Engineer, at Contractor's expense.

3.04 BEDDING

A. Excavate pipe trench and place bedding material in accordance with Geotechnical Engineer recommendations.

3.05 INSTALLATION – PIPE

A. Laying Pipe: Each length of pipe shall be laid with firm, full and even bearing throughout the entire length, in a trench prepared and maintained in accordance with the details of the Construction Drawings. Pipe shall be laid upgrade unless otherwise approved by Owner's Engineer.

Bell and spigot pipe shall be laid with the bell end upgrade. The pipe shall be joined so that there will be uniform space around the pipe. Trimming of the pipe shall not be allowed.

Every length of pipe shall be inspected and cleaned of all dirt and debris before being laid. Prior to placing a length of pipe, the end of the previously laid length shall be carefully and thoroughly wiped smooth and clean to obtain an even and closefitting joint.

No length of pipe shall be laid until the preceding lengths of pipe have been thoroughly embedded in place, so as to prevent movement or disturbance of the pipe.

- B. Place pipe on minimum 6-inch thick bed of compacted bedding or as shown on the details of the drawings.
- C. Install pipe, fittings, and accessories in accordance with ASTM C12, ASTM D2321, manufacturer's instructions and/or State or Local requirements. Seal joints to be watertight.
- D. Lay pipe to slope gradients noted on civil engineering drawings.
- E. Place and compact bedding aggregate at sides and around the pipe.
- F. Do not displace or damage pipe when compacting.
- G. Full Lengths of Pipe: Only full lengths of pipe shall be used in the installation except that partial lengths of pipe may be used at the entrance to structures where necessary to obtain a proper connection to the structure.
- H. Pipe Entrances to Structures: All pipe entering structures (e.g.: manholes, catch basins, etc.) shall be cut flush with the inside of the structure, and the cut ends of the pipe and surface of the structure shall be properly rounded and finished so that there will be no protrusion, jagged edges, or imperfections that will impede the flow of water or affect the hydraulic characteristics of the installation.
- I. Bedding and Backfilling: The type of materials to be used in bedding and backfilling and the method and placement shall conform to the details of the Construction Drawings.
- J. Protection During Construction: The installation shall be protected at all times during construction, and movement of construction equipment, vehicles and loads over and or adjacent to any pipe shall be performed at Contractor's risk.
- K. Tolerance: Pipe shall be laid accurately to the line and grade shown on the Construction Drawings and/or as approved by Owner's Engineer. Allowable tolerances shall be one-half (½) inch on grade and one (1) inch on line in any section of pipe between structures. Deviations from these tolerances shall be a basis for rejection of the line of pipe by Owner's Engineer. Any line, which has been rejected, shall be rebuilt to correct line and grade by Contractor at its own expense.

3.06 INSTALLATION – PRECAST CATCH BASINS AND MANHOLES

- A. Form bottom of excavation clean and smooth to correct elevation.
- B. Place precast reinforced concrete sections with provision for storm sewer pipe sections at the location and elevation specified on the plans.
- C. Level top surface of each precast concrete shaft sections as assembly progresses.
- D. To ensure joint integrity when joining sections of precast concrete structures, give particular attention to removing all foreign materials from joint surfaces prior to placing sealant material. If a mortar grout is to be used as a seal, clean and moisten all

surfaces to be grouted. The grout should be of a consistency so that it will not flow when applied. Apply the mortar grout in a manner to ensure filling of all voids in the joint being sealed. Dress the interior joints to remove excess mortar.

- E. Establish elevations and pipe inverts for inlets and outlets as indicated on the approved shop drawings.
- F. Lay brick masonry in running bond with full 3/8" mortar joints to receive casting assembly. Level casting frame in grout to receive grated inlet or manhole cover.

3.07 PLACING PRE-CAST MANHOLE BARREL SECTIONS

- A. Place base pad to proper elevation and location and trowel top surface level for placement of manhole barrel.
- B. Place manhole barrel plumb and level to correct elevations and anchor to base pad.
 - 1. After completion of slab foundation the first joint of manhole barrel shall be lowered into position, grooved end first, and set level and plumb on concrete base. Align and adjust to proper grade prior to placing and forming invert, which shall be poured immediately after setting of first section of manhole barrel. Align manhole sections so that ladder rungs face on-coming traffic.
 - 2. Prior to setting subsequent manhole barrel sections, apply primer to tongue and groove ends and allow to set in accordance with manufacturer recommendations. Place "Ram-nek", or equivalent, plastic rope on tongue end. Lower next section into position, and remove excess material from interior of structure. Add additional material on exterior of joint, if necessary, for completely watertight joint.

3.08 PIPE JOINTS

A. High Density Polyethylene Pipes (HDPE) joined with bell-and-spigot joints shall meet AASHTO M252 or AASHTO M294. The joint shall be silt-tight and non-rated watertight. Silt-tight joints shall meet laboratory test per ASTM D 3212 except that the joint be tested using 2.0 psi (14 kPa). Gaskets shall be made of polyisoprene meeting the requirements of ASTM F477 with the addition that the gaskets shall not have any visible cracking when tested according to ASTM D1149 after 72-hour exposure in 50 PPHM ozone at 104°F (40°C). Gaskets shall be installed by the pipe manufacturer and covered with a removable wrap to ensure the gasket is free from debris. A joint lubricant available from the manufacturer shall be used on the gasket and bell during assembly.

3.09 INTERFACE WITH EXISTING FACILITIES

- A. Requirements: All required connections of the proposed drainage facilities into existing drainage facilities, where and as shown on the Construction Drawings and/or as approved by Owner's Engineer shall be made.
- B. Compliance with Facility Owner Requirements: Connections made into existing drainage facilities shall be performed in accordance with the requirements of Owner of the facility. All such requirements, including securing of all required permits, and paying

the costs thereof shall be met. The cost of making the connections in accordance with the requirements of Owner of the existing facility shall be included in the Contract Sum.

3.10 MODIFICATIONS OF EXISTING STRUCTURES

- A. General: Existing structures shall be altered, reconstructed and/or converted where and as shown on the Construction Drawings, and/or as approved by Owner's Engineer. In general, alterations shall be performed with the same type of material used in the original construction unless otherwise indicated on the Construction Drawings or approved by Owner's Engineer.
- B. Damage to Existing Installations: Extreme care during such alteration, reconstruction and/or conversions shall be exercised so as not to damage any portions of the structure and/or pipe shown to remain. Any such damage shall be repaired by Contractor at its own expense and to the satisfaction of Owner's Engineer.

3.11 CLEANING AND REPAIR

Clean the entire drainage system of all debris and obstructions. This shall include, but not be limited to, removal of all formwork from structures, concrete and mortar droppings, construction debris and dirt. The system shall be thoroughly flushed clean and all necessary hose, pumps, pipe and other equipment that may be required for this purpose shall be furnished by the Contractor. No debris shall be flushed into existing storm drains or streams; all debris shall be removed from the system as well as any temporary or permanent ponds. After the system has been cleaned, a thorough inspection of the system and all repairs shown to be necessary shall be promptly made. All work of cleaning and repair as specified herein shall be performed at Contractor's expense and to the complete satisfaction of Owner's Engineer.

3.12 AS-BUILT RECORD DRAWINGS

- A. An As-Built record of the sewer system as sections are completed shall be kept. The As-Built record shall be produced in AutoCAD or approved equal computer drafting software and include the exact location of the constructed storm system, rim, and invert elevations, size, and material of all storm lines. Elevations and coordinates shall be based on the datum and coordinate system established by the project design team.
- B. An electronic file and 3 copies of the As-Built record of the work completed under this section shall be submitted to the Owner's Engineer.

3.13 FINAL INSPECTION

A. Upon completion of the work and before final acceptance by Owner, the entire drainage system shall be subject to a final inspection in the presence of the Site Engineer and/or Owner's Engineer. The work shall not be considered as complete until all requirements for line, grade, cleanliness, and workmanship have been completed to the satisfaction of Owner's Engineer and/or Site Engineer.

END OF SECTION 334000

APPENDIX B

OWNER PURCHASED MATERIALS
Submittal

Project Name:

TCNJ - Roscoe Hall Lower Level (Revision 0)

Contractor:	
Engineer:	NORR
Architect:	NORR
Rep/Distributor:	Trane Technologies
	Project Detail:
Customer:	The College of New Jersey
Address:	2000 Pennington Road
City:	Ewing
State:	New Jersey
Zip:	08628
	Submittal Date:
	8/8/2024
	Submitted By:
Name:	Steven Jacobus
Company:	Trane Technologies
Email:	steven.jacobus@tranetechnologies.com
Phone:	973-309-3050
Submittal Stage:	Design Only

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Notes

Equipment Bill Of Material

Quantities

Qty	Model	Description	
			CTR1-ACC-6,CTR2-ACC-5,CTR3
			2,CTR6-ACC-1,CTR7-ACCU-12,C
			11.CTR10-ACCU-13.CTR11-ACC
			10.CTR14-ACC-9.CTR15-ACC-8.0
34	PAC-Y153CRAU-J	Simple MA controller	32.CTR18-ACC-33.CTR19-ACC-3
			23.CTR2-ACC-22.CTR3-ACC-19.0
			ACC-36 CTR7-ACC-26 CTR8-AC
			27.CTR11-ACC-29.CTR12-ACC-3
1	TURYE2644BN41AN	R410A R2 Series Outdoor Unit	HP-1
1	TURYE3124BN41AN	R410A R2 Series Outdoor Unit	HP-2
1	TRUYA0121KA70NA	R410A P Series Outdoor Unit	ACCU-17
2	TCMBM1016JA11N4	BC Controller Main	BC-1.BC-2
1	TCMBS0108KB21N4	BC Controller Sub	SBC-1
2	CMY-R160-J1	Joint Pipe	HP-2.HP-2
8	TPLFYP008FM140A	Ceiling-Cassette (Four-Way) Indoor Unit	ACC-6.ACC-5.ACC-4.ACC-3.ACC
7	TPLEYP005FM140A	Ceiling-Cassette (Four-Way) Indoor Unit	ACCU-12 ACCU-7 ACCU-11 ACC
4	TPI FYP018FM140A	Ceiling-Cassette (Four-Way) Indoor Unit	ACC-14 ACC-15 ACC-16 ACC-32
5	TPLFYP030FM140B	Ceiling-Cassette (Four-Way) Indoor Unit	ACC-33 ACC-38 ACC-37 ACC-36
2	TPL FYP036FM142A	Ceiling-Cassette (Four-Way) Indoor Unit	ACC-31 ACC-34
1	TPKEYP012LM140A	Wall -Mounted Indoor Unit	ACCU-21
1	TPI EYP012EM140A	Ceiling-Cassette (Four-Way) Indoor Unit	ACC-39
5		Ceiling-Cassette (Four-Way) Indoor Unit	
1		Ceiling-Cassette (Four-Way) Indoor Unit	ΔCC-22
1		Ceiling-Cassette (Four-Way) Indoor Unit	
4		Wall Mounted Indoor Unit	
5		Branch Joint	
3			
2		System Remete Controller	
1	BACNET Master		
2	SCN 1	Sido Spow/Hail Cuard	
2		Front or Roor Snow/Hail Guard	
0			
0		Sillow Houd	
2		Super Stand W/ 4011 Talls, Toll Tall	
2	QS3,40WI-10		
01		Decoration Danal	
21	ILP-18FAU	Decoration Panel	
			15,AUU-32,AUU-39,AUU-22,AUU-
10			ACC-33,ACC-31,ACC-23,ACC-19
10	ILP-4TEAEU	Gnile with 3D I-see Sensor'	34,ACC-38,ACC-37,ACC-36,ACC-
2		Wall Mount Unit Condensate Dump	
2		Rell Value 2/8"	
35			
35			
2			
1			BC-1
1	CINT-R3065-G	Reducer	580-1
2	SGN-2	Front or Rear Snow/Hall Guard	
2			
		Super Stand EXT W/ 74In Kalls, 18In Tall	
1			
1			
1			
1	PAC-SJ96MA-E	M-NET Converter	
1	IQSMS1801M	Stand - 18" High	JACCU-17

Refrigerant Piping Materials

Pipe Size (inch)	Total Length (feet)	Number of Bends
7/8	30	0
1-1/8	45	4
3/4	163	0
1/4	1278	4
1/2	1278	4
3/8	499	0
5/8	336	0
1-3/8	45	4
1-5/8	0	0

Тад
-ACC-4,CTR4-ACC-3,CTR5-ACC-
CTR8-ACCU-7,CTR9-ACCU-
-14,CTR12-ACC-16,CTR13-ACC-
CTR16-ACC-20,CTR17-ACC-
31,CTR20-ACCU-21,CTR1-ACC-
CTR4-ACC-18,CTR5-ACC-38,CTR6-
C-25,CTR9-ACC-24,CTR10-ACC-
34,CTR21-ACC-39,CTR1-ACC-17

C-2,ACC-1,ACC-20,ACC-26 CU-13,ACC-10,ACC-9,ACC-8

6,ACC-35

25,ACC-24

0

-B1,ODU-B1

C-2,ACC-1,ACCU-12,ACCU-7,ACCU-CC-9,ACC-8,ACC-20,ACC-14,ACC-C-26

19,ACC-18,ACC-25,ACC-24,ACC-C-35,ACC-27,ACC-28,ACC-29,ACC-30

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General

SYSTEM DESCRIPTION R2-SERIES (SIMULTANEOUS HEAT/COOL)

Per the equipment schedule, the variable capacity, heat pump heat recovery air conditioning system basis of design is Mitsubishi Electric CITY MULTI VRF (Variable Refrigerant Flow) zoning system(s).

Acceptable alternative manufacturers, assuming compliance with these equipment specifications, are Daikin, Panasonic, and Hitachi. Contractor bidding an alternate manufacturer does so with full knowledge that that manufactures product may not be acceptable or approved and that contractor is responsible for all specified items and intents of this document without further compensation.

Simultaneous heating/cooling (heat recovery) systems shall consist of an outdoor unit, BC (Branch Circuit) Controller (or comparable branch devices), multiple indoor units, and an integral DDC (Direct Digital Controls) system. Each indoor unit or group of indoor units shall be capable of operating in any mode independently of other indoor units or groups. System shall be capable of changing mode (cooling to heating, heating to cooling) with no interruption to system operation. To ensure owner comfort, each indoor unit or group of indoor units shall be independently controlled and capable of changing mode automatically when zone temperature strays 1.8 degrees F from set point for ten minutes.

No additional branch circuit controllers (or comparable branch devices) than shown on the drawings/schedule may be connected to any one outdoor unit. Contractors proposing alternate systems requiring more branch devices than those included as the basis of design are responsible for additional piping & electrical costs and are required to identify additional costs & installation time required of other trades with their bid.

QUALITY ASSURANCE

The units shall be listed by Electrical Testing Laboratories (ETL) and bear the ETL label. All wiring shall be in accordance with the National Electrical Code (N.E.C.).

The units shall be manufactured in a facility registered to ISO 9001 and ISO14001 which is a set of standards applying to environmental protection set by the International Standard Organization (ISO).

All units must meet or exceed the 2010 Federal minimum efficiency requirements and the ASHRAE 90.1 efficiency requirements for VRF systems. Efficiency shall be published in accordance with the Air-Conditioning, Heating, and Refrigeration Institute (AHRI) Standard 1230.

System start-up supervision shall be a required service to be completed by the manufacturer or a duly authorized, competent representative that has been factory trained in system configuration and operation. The representative shall provide proof of manufacturer certification indicating successful completion within no more than two (2) years prior to system installation. This certification shall be included as part of the equipment and/or controls submittals.

DELIVERY, STORAGE AND HANDLING

Unit shall be stored and handled according to the manufacturer's recommendation.

Warranty

The CITY MULTI units shall be covered by the manufacturer's limited warranty for a period of one (1) year parts and seven (7) year compressor to the original owner from date of installation.

Installing contractor shall meet manufacturer requirements to obtain extended manufacturer's limited parts and compressor warranty for a period of ten (10) years to the original owner from date of installation. This warranty shall not include labor.

Manufacturer shall have a minimum of fifteen (15) years continuous experience providing VRF systems in the U.S. market.

All manufacturer technical and service manuals must be readily available for download by any local contractor should emergency service be required. Registering and sign-in requirements which may delay emergency service reference are not allowed.

The CITY MULTI VRF system shall be installed by a contractor with extensive CITY MULTI install and service training. The mandatory contractor service and install training should be performed by the manufacturer.

Outdoor Units

R2-SERIES HIGH EFFICIENCY (HEAT RECOVERY), AIR COOLED OUTDOOR UNITS

General:

The outdoor unit modules shall be air-cooled, direct expansion (DX), multi-zone units used specifically with VRF components described in this section and Part 5 (Controls). The outdoor unit modules shall be equipped with a single compressor which is inverter-driven and multiple circuit boards—all of which must be manufactured by the branded VRF manufacturer. Each outdoor unit module shall be completely factory assembled, piped and wired and run tested at the factory.

Outdoor unit systems may be comprised of multiple modules with differing capacity if a brand other than basis of design is proposed. All units requiring a factory supplied twinning kits shall be piped together in the field, without the need for equalizing line(s). If an alternate manufacturer is selected, any additional material, cost, and labor to install additional lines shall be incurred by the contractor. Contractor responsible for ensuring alternative brand compatibility in terms of availability, physical dimensions, weight, electrical requirements, etc.

Outdoor unit shall have a sound rating no higher than 68 dB(A) individually or 70 dB(A) twinned. Units shall have a sound rating no higher than 52 dB(A) individually or 55 dB(A) twinned while in night mode operation. Units shall have 5 levels sound adjustment via dip switch selectable fan speed settings. If an alternate manufacturer is selected, any additional material, cost, and labor to meet published sound levels shall be incurred by the contractor.

Refrigerant lines from the outdoor unit to the indoor units shall be insulated in accordance with the installation manual.

The outdoor unit shall have the capability of installing the main refrigerant piping through the bottom of the unit.

The outdoor unit shall have an accumulator with refrigerant level sensors and controls. Units shall actively control liquid level in the accumulator via Linear Expansion Valves (LEV) from the heat exchanger.

The outdoor unit shall have a high pressure safety switch, over-current protection, crankcase heater and DC bus protection.

VRF system shall meet performance requirements per schedule and be within piping limitations & acceptable ambient temperature ranges as described in respective manufacturers' published product catalogs. Non-published product capabilities or performance data are not acceptable.

The outdoor unit shall be capable of operating in heating mode down to -25F ambient temperatures or cooling mode down to 23F ambient temperatures, without additional low ambient controls. If an alternate manufacturer is selected, any additional material, cost, and labor to meet low ambient operating condition and performance shall be incurred by the contractor.

The outdoor unit shall have a high efficiency oil separator plus additional logic controls to ensure adequate oil volume in the compressor is maintained. Oil return sequences must be enabled only during extended periods of reduced refrigerant flow to ensure no disruption to correct refrigerant flow to individual zones during peak loads. Systems which might engage oil return sequence based on hours of operation risk oil return during inopportune periods are not allowed. Systems which rely on sensors (which may fail) to engage oil return sequence are not allowed.

Unit must defrost all circuits simultaneously in order to resume full heating more quickly during extreme low ambient temperatures (below 23F). Partial defrost, also known as hot gas defrost which allows reduced heating output during defrost, is permissible only when ambient temperature is above 23F.

While in hot gas defrost the system shall slow the indoor unit fan speed down to maintain a high discharge air temperature, systems that keep fan running in same state shall not be allowed as they provide an uncomfortable draft to the indoor zone due to lower discharge air temperatures.

In reverse defrost all refrigerant shall be bypassed in the main branch controller and shall not be sent out to the indoor units, systems that flow refrigerant through indoor units during reverse defrost shall not be allowed.

The outdoor unit shall be provided with a manufacturer supplied 20 gauge hot dipped galvanized snow /hail guard. The snow/hail guard protects the outdoor coil surfaces from hail damage and snow build-up in severe climates.

VRF four-legged outdoor unit mounting systems shall be provided by manufacturer. Stand shall be made from 7 gauge plate steel with thermally fused polyester powder coat finish that meets ASTM D3451-06 standards. Stands shall be provided with galvanized mounting hardware and meets all ASCE 7 overturning safety requirement.

Unit Cabinet:

The casing(s) shall be fabricated of galvanized steel, bonderized and finished.

The outdoor unit shall be tested in compliance with ISO9277 such that no unusual rust shall develop after 960 hours of salt spray testing.

Panels on the outdoor unit shall be scratch free at system startup. If a scratch occurs the salt spray protection is compromised and the panel should be replaced immediately.

Fan:

Each outdoor unit module shall be furnished with direct drive, variable speed propeller type fan(s) only. Fans shall be factory set for operation at 0 in. WG. external static pressure, but capable of normal operation with a maximum of 0.32 in. WG. external static pressure via dipswitch.

All fan motors shall have inherent protection, have permanently lubricated bearings, and be completely variable speed.

All fans shall be provided with a raised guard to prevent contact with moving parts.

Refrigerant and Refrigerant Piping:

R410A refrigerant shall be required for systems.

Polyolester (POE) oil—widely available and used in conventional domestic systems—shall be required. Prior to bidding, manufacturers using alternate oil types shall submit material safety data sheets (MSDS) and comparison of hygroscopic properties for alternate oil with list of local suppliers stocking alternate oil for approval at least two weeks prior to bidding.

Refrigerant piping shall be phosphorus deoxidized copper (copper and copper alloy seamless pipes) of sufficient radial thickness as defined by the VRF equipment manufacturer and installed in accordance with manufacturer recommendations.

All refrigerant piping must be insulated with ½" closed cell, CFC-free foam insulation with flame-Spread Index of less than 25 and a smoke-development Index of less than 50 as tested by ASTM E 84 and CAN / ULC S-102. R value of insulation must be at least 3.

Refrigerant line sizing shall be in accordance with manufacturer specifications. Future changes to indoor unit styles or sizes must be possible without resizing/replacing refrigerant piping to any other branch devices or indoor units.

Coil:

Outdoor Coil shall be constructed to provide equal airflow to all coil face surface are by means of a 4-sided coil

Outdoor Coil shall be elevated at least 12" from the base on the unit to protect coil from freezing and snow build up in cold climates. Manufacturer's in which their coil extends to within a few inches from the bottom of their cabinet frame shall provide an additional 12" of height to their stand or support structure to provide equal protection from elements as Mitsubishi Electric basis of design. Any additional support costs, equipment fencing, and tie downs required to meet this additional height shall be responsibility of Mechanical Contractor to provide.

The outdoor heat exchanger shall be of zinc coated aluminum construction with turbulating flat tube construction. The coil fins shall have a factory applied corrosion resistant finish. Uncoated aluminum coils/fins are not allowed.

The coil shall be protected with an integral metal guard.

Refrigerant flow from the outdoor unit shall be controlled by means of an inverter driven compressor.

Unit shall have prewired plugs for optional panel heaters in order to prevent any residual ice buildup from defrost. Panel heaters are recommended for operating environments where the ambient temperature is expected to stay below -1F for 72 hours.

Condenser coil shall have active hot gas circuit direct from compressor discharge on lowest coil face area to shed defrost condensate away from coil and protect from Ice formation after returning to standard heat pump operation. While in Heat Pump operation this lower section of the Outdoor Evaporator coil shall continually run hot gas from the compressor discharge to protect the coil from ice buildup and coil rupture. Manufacturers who do not have an active hot gas circuit in the lower section of the Outdoor coil to protect coil from freezing shall not be allowed to bid on project in markets where the outdoor unit will see temperatures below freezing.

Compressor:

Each outdoor unit module shall be equipped with only inverter driven scroll hermetic compressors. Non inverter-driven compressors, which may cause inrush current (demand charges) and require larger generators for temporary power shall not be allowed.

Each compressor shall be equipped with a multi-port discharge mechanism to eliminate over compression at part load. Manufacturer's that rely on a single compressor discharge port and provide no means of eliminating over compression and energy waste at part load shall not be allowed.

Crankcase heat shall be provided via induction-type heater utilizing eddy currents from motor windings. Energy-wasting "belly-band" type crankcase heaters are not allowed. Manufacturers that utilize belly-band crankcase heaters will be considered as alternate only.

Compressor shall have an inverter to modulate capacity. The capacity for each compressor shall be variable with a minimum turndown not greater than 15%.

The compressor shall be equipped with an internal thermal overload.

Field-installed oil equalization lines between modules are not allowed. Prior to bidding, manufacturers requiring equalization must submit oil line sizing calculations specific to each system and module placement for this project.

Manufacturers that utilize a compressor sump oil sensor to equalize compressor oil volume within a single module shall not be allowed unless they actively shut down the system to protect from compressor failure.

Controls:

The unit shall be an integral part of the system & control network described in Part 5 (Controls) and react to heating/cooling demand as communicated from connected indoor units over the control circuit. Required field-installed control voltage transformers and/or signal boosters shall be provided by the manufacturer.

Each outdoor unit module shall have the capability of 4 levels of demand control based on external input.

Electrical:

The outdoor unit electrical power shall be 208/230 volts, 3-phase, 60 hertz or 460 volts, 3-phase, 60 hertz per equipment schedule.

The outdoor unit shall be controlled by integral microprocessors.

The control circuit between the indoor units, BC Controller and the outdoor unit shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.

BRANCH CIRCUIT (BC) CONTROLLERS AS REQUIRED FOR SIMULTANEOUS HEAT/COOL SYSTEMS

General

BC (Branch Circuit) Controllers (or comparable branch devices) shall include multiple branches to allow simultaneous heating and cooling by allowing either hot gas refrigerant to flow to indoor unit(s) for heating or subcooled liquid refrigerant to flow to indoor unit(s) for cooling. Refrigerant used for cooling must always be subcooled for optimal indoor unit LEV performance; alternate branch devices which do not include controlled refrigerant subcooling risk bubbles in liquid supplied to indoor unit LEVs and are not allowed.

BC Controllers (or comparable branch devices) shall be equipped with a circuit board that interfaces to the controls system and shall perform all functions necessary for operation. The unit shall have a galvanized steel finish and be completely factory assembled, piped and wired. Each unit shall be run tested at the factory. This unit shall be mounted indoors, with access and service clearance provided for each controller. BC Controllers (or comparable branch devices) shall be suitable for use in plenums in accordance with UL1995 ed 4.

BC Unit Cabinet:

The casing shall be fabricated of galvanized steel. Each cabinet shall house a liquid-gas separator and multiple refrigeration control valves. The unit shall house two tube-in-tube heat exchangers.

Refrigerant Piping (specifications in addition to those for outdoor unit):

All refrigerant pipe connections shall be brazed.

Future changes to indoor unit quantities or sizes served by BC Controller or comparable branch device must be possible with no piping changes except between the branch device and indoor unit(s) changing. Systems which might require future piping changes between branch device and outdoor unit—if changes to indoor unit quantities or sizes are made—are not considered equal and are not allowed.

Refrigerant valves:

Service shut-off values shall be field-provided/installed for each branch to allow service to any indoor unit without field interruption to overall system operation.

Condensate Management:

BC Controller (or comparable branch device) must have integral resin drain pan or insulate refrigeration components with removable insulation that allows easy access for future service needs. Cabinets filled with solid foam insulation do not allow for future service and are not allowed.

Electrical:

The unit electrical power shall be 208/230 volts, 1 phase, 60 Hertz. The unit shall be capable of satisfactory operation within voltage limits of 187-228 (208V/60Hz) or 207-253 (230/60Hz).

The BC Controller shall be controlled by integral microprocessors

The control circuit between the indoor units and outdoor units shall be 24VDC completed using a 2-conductor, twisted pair shielded cable to provide total integration of the system.

Indoor Units

WALL MOUNTED INDOOR UNIT

General:

The wall-mounted indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory.

Unit Cabinet:

All casings, regardless of model size, shall have the same white finish

Multi directional drain and refrigerant piping offering four (4) directions for refrigerant piping and two (2) directions for draining are required.

There shall be a separate back plate which secures the unit firmly to the wall.

Fan:

The indoor fan shall be statically and dynamically balanced to run on a single motor with permanently lubricated bearings.

A manual adjustable guide vane shall be provided with the ability to change the airflow from side to side (left to right).

A motorized air sweep louver shall provide an automatic change in airflow by directing the air up and down to provide uniform air distribution.

Filter:

Return air shall be filtered by means of an easily removable, washable filter.

Coil:

Basis of design indoor units include factory-installed LEV/EEV. Alternative brands which require field-installed, accessory LEV or EEV kits are permissible only with written Engineer and Architect approval for the location of kits being submitted two weeks prior to bid date. EEV kits mounted in cavities inside fire-rated interior walls shall be mounted inside three hour fire rated enclosures with access panels supplied by the manufacturer. Enclosure type and placement require prior approval.

The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing. The tubing shall have inner grooves for high efficiency heat exchange. All tube joints shall be brazed with phos-copper or silver alloy.

The coils shall be pressure tested at the factory.

Electrical:

The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.

The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz)

Controls:

The unit shall include an IR receiver for wireless remote control flexibility

Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.

Control board shall include contacts for control of external heat source. External heat may be energized as second stage with $1.8^{\circ}F - 9.0^{\circ}F$ adjustable deadband from set point.

Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.

Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.

4-WAY CEILING-RECESSED CASSETTE WITH GRILLE INDOOR UNIT

General:

The ceiling-recessed indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, an emergency operation function, a test run switch, and the ability to adjust airflow patterns for different ceiling heights. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory. The unit shall be suitable for use in plenums in accordance with UL1995 ed 4.

Unit Cabinet:

The cabinet panel shall have provisions for a field installed filtered outside air intake.

Branch ducting shall be allowed from cabinet.

Four-way grille shall be fixed to bottom of cabinet allowing two, three or four-way blow.

The grille vane angles shall be individually adjustable from a wired remote controller to customize the airflow pattern for the conditioned space

Fan:

The indoor fan shall be an assembly with a statically and dynamically balanced turbo fan direct driven by a single motor with permanently lubricated bearings.

The indoor unit shall include an AUTO fan setting capable of maximizing energy efficiency by adjusting the fan speed based on the difference between controller set-point and space temperature. The indoor fan shall be capable of five (5) speed settings, Low, Mid1, Mid2, High and Auto.

The indoor unit shall have an adjustable air outlet system offering 4-way airflow, 3-way airflow, or 2-way airflow.

The indoor unit fan logic must include multiple setting that can be changed to provide optimum airflow based on ceiling height and number of outlets used.

The indoor unit vanes shall have 5 fixed positions and a swing feature that shall be capable of automatically swinging the vanes up and down for uniform air distribution.

The vanes shall have an Auto-Wave selectable option in the heating mode that shall randomly cycle the vanes up and down to evenly heat the space.

Grille shall include a factory-installed "3D i-see" sensor, or equal, to work in conjunction with indoor unit control sequence to prevent unnecessary cooling or heating in unoccupied areas of the zone without decreasing comfort levels. Sensor must detect occupancy (not simply motion) and location of occupants by measuring size & temperature of objects within a 39' detecting diameter (based on 8.8ft mounting height) with 1,856 or more measuring points.

Filter:

Return air shall be filtered by means of a long-life washable filter

Coil:

The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing. The tubing shall have inner grooves for high efficiency heat exchange. All tube joints shall be brazed with phos-copper or silver alloy.

The coils shall be pressure tested at the factory.

The unit shall be provided with an integral condensate lift mechanism that will be able to raise drain water 33 inches above the condensate pan.

Electrical:

The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.

The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).

Controls:

Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.

Control board shall include contacts for control of external heat source. External heat may be energized as second stage with $1.8^{\circ}F - 9.0^{\circ}F$ adjustable deadband from set point.

Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.

Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.

A factory-installed drain pan sensor shall provide protection against drain pan overflow by sensing a high condensate level in the drain pan. Should this occur the control shuts down the indoor unit before an overflow can occur. A thermistor error code will be produced should the sensor activate indicating a fault which must be resolved before the unit re-starts.

4-WAY CEILING-RECESSED CASSETTE WITH GRILLE FOR 2X2 GRID INDOOR UNIT

General:

The indoor unit shall be a four-way cassette style indoor unit that recesses into the ceiling with a ceiling grille. The indoor unit shall be factory assembled, wired and run tested. Contained within the unit shall be all factory wiring, piping, electronic modulating linear expansion device, control circuit board and fan motor. The unit shall have a self-diagnostic function, 3-minute time delay mechanism, an auto restart function, an emergency operation function and a test run switch. Indoor unit and refrigerant pipes shall be charged with dehydrated air before shipment from the factory. The unit shall be suitable for use in plenums in accordance with UL1995 ed 4.

Unit Cabinet:

The cabinet shall be a compact 22-7/16" wide x 22-7/16" deep so it will fit within a standard 24" square suspended ceiling grid.

The cabinet panel shall have provisions for a field installed filtered outside air intake.

Four-way grille shall be fixed to bottom of cabinet allowing two, three or four-way blow.

Fan:

The indoor fan shall be an assembly with a turbo fan direct driven by a single motor.

The indoor fan shall be statically and dynamically balanced to run on a motor with permanently lubricated bearings.

The indoor fan shall be capable of three (3) speed settings, Low, Mid, and High.

The indoor unit shall have an adjustable air outlet system offering 4-way airflow, 3-way airflow, or 2-way airflow.

The indoor unit vanes shall have 5 fixed positions and a swing feature that shall be capable of automatically swinging the vanes up and down for uniform air distribution.

Grille shall include an optional "3D i-see" sensor, or equal, to work in conjunction with indoor unit control sequence to prevent unnecessary cooling or heating in unoccupied areas of the zone without decreasing comfort levels. Sensor must detect occupancy (not simply motion) and location of occupants by measuring size & temperature of objects within a 39' detecting diameter (based on 8.8ft mounting height) with 1,856 or more measuring points.

Filter:

Return air shall be filtered by means of a long-life washable filter.

Coil:

The indoor coil shall be of nonferrous construction with smooth plate fins on copper tubing. The tubing shall have inner grooves for high efficiency heat exchange. All tube joints shall be brazed with phos-copper or silver alloy.

The coils shall be pressure tested at the factory.

The unit shall be provided with an integral condensate lift mechanism that will be able to raise drain water 19-3/4" inches above the condensate pan.

Electrical:

The unit electrical power shall be 208/230 volts, 1-phase, 60 hertz.

The system shall be capable of satisfactory operation within voltage limits of 187-228 volts (208V/60Hz) or 207-253 volts (230V/60Hz).

Controls:

Indoor unit shall compensate for the higher temperature sensed by the return air sensor compared to the temperature at level of the occupant when in HEAT mode. Disabling of compensation shall be possible for individual units to accommodate instances when compensation is not required.

Control board shall include contacts for control of external heat source. External heat may be energized as second stage with $1.8^{\circ}F - 9.0^{\circ}F$ adjustable deadband from set point.

Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.

Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.

A factory-installed drain pan sensor shall provide protection against drain pan overflow by sensing a high condensate level in the drain pan. Should this occur, the control shuts down the indoor unit before an overflow can occur. A thermistor error code will be produced should the sensor activate indicating a fault which must be resolved before the unit re-starts.

Control board shall include contacts for control of no less than two stages of external heat. The first stage of external heat may be energized when the space temperature is 2.7°F from set point for between 10-25 minutes (user adjustable). The second stage of external heat may be energized when the first stage has been active for no less than 5 minutes and the space temperature has not risen by more than 0.9°F.

Indoor unit shall include no less than four (4) digital inputs capable of being used for customizable control strategies.

Indoor unit shall include no less than three (3) digital outputs capable of being used for customizable control strategies.

Controls

OVERVIEW

The control system shall consist of a low voltage communication network and a web-based interface. The controls system shall gather data and generate web pages accessible through a conventional web browser on each PC connected to the network. Operators shall be able to perform all normal operator functions through the web browser interface.

Furnish energy conservation features such as optimal start, request-based logic, and demand level adjustment of overall system capacity as specified in the sequence.

System shall be capable of email generation for remote alarm annunciation.

ELECTRICAL CHARACTERISTICS

General:

Controller power and communications shall be via a common non-polar communications bus and shall operate at 30VDC.

Wiring:

Control wiring shall be installed in a daisy chain configuration from indoor unit to indoor unit, to the BC controller (main and subs, if applicable) and to the outdoor unit. Control wiring to remote controllers shall be run from the indoor unit terminal block to the controller associated with that unit.

Control wiring for centralized controllers shall be installed in a daisy chain configuration from outdoor unit to outdoor unit, to the system controllers (centralized controllers and/or integrated web based interface), to the power supply.

Wiring type:

Wiring shall be 2-conductor (16 AWG), twisted, stranded, shielded wire as defined by the Diamond System Builder output.

Network wiring shall be CAT-5 with RJ-45 connection.

CITY MULTI CONTROLS NETWORK

The CITY MULTI Controls Network (CMCN) consists of remote controllers, centralized controllers, and/or integrated web based interface communicating over a high-speed communication bus. The CITY MULTI Controls Network shall support operation monitoring, scheduling, occupancy, error email distribution, personal web browsers, tenant billing, online maintenance support, and integration with Building Management Systems (BMS) using either LonWorks® or BACnet® interfaces. The below figure illustrates a sample CMCN System Configuration.



CMCN System Configuration

CMCN: REMOTE CONTROLLERS

Simple MA Remote Controller:

The Backlit Simple MA Remote Controller shall be capable of controlling up to 16 indoor units (defined as 1 group).

The Backlit Simple MA Remote Controller shall only be used in same group with Wireless MA Remote Controllers or with other Backlit Simple MA Remote Controllers, with up to two remote controllers per group.

Simple MA Remote Controller			
Item	Description	Operation	Display
	Pup and stop operation for a single group	Each	Each
		Group	Group
Operation Mode	Switches between Cool/Drying/Auto/Fan/Heat/Setback. Operation modes vary depending on the air conditioner unit. Auto and Setback mode are available for the R2/WR2- Series only.	Each Group	Each Group
Temperature Setting	Sets the temperature from 40°F – 95°F depending on operation mode and indoor unit. Separate COOL and HEAT mode set points available depending on central controller and connected mechanical equipment.	Each Group	Each Group
Fan Speed Setting	Available fan speed settings depending on indoor unit.	Each Group	Each Group
Air Flow Direction Setting	Air flow direction settings vary depending on the indoor unit model.	Each Group	Each Group
Permit / Prohibit Local Operation	Individually prohibit operation of each local remote control function (Start/Stop, Change operation mode, Set temperature, Reset filter). *1: Centrally Controlled is displayed on the remote controller for prohibited functions.	N/A	Each Group *1
Display Indoor Unit Intake Temp	Measures and displays the intake temperature of the indoor unit when the indoor unit is operating.	N/A	Each Group
Display Backlight	Pressing the button lights up a backlight. The light automatically turns off after a certain period of time. (The brightness settings can be selected from Bright, Dark, and Light off.)	N/A	Each Unit
Error	When an error is currently occurring on an air conditioner unit, the afflicted unit and the error code are displayed	N/A	Each Unit
Test Run	Operates air conditioner units in test run mode.	Each	Each
	*2 The display for test run mode will be the same as	Group	Group *2

	for normal start/stop (does not display "test run").		
Ventilation Equipment	Up to 16 indoor units can be connected to an interlocked system that has one LOSSNAY unit.	Each Group	N/A
Set Temperature Range Limit	Set temperature range limit for cooling, heating, or auto mode.	Each Group	Each Group

CENTRALIZED CONTROLLER (WEB-ENABLED)

Master Centralized Controller:

The Master Centralized Controller shall be capable of controlling a maximum of two hundred (200) indoor units across multiple CITY MULTI outdoor units with the use of three expansion controllers. The Master Centralized Controller shall be approximately 11-5/32" x 7-55/64" x 2-17/32" in size and shall be powered with an integrated 100-240 VAC power supply. The Master Centralized Controller shall support system configuration, daily/weekly scheduling, monitoring of operation status, night setback settings, free contact interlock configuration and malfunction monitoring. When being used alone without the expansion controllers, the Master Centralized Controller shall have five basic operation controls which can be applied to an individual indoor unit, a collection of indoor units (up to 50 indoor units), or all indoor units (collective batch operation). This basic set of operation controls for the Master Centralized Controller shall include on/off, operation mode selection (cool, heat, auto (R2/WR2-Series only), dry, setback (R2/WR2-Series only) and fan), temperature setting, fan speed setting, and airflow direction setting. Since the master provides centralized control it shall be able to enable or disable operation of local remote controllers. In terms of scheduling, the Master Centralized Controller shall allow the user to define both daily and weekly schedules (up to 24 scheduled events per day) with operations consisting of ON/OFF, mode selection, temperature setting, air flow (vane) direction, fan speed, and permit/prohibit of remote controllers.

Master Centralized Controller			
ltem	Description	Operation	Display
ON/OFF	Run and stop operation.	Each Block, Group or Collective	Each Group or Collective

Operation Mode	Switches between Cool/Dry/Auto/Fan/Heat. (Group of Lossnay unit: automatic ventilation/vent- heat/interchange/normal ventilation) Operation modes vary depending on the air conditioner unit. Auto mode is available for the R2/WR2-Series only.	Each Block, Group or Collective	Each Group
Temperature Setting	Sets the temperature from 57°F – 87°F depending on operation mode and indoor unit.	Each Block, Group or Collective	Each Group
Fan Speed Setting	Available fan speed settings depending on indoor unit.	Each Block, Group or Collective	Each Group
Air Flow Direction Setting	Air flow direction settings vary depending on the indoor unit model. *1. Louver cannot be set.	*1 Each Block, Group or Collective	Each Group
Schedule Operation	 Annual/weekly/today schedule can be set for each group of air conditioning units. Optimized start setting is also available. *1. The system follows either the current day, annual schedule, or weekly, which are in the descending order of overriding priority. Twenty-four events can scheduled per day, including ON/OFF, Mode, Temperature Setting, Air Direction, Fan Speed and Operation Prohibition. Five types of weekly schedule (seasonal) can be set. Settable items depend on the functions that a given air conditioning unit supports. 	*2 Each Block, Group or Collective	Each Group
Optimized Start	Unit starts 5 - 60 minutes before the scheduled time based on the operation data history in order to reach the scheduled temperature at the scheduled time.	Each Block, Group or Collective	Each Block, Group or Collective
Night Setback Setting	The function helps keep the indoor temperature in the temperature range while the units are stopped and during the time this function is effective.	Each Group	Each Group

Permit / Prohibit Local Operation	Individually prohibit operation of each local remote control function (Start/Stop, Change operation mode, Set temperature, Reset filter). *3. Centrally Controlled is displayed on the remote controller for prohibited functions.	Each Block, Group or Collective	*3 Each Group
Room Temp	Displays the room temperature of the group. Space temperature displayed on the indoor unit icon on the touch screen interface.	N/A	Each Group
Error	 When an error is currently occurring on an air conditioner unit, the afflicted unit and the error code are displayed *4. When an error occurs, the LED flashes. The operation monitor screen shows the abnormal unit by flashing it. The error monitor screen shows the abnormal unit address, error code and source of detection. The error log monitor screen shows the time and date, the abnormal unit address, error code and source of detection 	N/A	*4 Each Unit or Collective
Outdoor Unit Status	Compressor capacity percentage and system pressure (high and low) pressure (excludes S-Series)	Each ODU	Each ODU
Connected Unit Information	MNET addresses of all connected systems	Each IDU, ODU and BC	Each IDU, ODU and BC
Ventilation Equipment	This interlocked system settings can be performed by the master system controller. When setting the interlocked system, use the ventilation switch the free plan LOSSNAY settings between "Hi", "Low" and "Stop". When setting a group of only free plan LOSSNAY units, you can switch between "Normal ventilation", "Interchange ventilation" and "Automatic ventilation".	Each Group	Each Group
Multiple Language	Other than English, the following languages can be selected: Spanish, French, Japanese, Dutch, Italian, Russian, Chinese, and Portuguese.	N/A	Collective

External Input / Output	By using accessory cables you can set and monitor the following. Input By level: "Batch start/stop", "Batch emergency stop" By pulse: "batch start/stop", "Enable/disable remote controller" Output: "start/stop", "error/Normal" *5. Requires the external I/O cables (PAC- YG10HA-E) sold separately.	*5 Collective	*5 Collective
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All Master Centralized Controllers shall be equipped with two RJ-45 Ethernet ports to support interconnection with a network PC via a closed/direct Local Area Network (LAN) or to a network switch for IP communication to up to three expansion controllers for display of up to two hundred (200) indoor units on the main master centralized controller interface.

The Master Centralized Controller shall be capable of performing initial settings via the highresolution, backlit, color touch panel on the controller or via a PC browser using the initial settings.

Standard software functions shall be available so that the building manager can securely log into each master centralized controller via the PC's web browser to support operation monitoring, scheduling, error email, interlocking and online maintenance diagnostics. Additional optional software functions of personal browser for PCs and MACs and Energy shall be available but are not included. The Energy Apportionment function shall require a LIC-Charge software license

Expansion Controller:

The Expansion Controller shall serve as a standalone centralized controller or as an expansion module to the Master Centralized Controller for the purpose of adding up to 50 indoor units to either the main touch screen interface of the master centralized controller. Up to three (3) expansion controllers can be connected to the master via a local IP network (and their IP addresses assigned on the master) to the master to allow for up to two hundred (200) indoor units to be monitored and controlled from the master interface.

The expansion controllers have all of the same capabilities to monitor and control their associated indoor units as the features specified above. Even when connected to the master and configured to display their units on the main controller, the individual indoor units connected to the expansion can still be monitored and controlled from the interface of the expansion. The last command entered will take precedence, whether at the wall controller, the expansion or the master Centralized Controller.

Non Touch Screen, Networked Centralized Controller:

The Non Touch Screen, Networked Centralized Controller shall be capable of controlling a maximum of 50 indoor units across multiple CITY MULTI outdoor units. The controller shall be approximately 8-1/2"x10" in size and shall be powered by its internal power supply. The controller shall support system configuration, daily/weekly scheduling, monitoring of operation status, free contact interlock configuration and malfunction monitoring. The controller shall have five basic operation controls which can be applied to an individual indoor unit, a group of indoor units (up to 50 indoor units), or all indoor units (collective batch operation). This basic set of operation controls for the controller shall include on/off, operation mode selection (cool, heat, auto (R2/WR2-Series only), dry, temperature setting, fan speed setting, and airflow direction setting. Since the controller provides centralized control it shall be able to enable or disable operation of local remote controllers. In terms of scheduling, the controller shall allow the user to define both daily and weekly schedules with operations consisting of ON/OFF, mode selection, temperature setting, air flow (vane) direction, fan speed, and permit/prohibit of remote controllers.

Non Touch Screen, Networked Centralized Controller			
ltem	Description	Operation	Display
ON/OFF	Run and stop operation.	Each Block, Group or Collective	Each Group or Collective
Operation Mode	Indoor unit modes: COOL/DRY/FAN/AUTO/HEAT. Lossnay unit modes: HEAT RECOVERY/BYPASS/AUTO Air to water (PWFY) modes: HEATING/HEATING ECO/HOT WATER/ANTI- FREEZE/COOLING *Operation modes vary depending on the unit model connected. ** Auto mode is available for the R2/WR2-Series only.	Each Block, Group or Collective	Each Group
Temperature Setting	Sets the temperature from 40°F – 95°F depending on operation mode and indoor unit model. Separate COOL and HEAT mode set points available depending on remote controller and connected mechanical equipment.	Each Block, Group or Collective	Each Group
Set Temperature Range Limit	The range of room temperature setting can be limited by the initial setting depending on the indoor unit connected.	Each Group	Each Group
Fan Speed Setting	Available fan speed settings depend on indoor unit model.	Each Block, Group or Collective	Each Group
Air Flow Direction Setting	*Air flow direction settings vary depending on the indoor unit model. *1. Louver cannot be set.	*1 Each Block, Group or Collective	Each Group

Schedule Operation	 Annual/weekly/today schedule can be set for each group of air conditioning units. Optimized start setting is also available. *2. The system follows either the current day, annual schedule, or weekly, which are in the descending order of overriding priority. Twenty-four events can scheduled per day, including ON/OFF, Mode, Temperature Setting, Air Direction, Fan Speed and Operation Prohibition. Five types of weekly schedule (seasonal) can be set. Settable items depend on the functions that a given air conditioning unit supports. 	*2 Each Block, Group or Collective	Each Group
Hold	Disables scheduled functions for indoor unit groups and their associated remote controller timers. *not available for general equipment	Each Block, Group or Collective	Each Group
Optimized Start	Unit starts 5 - 60 minutes before the scheduled time based on the operation data history in order to reach the scheduled temperature at the scheduled time.	Each Block, Group or Collective	Each Block, Group or Collective
Permit / Prohibit Local Operation	 Individually prohibit operation of each local remote control function (Start/Stop, Change operation mode, Set temperature, Fan Speed, Air Direction and Reset filter). *3. Centrally Controlled is displayed on the remote controller for prohibited functions. 	Each Block, Group or Collective	*3 Each Group
Room Temp	Displays the room temperature of the group.	N/A	Each Group
Room Humidity	Displays the percent relative humidity in the space as sensed by the Smart ME Remote Controller	N/A	Each Group
Occupancy Sensor	Displays the occupancy icon on the group icon in the condition list page when the room is occupied (blue) or vacant (gray). *The Smart ME Remote Controller Occupancy sensor is required.	N/A	Each Group
Brightness Sensor	Displays the brightness icon on the group icon in the condition list when the space is determined to be bright (yellow) or dark (gray). *The Smart ME Remote Controller Brightness sensor is required.	N/A	Each Group

Error	 When an error is currently occurring on an air conditioner unit, the afflicted unit and the error code are displayed *4. When an error occurs, the LED flashes. The operation monitor screen shows the abnormal unit by flashing it. The error monitor screen shows the abnormal unit address, error code and source of detection. The error log monitor screen shows the time and date, the abnormal unit address, error code and source of detection 	N/A	*4 Each Unit or Collective
Ventilation Equipment	This interlocked system settings can be performed by the master system controller. When setting the interlocked system, use the ventilation switch the free plan LOSSNAY settings between "Hi", "Low" and "Stop". When setting a group of only free plan LOSSNAY units, you can switch between "Normal ventilation", "Interchange ventilation" and "Automatic ventilation"		Each Group
Multiple Language	Other than English, the following languages can be selected: Spanish, French, Japanese, German, Italian, Russian, Chinese, and Portuguese.		N/A
External Input / Output	By using accessory cables you can set and monitor the following. Input: By level: "Batch start/stop", "Batch emergency stop"; By pulse: "batch start/stop", "Enable/disable remote controller" Output: "start/stop", "error/Normal" *5. Requires the external I/O cables (PAC- YG10HA-E) sold separately.	*5 Collective	*5 Collective
M-Net	M-Net The "M-NET" LED lights, when AC power supply is turned ON. The LED blinks while M-NET is communicating.		Each Group (LED)
Collective ON/OFF	All the units can be operated / stopped with a DIP Collective N/A switch.		N/A
Measurement	Experience between the second		Each Unit
AHC Status	Displays the status of the of the inputs and outputs of each Advanced HVAC Controller (DC- A2IO)	N/A	Each Unit
Free Contact Status	Displays the input/output status of the Free Contacts on the indoor units	N/A	Each Unit

Free Contact Interlock Control	Operation of indoor groups, general equipment or free contact outputs based on group(s) conditions or free contact(s) input states.	Each Group, Output or Collective	N/A
Data Back-up (PC)	Initial setting data can be exported to a PC.	Collective	N/A

All Non Touch Screen, Networked Centralized Controller shall be equipped with two RJ-45 Ethernet port to support interconnection with a network PC and BACnet/IP communication via a closed/direct Local Area Network (LAN). The controller shall be capable of performing initial settings online via a PC using the controller's initial setting browser or online/offline with the Initial Setting Tool.

Standard software functions shall be available so that the building manager can securely log into each controller via the PC's web browser to support operation monitoring, scheduling, error email, interlocking and online maintenance diagnostics. Standard software functions shall not expire. Additional optional software functions of personal browser for PCs and MACs and Energy Allocation shall be available. The Energy Allocation function shall require Master Centralized Controller Energy Allocation Integrated System in conjunction with Non Touch Screen, Networked Centralized Controller.

GRAPHICAL USER INTERFACE

The Graphical User Interface (Integrated Centralized Control Web) shall require a field supplied PC or Tablet.

ICCW

The Integrated Centralized Control Web System (ICCW) interface shall enable the user to control multiple networked central controllers and shall provide additional functions such as energy apportionment from a single network PC configured with the Charge Calculation Tool. The ICCW shall be capable of controlling up to forty networked Centralized Controllers with a maximum of 2,000 indoor units across multiple CITY MULTI outdoor units. The ICCW shall be required if the user wants to simultaneously control more than 1 Centralized Controllers from a single PC or tablet using a single web browser session. Licensing per function, per Centralized Controller shall be required for the ICCW. Optional software features shall be available through the ICCW including energy apportionment and personalized web. These optional software features shall require the ICCW, advance purchase from the customer, and licensing from ICCW.

ICCW (Integrated System Software)		
ltem	Details	
ON/OFF	The units can turn ON and OFF for all floors or in a block, floor, or group of units.	
Operation	The operation mode can be switched between COOL, DRY, FAN,	

Modes	AUTO, and HEAT for all floors or in a block, floor, or group of units
Temperature Setting	 Sets the temperature for a single group. Range of Temperature setting from 57°F – 87°F depending on operation mode and indoor unit model. Separate COOL and HEAT mode set points available depending on remote controller and connected mechanical equipment.
Fan Speed	The fan speed can be set to four stages for all floors or in a block, floor, or group of units
Air Direction	The air direction can be set in four vertical directions or to swing for all floors or in block, floor, or group of units. (The selectable air direction differs according to the model.)
Interlocked Unit ON/OFF LOSSNAY	If there is an interlocked unit (LOSSNAY), then the unit can be turned ON (strong/weak) or OFF for all floors or in a block, floor, or group of units. (Note that the ventilation mode cannot be selected for interlocked units.)
Local Operation Prohibit	The items for which operation with the local remote controller are to be prohibited can be selected for all floors or in a block, floor, or group of units. (The items that can be prohibited are ON/OFF, operation mode, set temperature and filter sign reset.)
Annual / Weekly Schedule	The annual/weekly schedule function can be used by registering the license. Two settings, such as seasonal settings for summer and winter, can be saved.
Power Rate Apportionment Charging	A watt-hour meter (WHM) with kWH pulse output is connected to calculate the air conditioning charges based on the amount each tenant's air-conditioner has operated. Five charging rates can be applied per day.
<u> </u>	***OPTIONAL ENERGY APPORTIONMENT SOFTWARE (LIC- CHARGE) and PI Controller (PAC-Y60MCA) REQUIRED
History	Up to 3,000 items for the error history and up to 10,000 items for operation history can be saved. Each history file can be output as a daily report or monthly report in CSV format. (The operation history consists only of the operations carried out with the ICCW and is limited to some limited operation items.)
Operation Time Monitor	The cumulative operation time of each indoor unit can be viewed or output as a CSV format file. (This function is valid only when the

	charging function license is registered.)
Filter Sign Display Mask	The filter sign display at the remote controllers can be disabled.
Set Temperature Limit	The set temperature lower limit can be set for cooling and the upper limit for heating. (ME remote controller required)

ENERGY APPOINTMENT METHOD FOR CITY MULTI CENTRALIZED CONTROLLERS



CMCN System Configuration

System Overview

For centralized systems serving multiple tenants for which one-to-one electricity metering is not possible, an apportioned electricity billing function that attributes just the electrical energy consumed by each individual tenant's air conditioner is required. The Energy Apportionment function takes the information on the electrical energy usage gathered from Watt Hour Meters (WHM) connected to dedicated breaker panels serving the system's outdoor units and synthesizes it with the information on the operating status of the indoor units that is collected by the CITY MULTI centralized controller(s).

Watt Hour Meters

Requirements:

The Watt Hour Meters (WHMs) to be used to read the electrical energy consumption of the outdoor units must be capable of a pulse output, which would be configured based on the current rating of the units. The associated current transformers/ transducers (CTs) must also be sized based on the current rating of either the individual outdoor units or the dedicated air conditioning electrical panels they are to be reading. The proper quantity of meters for a particular sized system must be selected in order to ensure sufficient resolution and hysteresis in the unit pulse output of the meters so as to ascribe an acceptable level of accuracy to the apportionment of energy usage for each tenant's system. The system is designed to work with any WHM capable of a pulse output that meets ANSI C12.20 class 0.2% or 0.5% accuracy standards.

Connection:

The WHMs are to be physically connected to the integrated pulse input module or an external Mitsubishi Electric PI Controller if such an input is not available or if there is a wiring length limitation or installation hardship. The cable type of the interconnecting wiring shall be according to the wiring specifications of the WHM manufacturer.

CITY MULTI Centralized Controller Requirements

Licensing:

Each centralized controller to which units are assigned that require the energy apportionment function must have the "LIC-Charge" software license purchased and properly unlocked in order to enable the operating status of the indoor units to be passed to the energy apportionment tool. The procedure for licensing the centralized controllers with this function and the necessary forms can be found on Mitsubishi Electric's technical documentation repository, mylinkdrive.com. Purchase Order information for the licenses will be required at the time of submission of the licensing request forms.

Dedicated master centralized controller for apportionment (no MNET connection)

A dedicated master centralized controller, for which the LIC-Charge license is purchased and the energy apportionment function enabled, must be provided in order to serve as the portal for exporting metering device and energy management data to a USB drive or to a PC via LAN connection. This means that by virtue of selecting this master centralized controller to serve this function, the MNET capability of this particular centralized controller will be disabled. All indoor units must be physically wired via MNET to other expansion centralized controllers, which must be physically wired via LAN with Static IP addresses and a network hub or switch to the master apportionment controller.

PC for collecting charge calculation results

A networked PC, which does not necessarily have to be dedicated to the task of collecting energy apportionment data, can be provided and loaded with the Charge Calculation Tool software for exporting data necessary to generate billing documentation to be performed by a third party. The system requirements of the PC are as follows:

Item	Requirements
CPU	1 GHz or better (at least 2 GHz recommended)
Memory	2GB or more
Screen Resolution	1024 x 768 or better
OS	Windows 7, Windows 8.1 (32bit/64bit)
System requirements	The system should meet the minimum requirement for Windows 7 or Windows 8.1
	 Net Framework 4.5 or later
Internal LAN port or LAN card	100 BASE-TX or better
Porting device	Mouse, etc.

CMCN: SYSTEM INTEGRATION

BACnet[®] Integration:

The Mitsubishi Electric Cooling & Heating BACnet® hardware, which is built into all networked central controllers, shall be compliant with BACnet® Protocol (ANSI/ASHRAE 135-2010) and be Certified by the (BTL) BACnet® Testing Laboratories. The BACnet® interface shall support BACnet Broadcast Management (BBMD). The BACnet® interface shall support a maximum of 50 indoor units. Operation and monitoring points include, but are not limited to, on/off, operation mode, fan speed, prohibit remote controller, filter sign reset, alarm state, error code, and error address.

Licenses:

- 1. LIC-BACnet Master: Master Controller license for Master Centralized Controller and Non Touch Screen, Networked Centralized Controller
- 2. LIC-BACnet Expansion: Expansion Controller license for Expansion Controller and Non Touch Screen, Networked Centralized Controller

LIC-BACnet Specifications:

- 3. Control up to 50 groups
- 4. 1 to 16 indoor units can be collectively controlled in a group
- 5. Supports dual set point functionality (connected model dependant)
- 6. BTL Compliant
- 7. BACnet communication specifications are based on ANSI/ASHRAE Standards 135-2010

PC Requirements:

- 8. CPU: 1GHz or higher
- 9. Memory: 1GB or more
- 10. HDD Space: 100 MB or more
- 11. Screen Resolution: 1024 x 768 or higher
- 12. OS: Microsoft Windows 7 32-bit/64-bit, Microsoft 8.1 32-bit/64-bit. Not compatible with Windows Vista
- 13. Execution Environment: Microsoft .NET Framework 4.5 or later
- 14. Others: Pointing device such as a mouse, internet connection (required when installing a .NET Framework)

LIC-BACnet – System Example



BACnet Point List

Object List
On Off Setup
On Off State, Number of ON/OFF, Cumulative operation time
Alarm Signal (4-digit error code)
Error Code
Operational Mode Setup
Operational Mode State
Fan Speed Setup
Fan Speed State
Room Temp [Water Temp]
Set Temp [Set Water Temp]
Set Temp Cool
Set Temp Heat
Set Temp Auto
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Filter Sign [Circulating Water Exchange Sign]
Filter Sign Reset [Circulating Water Exchange Sign Reset]
Prohibition On Off
Prohibition Mode
Prohibition Filter Sign Reset [Prohibition Circulating Water Exchange Sign Reset]
Prohibition Set Temperature
M-NET Communication State
System Forced Off
Air Direction Setup
Air Direction State
Set High Limit Setback Temp
Set Low Limit Setback Temp
Ventilation Mode Setup
Ventilation Mode State
Air To Water Mode Setup
System Alarm Signal (4-digit error code)
PI Controller Alarm Signal (4-digit error code)
Group Apportioned Electric Energy
Interlocked Units Apportioned Electric Energy
PI controller Electric Energy 1–4
Pulse Input Electric Energy 1–4
Group Apportionment Parameter

Interlocked Units Apportionment Parameter
Night Purge State
Thermo On Off State
Trend Log Room Temp
Trend Log Group Apportioned Electric Energy
Trend Log Interlocked Units Apportioned Electric Energy
Trend Log PI controller Electric Energy 1–4
Trend Log Pulse Input Electric Energy 1–4
Trend Log Group Apportionment Parameter
Trend Log Interlocked Units Apportionment Parameter

Equipment Schedules

MITSUBISHI ELECTRIC TRANE HVAC US: CITY MULTI VRF OUTDOOR UNIT SCHEDULE

												Electrical-I	Per Module		
							Design Cooling	Design Heating	Corrected Cooling			208/230	or [460V]		
					Nominal Cooling	Nominal Heating	Outdoor Temp DB	Outdoor Temp	Total Capacity	Corrected Heating		MCA 208/230 or			
System Tag	Tag Reference	M-NET Address	Model Number	Modules	Capacity (BTU/h)	Capacity (BTU/h)	(°F)	WB (°F)	(BTU/h)	Capacity (BTU/h)	Voltage / Phase	[460V]	RFS	MOCP	Notes / Options
											460V / 3-phase 3-				
HP-1	HP-1	51, 52	TURYE2644BN41AN	EP144, EP120	264,000	295,000	95.0	43.0	250,133.0	286,422.8	wire	34, 26	35, 30	50, 40	1, 2, 3, 4, 5
											460V / 3-phase 3-				
HP-2	HP-2	73, 74	TURYE3124BN41AN	EP168, EP144	312,000	350,000	95.0	43.0	300,654.5	340,832.9	wire	35, 34	40, 35	50, 50	1, 2, 3, 4, 5
											208/230V / 1-				
ACCU-17	ACCU-17	39	TRUYA0121KA70NA		12,000		95.0	43.0	11,398.3	0.0	phase	11	15	28	1, 2, 3, 4, 5

Notes & Options:

1 Nominal cooling capacities are based on indoor coil EAT of 80/67°F (DB/WB), outdoor of 95°F (DB)

2 Nominal heating capacities are based on indoor coil EAT of 70°F (DB), outdoor of 43°F (WB)

3 Efficiency values for EER, IEER, COP are based on AHRI 1230 test method for mixture of ducted & non-ducted indoor units.

4 For systems with multiple modules, refrigerant pipe dimensions indicate total system combined piping downstream of module twinning.

5 Added field charge listed is in addition to factory charge, this must be updated based upon final as-built piping layout.

MITSUBISHI ELECTRIC TRANE HVAC US: CITY MULTI VRF INDOOR UNIT SCHEDULE

							Cooling Design	Heating Design			Corrected Capacity	y					Max Fan ESP			
System Tag	Room Name	Tag Reference	Model	Туре	Nominal Cooling Capacity (BTU/h)	Nominal Heating Capacity (BTU/h	 Entering Temp DB/WB (°F) / [Water in temp] 	Entering Temp DB/WB (°F) / [Water in temp]	Cooling Diversity Full/Partial (See Note 5, 6)	/ Cooling Total Capacity (BTU/h)	Cooling Sensible Capacity (BTU/h)	Heating Diversity Full/Partial (See Note 5, 6)	Heating Capacity (BTU/h)	Refrig Pipe Dim Liquid/Suction (inch)	Fan Speed Setting	Peak Fan Airflow (cfm) / [Design gpm G(US)/min]	Setting 208V/230V (IN WG)	Voltage / Phase	Electrical MCA/MFS	Notes / Options
HP-1		ACC-6	TPLFYP008FM14 0A	4 Ceiling-Cassette (Four-Way)	8,000	9,000	80.0/67.0	70	FULL DEMAND	7,909.3	6,182.1	FULL DEMAND	8,913.7	1/4 / 1/2	HIGH	315		208/230V/1- phase	0.28/0.28/15	1, 2, 3, 4
HP-1		ACC-5	TPLFYP008FM14 0A	4 Ceiling-Cassette (Four-Way)	8,000	9,000	80.0/67.0	70	FULL DEMAND	7,909.3	6,182.1	FULL DEMAND	8,913.7	1/4 / 1/2	HIGH	315		208/230V/1- phase	0.28/0.28/15	1, 2, 3, 4
HP-1		ACC-4	TPLFYP008FM14 0A	4 Ceiling-Cassette (Four-Way)	8,000	9,000	80.0/67.0	70	FULL DEMAND	7,909.3	6,182.1	FULL DEMAND	8,913.7	1/4 / 1/2	HIGH	315		208/230V/1- phase	0.28/0.28/15	1, 2, 3, 4
HP-1		ACC-3	TPLFYP008FM14 0A	4 Ceiling-Cassette (Four-Way)	8.000	9,000	80.0/67.0	70	FULL DEMAND	7,909.3	6,182.1	FULL DEMAND	8,913.7	1/4 / 1/2	HIGH	315		208/230V/1- phase	0.28/0.28/15	1, 2, 3, 4
HP-1		ACC-2	TPLFYP008FM14 0A	4 Ceiling-Cassette (Four-Way)	8.000	9.000	80.0/67.0	70	FULL DEMAND	7.909.3	6.182.1	FULL DEMAND	8.913.7	1/4 / 1/2	HIGH	315		208/230V/1- phase	0.28/0.28/15	1. 2. 3. 4
HP-1		ACC-1	TPLFYP008FM14 0A	4 Ceiling-Cassette (Four-Way)	8.000	9.000	80.0/67.0	70	FULL DEMAND	7,909.3	6,182.1	FULL DEMAND	8,913.7	1/4 / 1/2	HIGH	315		208/230V/1- phase	0.28/0.28/15	1, 2, 3, 4
HP-1		ACCU-12	TPLFYP005FM14	4 Ceiling-Cassette (Four-Way)	5.000	5.600	80.0/67.0	70	FULL DEMAND	4,943,3	4.362.2	FULL DEMAND	5.546.3	1/4 / 1/2	HIGH	280		208/230V/1- phase	0.24/0.24/15	1. 2. 3. 4
HP-1		ACCU-7	TPLFYP005FM14 0A	4 Ceiling-Cassette (Four-Way)	5.000	5.600	80.0/67.0	70	FULL DEMAND	4,943.3	4,362.2	FULL DEMAND	5,546.3	1/4 / 1/2	HIGH	280		208/230V/1- phase	0.24/0.24/15	1, 2, 3, 4
HP-1		ACCU-11	TPLFYP005FM14 0A	4 Ceiling-Cassette (Four-Way)	5.000	5,600	80.0/67.0	70	FULL DEMAND	4,943.3	4,362.2	FULL DEMAND	5,546.3	1/4 / 1/2	HIGH	280		208/230V/1- phase	0.24/0.24/15	1, 2, 3, 4
HP-1		ACCU-13	TPLFYP005FM14 0A	4 Ceiling-Cassette (Four-Way)	5.000	5.600	80.0/67.0	70	FULL DEMAND	4.943.3	4.362.2	FULL DEMAND	5.546.3	1/4 / 1/2	HIGH	280		208/230V/1- phase	0.24/0.24/15	1. 2. 3. 4
HP-1		ACC-14	TPLFYP018FM14 0A	4 Ceiling-Cassette (Four-Way)	18.000	20.000	80.0/67.0	70	FULL DEMAND	17.796.0	11.816.9	FULL DEMAND	19.808.1	1/4 / 1/2	HIGH	460		208/230V/1- phase	0.5/0.5/15	1. 2. 3. 4
HP-1		ACC-15	TPLFYP018FM14	4 Ceiling-Cassette (Four-Way)	18,000	20.000	80.0/67.0	70	FULL DEMAND	17.796.0	11.816.9	FULL DEMAND	19.808.1	1/4 / 1/2	HIGH	460		208/230V/1- phase	0.5/0.5/15	1. 2. 3. 4
HP-1		ACC-16	TPLFYP018FM14	4 Ceiling-Cassette (Four-Way)	18,000	20.000	80.0/67.0	70	FULL DEMAND	17.796.0	11.816.9	FULL DEMAND	19.808.1	1/4 / 1/2	HIGH	460		208/230V/1- phase	0.5/0.5/15	1, 2, 3, 4
HP-1		ACC-10	TPLFYP005FM14	4 Ceiling-Cassette (Four-Way)	5,000	5.600	80.0/67.0	70		4.943.3	4.362.2		5.546.3	1/4 / 1/2	нідн	280		208/230V/1-	0.24/0.24/15	1, 2, 3, 4
HP-1		ACC-9	TPLFYP005FM14	4 Ceiling-Cassette (Four-Way)	5,000	5,600	80.0/67.0	70		4.943.3	4.362.2		5.546.3	1/4 / 1/2	нідн	280		208/230V/1-	0.24/0.24/15	1, 2, 3, 4
HP-1		ACC-8	TPLFYP005FM14	4 Ceiling-Cassette (Four-Way)	5,000	5,600	80.0/67.0	70		4.943.3	4.362.2		5.546.3	1/4 / 1/2	нідн	280		208/230V/1-	0.24/0.24/15	1, 2, 3, 4
HP-1		ACC-20	TPLFYP008FM14	4 Ceiling-Cassette (Four-Way)	8,000	9.000	80.0/67.0	70	FULL DEMAND	7.909.3	6.182.1	FULL DEMAND	8.913.7	1/4 / 1/2	HIGH	315		208/230V/1-	0.28/0.28/15	1, 2, 3, 4
HP-1		ACC-32	TPLFYP018FM14	4 Ceiling-Cassette (Four-Way)	18,000	20.000	80.0/67.0	70		17.796.0	11.816.9		19.808.1	1/4 / 1/2	нідн	460		208/230V/1-	0.5/0.5/15	1, 2, 3, 4
HP-1		ACC-33	TPLFYP030EM14	4 Ceiling-Cassette (Four-Way)	30,000	34,000	80.0/67.0	70		29.660.0	21.006.5		33.673.8	3/8 / 5/8	нідн	812		208/230V/1-	0.57/0.57/15	1, 2, 3, 4
HP-1		ACC-31	TPLFYP036EM14	4 Ceiling-Cassette (Four-Way)	36,000	40.000	80.0/67.0	70	FULL DEMAND	35.592.1	24.879.3	FULL DEMAND	39.616.3	3/8 / 5/8	HIGH	1095		208/230V/1-	0.92/0.92/15	1, 2, 3, 4
HP-1		ACCU-21	TPKFYP012LM14	4 Wall -Mounted	12.000	13.500	80.0/67.0	70	FULL DEMAND	11.864.0	8.033.7	FULL DEMAND	13.370.5	1/4 / 1/2	HIGH	297		208/230V/1-	0.24/0.24/15	1, 2, 3, 4
HP-1		ACC-39	TPLFYP012FM14	4 Ceiling-Cassette (Four-Way)	12,000	13.500	80.0/67.0	70	FULL DEMAND	11.864.0	8.019.8	FULL DEMAND	13.370.5	1/4 / 1/2	HIGH	335		208/230V/1-	0.29/0.29/15	1. 2. 3. 4
HP-2		ACC-23	TPLFYP006EM14 2A	4 Ceiling-Cassette (Four-Way)	6.000	6.700	80.0/67.0	70	FULL DEMAND	5,953.2	5.069.0	FULL DEMAND	6.635.8	1/4 / 1/2	HIGH	494		208/230V/1- phase	0.24/0.19/15	1, 2, 3, 4
HP-2		ACC-22	TPLFYP008FM14 0B	4 Ceiling-Cassette (Four-Way)	8,000	9,000	80.0/67.0	70	FULL DEMAND	7,937.6	6,193.1	FULL DEMAND	8,913.7	1/4 / 1/2	HIGH	315		208/230V/1- phase	0.28/0.28/15	1, 2, 3, 4
HP-2		ACC-19	TPLFYP006EM14 2A	4 Ceiling-Cassette (Four-Way)	6.000	6.700	80.0/67.0	70	FULL DEMAND	5,953.2	5.069.0	FULL DEMAND	6.635.8	1/4 / 1/2	HIGH	494		208/230V/1- phase	0.24/0.19/15	1, 2, 3, 4
HP-2		ACC-18	TPLFYP006EM14	4 Ceiling-Cassette (Four-Way)	6.000	6.700	80.0/67.0	70	FULL DEMAND	5.953.2	5.069.0	FULL DEMAND	6.635.8	1/4 / 1/2	HIGH	494		208/230V/1- phase	0.24/0.19/15	1. 2. 3. 4
HP-2		ACC-38	TPLFYP030EM14	4 Ceiling-Cassette (Four-Way)	30.000	34.000	80.0/67.0	70	FULL DEMAND	29.766.2	21.050.1	FULL DEMAND	33.674.1	3/8 / 5/8	HIGH	812		208/230V/1- phase	0.57/0.57/15	1. 2. 3. 4
HP-2		ACC-37	TPLFYP030EM14 0B	4 Ceiling-Cassette (Four-Way)	30,000	34,000	80.0/67.0	70	FULL DEMAND	29,766.2	21,050.1	FULL DEMAND	33,674.1	3/8 / 5/8	HIGH	812		208/230V/1- phase	0.57/0.57/15	1, 2, 3, 4
HP-2		ACC-36	TPLFYP030EM14 0B	4 Ceiling-Cassette (Four-Way)	30,000	34,000	80.0/67.0	70	FULL DEMAND	29,766.2	21,050.1	FULL DEMAND	33,674.1	3/8 / 5/8	HIGH	812		208/230V/1- phase	0.57/0.57/15	1, 2, 3, 4
HP-2		ACC-35	TPLFYP030EM14 0B	4 Ceiling-Cassette (Four-Way)	30,000	34,000	80.0/67.0	70	FULL DEMAND	29,766.2	21,050.1	FULL DEMAND	33,674.1	3/8 / 5/8	HIGH	812		208/230V/1- phase	0.57/0.57/15	1, 2, 3, 4
HP-2		ACC-26	TPLFYP008FM14 0A	4 Ceiling-Cassette (Four-Way)	8,000	9,000	80.0/67.0	70	FULL DEMAND	7,937.6	6,193.1	FULL DEMAND	8,913.7	1/4 / 1/2	HIGH	315		208/230V/1- phase	0.28/0.28/15	1, 2, 3, 4
HP-2		ACC-25	TPLFYP006EM14 2A	4 Ceiling-Cassette (Four-Way)	6,000	6,700	80.0/67.0	70	FULL DEMAND	5,953.2	5,069.0	FULL DEMAND	6,635.8	1/4 / 1/2	HIGH	494		208/230V/1- phase	0.24/0.19/15	1, 2, 3, 4
HP-2		ACC-24	TPLFYP006EM14 2A	4 Ceiling-Cassette (Four-Way)	6,000	6,700	80.0/67.0	70	FULL DEMAND	5,953.2	5,069.0	FULL DEMAND	6,635.8	1/4 / 1/2	HIGH	494		208/230V/1- phase	0.24/0.19/15	1, 2, 3, 4
HP-2		ACC-27	TPLFYP024EM14 0B	4 Ceiling-Cassette (Four-Way)	24.000	27,000	80.0/67.0	70	FULL DEMAND	23,812.9	16,785.1	FULL DEMAND	26,741.2	3/8 / 5/8	HIGH	812		208/230V/1- phase	0.54/0.54/15	1, 2, 3, 4
HP-2		ACC-28	TPLFYP024EM14 0B	Ceiling-Cassette (Four-Wav)	24,000	27,000	80.0/67.0	70	FULL DEMAND	23,812.9	16,785.1	FULL DEMAND	26,741.2	3/8 / 5/8	НІGН	812		208/230V/1- phase	0.54/0.54/15	1, 2, 3, 4
HP-2		ACC-29	TPLFYP024EM14 0B	Ceiling-Cassette (Four-Wav)	24,000	27,000	80.0/67.0	70	FULL DEMAND	23,812.9	16,785.1	FULL DEMAND	26,741.2	3/8 / 5/8	НІGН	812		208/230V/1- phase	0.54/0.54/15	1, 2, 3, 4
HP-2		ACC-30	TPLFYP024EM14 0B	4 Ceiling-Cassette (Four-Wav)	24,000	27,000	80.0/67.0	70	FULL DEMAND	23,812.9	16,785.1	FULL DEMAND	26,741.2	3/8 / 5/8	НІGН	812		208/230V/1- phase	0.54/0.54/15	1, 2, 3, 4
HP-2		ACC-34	TPLFYP036EM14 2A	Ceiling-Cassette (Four-Wav)	36,000	40,000	80.0/67.0	70	FULL DEMAND	35,719.4	24,932.0	FULL DEMAND	39,616.6	3/8 / 5/8	НІGН	1095		208/230V/1- phase	0.92/0.92/15	1, 2, 3, 4
ACCU-17		ACC-17	TPKA0A0121LA1 0A	Wall -Mounted	12,000	14,000	80.0/67.0	70	FULL DEMAND	11,398.3	10,324.8	FULL DEMAND	0.0	1/2 / 1/4	нідн	385		208/230V/1- phase	Powered by Outdoor	1, 2, 3, 4

Notes & Options: 1 Nominal cooling capacities are based on indoor coil EAT of 80/67°F (DB/WB), outdoor of 95°F (DB) 2 Nominal heating capacities are based on indoor coil EAT of 70°F (DB), outdoor of 43°F (WB) 2 Operated capacity, and other factors assor

3 See outdoor unit schedule for outdoor ambient conditions, connected capacity, and other factors associated with corrected capacities

4 See schematic piping/control diagram for indication of required indoor unit remote controllers, system controllers, and integration devices.

5 Full demand corrected capacity includes de-rate associated with indoor vs. outdoor connected capacity indicated on outdoor unit schedule for associated system.

Partial corrected capacity assumes sufficient diversity exists such that the connected capacity de-rate does not apply. It is the designer's responsibility to ensure "Diamond System Builder" is set in the appropriate output capacity setting (full demand/partial demand) prior to generating this schedule.

6 It is recommended to always base heating corrected capacity on full demand.

					Turne (develop (Connected			
	o (-				Type (double /		Connected			
ļ	System Tag	Tag Reference	M-NET Address	Model Number	Main / Sub)	Number of Ports	Capacity to BC	Voltage / Phase	MCA 208/230	Notes / Optic
								208/230V/1-		
	HP-1	BC-1	53	TCMBM1016JA11N4	Main	16	253,000.0	phase	1.57/1.82	
								208/230V/1-		
	HP-1	SBC-1	68	TCMBS0108KB21N4	Sub	8	108,000.0	phase	0.74/0.87	
								208/230V/1-		
	HP-2	BC-2	75	TCMBM1016JA11N4	Main	16	298,000.0	phase	1.57/1.82	

VRF HEAT RECOVERY BRANCH CIRCUIT CONTROLLER

Notes & Options:

1 Include Diamondback Ball Valves BV-Series, 700PSIG working pressure, full port, 410A rated.

2 For sub BC controller CMB-P-NU-GB1 or -GB, the total connectable indoor unit capacity can be 126,000 BTUs or less. If two sub BC controllers are used, the total indoor unit capacity connected to BOTH sub BC controllers also cannot exceed 126,000 BTUs. For sub BC controller CMB-P1016NU-HB1 the total connectable indoor unit capacity can be 126,000 BTUs or less. However, if two sub controllers are used, and one of them is CMB-1016NU-HB1, the total indoor unit capacity connected to BOTH sub controllers must NOT exceed 168,000 BTUs.



Design View Piping Diagrams



1/4 / 1/2	TPLFYP018FM140A 10.0 ft	17,796 BTU/h (11,817 BTU/h)	Est. Cooling Discharge Air Temp: 55.7
20.0ft (0)	11/11/ACC-14	19,808 BTU/h	Est. Heating Discharge Air Temp: 109.9
1/4 / 1/2	TPLFYP018FM140A 10.0 ft	17,796 BTU/h (11,817 BTU/h)	Est. Cooling Discharge Air Temp: 55.7
20.0ft(0)	12/11/ACC-15	19,808 BTU/h	Est. Heating Discharge Air Temp: 109.9
TPLFYP018FM140A 10.0 ft	17,796 BTU/h (11,817 BTU/h)	Est. Cooling Discharge Air Temp	: 55.7
13/12/ACC-16	19,808 BTU/h	Est. Heating Discharge Air Temp	: 109.9
TPLFYP005FM140A 10.0 ft	4,943 BTU/h (4,362 BTU/h)	Est. Cooling Discharge Air Temp	c 65.3
14/13/ACC-10	5,546 BTU/h	Est. Heating Discharge Air Temp	c 88.4
TPLFYP005FM140A 10.0 ft	4,943 BTU/h (4,362 BTU/h)	Est. Cooling Discharge Air Temp	e: 65.3
15/14/ACC-9	5,546 BTU/h	Est. Heating Discharge Air Temp	e: 88.4
TPLFYP005FM140A 10.0 ft	4,943 BTU/h (4,362 BTU/h)	Est. Cooling Discharge Air Temp	c 65.3
16/15/ACC-8	5,546 BTU/h	Est. Heating Discharge Air Temp	c 88.4
TPLFYP008FM140A 10.0 ft	7,909 BTU/h (6,182 BTU/h)	Est. Cooling Discharge Air Temp	c 61.5
	8,914 BTU/h	Est. Heating Discharge Air Temp	c 96.2
/8_TCMBS0108KB21N4 / SBC-1	12.0 ft 68 106,776 BTU/h (7: 119,839 BTU/h	3.756 BTU/h)	
<u>1/4 / 1/2</u>	TPLFYP018FM140A 10.0 ft	17,796 BTU/h (11,817 BTU/h)	Est. Cooling Discharge Air Temp: 55.7
24.0ft (0)	18 / 17 / ACC-32	19,808 BTU/h	Est. Heating Discharge Air Temp: 109.9
<u>3/8 / 5/8</u>	TPLFYP030EM140B 10.0 ft	29,660 BTU/h (21,007 BTU/h)	Est. Cooling Discharge Air Temp: 55.6
46.0ft (0)	19/18/ACC-33	33,674 BTU/h	Est. Heating Discharge Air Temp: 108.4
3/8 / 5/8	TPLFYP036EM142A 10.0 ft	35,592 BTU/h (24,879 BTU/h)	Est. Cooling Discharge Air Temp: 58.5
55.0ft (0)	20 / 19 / ACC-31	39,616 BTU/h	Est. Heating Discharge Air Temp: 103.5
1/4 / 1/2	TPKFYP012LM140A 8.0 ft	11,864 BTU/h (8,034 BTU/h)	Est. Cooling Discharge Air Temp: 54.5
23.0ft(0)	21/20/ACCU-21	13,370 BTU/h	Est. Heating Discharge Air Temp: 111.7
1/4 / 1/2	TPLFYP012FM140A 10.0 ft	11,864 BTU/h (8,020 BTU/h)	Est. Cooling Discharge Air Temp: 57.4
39.0ft (0)	22/35/ACC-39	13,370 BTU/h	Est. Heating Discharge Air Temp: 107.0
	1/4 / 1/2 20.0ft (0) 1/4 / 1/2 20.0ft (0) 1/4 / 1/2 20.0ft (0) TPLFYP018FM140A 10.0 ft 13/12/ACC-16 TPLFYP005FM140A 10.0 ft 14/13/ACC-10 TPLFYP005FM140A 10.0 ft 15/14/ACC-9 TPLFYP005FM140A 10.0 ft 16/15/ACC-8 TPLFYP008FM140A 10.0 ft 17/16/ACC-20 7/8 1/4 / 1/2 24.0ft (0) 3/8 / 5/8 55.0ft (0) 1/4 / 1/2 23.0ft (0) 1/4 / 1/2 39.0ft (0)	1/4 / 1/2 TPLEYP018FM140A 10.0 ft 20.0ft (0) 11/111/ACC-14 1/4 / 1/2 TPLEYP018FM140A 10.0 ft 20.0ft (0) 12/111/ACC-15 TPLEYP018FM140A 10.0 ft 17,796 BTU/h (11,817 BTU/h) 13/12/ACC-16 17,796 BTU/h (4.362 BTU/h) TPLEYP005FM140A 10.0 ft 4.943 BTU/h (4.362 BTU/h) 14/13/ACC-10 4.943 BTU/h (4.362 BTU/h) TPLEYP005FM140A 10.0 ft 4.943 BTU/h (4.362 BTU/h) 15/14/ACC-9 4.943 BTU/h (4.362 BTU/h) 16/15/ACC-8 7.909 BTU/h (6.182 BTU/h) 17/16/ACC-20 7.909 BTU/h (6.182 BTU/h) 17/16/ACC-32 106,776 BTU/h (7) 17/16/ACC-32 106,776 BTU/h (7) 17/8 11/4 / 1/2 19/83 BTU/h 10.0 ft 3/8 / 5/8 TPLEYP036EM142A 10.0 ft 3/8 / 5/8 TPLEYP036EM142A 10.0 ft 1/4 / 1/2 TPKFYP012LM140A 8.0 ft <t< td=""><td>1/4 1/2 TPLFYP018FM140A 10.0 ft 17.796 BTU/h (11.817 BTU/h) 20.0ft (0) 11/11/ACC-14 19.808 BTU/h 17.796 BTU/h (11.817 BTU/h) 1/4 1/2 TPLFYP018FM140A 10.0 ft 17.796 BTU/h (11.817 BTU/h) 1/1/11/ACC-15 19.808 BTU/h 17.796 BTU/h (11.817 BTU/h) 19.808 BTU/h 1/1/11/ACC-16 17.796 BTU/h (11.817 BTU/h) Est. Cooling Discharge Air Temp 1/1/11/ACC-10 4.943 BTU/h (4.362 BTU/h) Est. Cooling Discharge Air Temp 1/1/11/ACC-10 5.546 BTU/h Est. Cooling Discharge Air Temp 1/1/14/ACC-9 5.546 BTU/h Est. Cooling Discharge Air Temp 1/1/16/ACC-9 5.546 BTU/h Est. Cooling Discharge Air Temp 1/1/16/ACC-8 5.546 BTU/h Est. Cooling Discharge Air Temp 1/1/16/ACC-8 5.546 BTU/h Est. Cooling Discharge Air Temp 1/1/16/ACC-8 7.909 BTU/h (6.182 BTU/h) Est. Cooling Discharge Air Temp 1/1/16/ACC-8 7.909 BTU/h (6.182 BTU/h) Est. Cooling Discharge Air Temp 1/1/16/ACC-8 7.909 BTU/h (6.182 BTU/h) Est. Cooling Discharge Air Temp 1/1/16/ACC-8 7.909 BTU/h (</td></t<>	1/4 1/2 TPLFYP018FM140A 10.0 ft 17.796 BTU/h (11.817 BTU/h) 20.0ft (0) 11/11/ACC-14 19.808 BTU/h 17.796 BTU/h (11.817 BTU/h) 1/4 1/2 TPLFYP018FM140A 10.0 ft 17.796 BTU/h (11.817 BTU/h) 1/1/11/ACC-15 19.808 BTU/h 17.796 BTU/h (11.817 BTU/h) 19.808 BTU/h 1/1/11/ACC-16 17.796 BTU/h (11.817 BTU/h) Est. Cooling Discharge Air Temp 1/1/11/ACC-10 4.943 BTU/h (4.362 BTU/h) Est. Cooling Discharge Air Temp 1/1/11/ACC-10 5.546 BTU/h Est. Cooling Discharge Air Temp 1/1/14/ACC-9 5.546 BTU/h Est. Cooling Discharge Air Temp 1/1/16/ACC-9 5.546 BTU/h Est. Cooling Discharge Air Temp 1/1/16/ACC-8 5.546 BTU/h Est. Cooling Discharge Air Temp 1/1/16/ACC-8 5.546 BTU/h Est. Cooling Discharge Air Temp 1/1/16/ACC-8 7.909 BTU/h (6.182 BTU/h) Est. Cooling Discharge Air Temp 1/1/16/ACC-8 7.909 BTU/h (6.182 BTU/h) Est. Cooling Discharge Air Temp 1/1/16/ACC-8 7.909 BTU/h (6.182 BTU/h) Est. Cooling Discharge Air Temp 1/1/16/ACC-8 7.909 BTU/h (



Indoor Units:			16 / 2 to 50		
Capacity:			298 / 156 to 468	(95.5%)	
* Connectable capacity is no	ot actual	capacity.			
Total Pipe Length:			628.0 / 3116.8	feet	
Furthest Actual:			140.0 / 541.0	feet	
Furthest Equiv.:			140.0 / 623.0	feet	
Furthest IU from BC Actu	al:		140.0 / 194.3	feet	
Furthest IU from BC Equiv	v.:		140.0 / 194.3	feet	
Furthest IU from BC Thru	Sub BC	Actual:	0.0 / 0.0	feet	7/
Furthest IU from BC Thru	Sub BC	Equiv.:	0.0 / 0.0	feet	7/
Correction Factors					
Outdoor Unit Capacity:	1.00	1.00			
Temperature:	1.00	1.00			
Piping Length:	0.96	0.98			
Defrosting:	-	1.00			
User Derate:	1.00	1.00			
Total Derate:	0.96	0.97			
Additional Refrigerant:	45.92	2 lb			
Total Refrigerant Amount	: 93.54	4 lb			
Conditions (°F)					
Cooling					
Indoor DB 80.0 Humi	dity 51	.8% Indoor WI	B 67.0		
Outdoor DB 950		ione macor m			

Heating Indoor DB 70.0 Outdoor DB 47.0 Humidity 72.8% Outdoor WB 43.0



×.

	Pipe Dia Liquid / Gas Model Num Pipe Length (Elbows) Address/ Gri	ber Elevation Clg Total (Sens.) Htg Total oup / Room / Tag Ref.		
BC-2 12	2.0 ft 75 295,677 BTU/h (214 332,284 BTU/h	1,004 BTU/h)		
1/2	TPLFYP006EM142A 10.0 ft	5,953 BTU/h (5,069 BTU/h)	Est. Cooling Discharge Air Temp	: 70.3
ft(0)	23/23/ACC-23	6,636 BTU/h	Est. Heating Discharge Air Temp	: 82.5
1/2	TPLFYP008FM140B 10.0 ft	7,938 BTU/h (6,193 BTU/h)	Est. Cooling Discharge Air Temp	: 61.4
ft(0)	24/24/ACC-22	8,914 BTU/h	Est. Heating Discharge Air Temp	: 96.2
1/2	TPLFYP006EM142A 10.0 ft	5,953 BTU/h (5,069 BTU/h)	Est. Cooling Discharge Air Temp	: 70.3
ft(0)	25/25/ACC-19	6,636 BTU/h	Est. Heating Discharge Air Temp	: 82.5
1/2	TPLFYP006EM142A 10.0 ft	5,953 BTU/h (5,069 BTU/h)	Est. Cooling Discharge Air Temp	70.3
Oft(0)	26/26/ACC-18	6,636 BTU/h	Est. Heating Discharge Air Temp	82.5
3/4 ft (0)	CMY-Y102SS-G2 59	532 BTU/h (42,100 BTU/h) 348 BTU/h		
	3/8 / 5/8	TPLFYP030EM140B 10.0 ft	29,766 BTU/h (21,050 BTU/h)	Est. Cooling Discharge Air Temp: 55.5
	8.0ft(0)	27/27/ACC-38	33,674 BTU/h	Est. Heating Discharge Air Temp: 108.4
	3/8 / 5/8	TPLFYP030EM140B 10.0 ft	29,766 BTU/h (21,050 BTU/h)	Est. Cooling Discharge Air Temp: 55.5
	8.0ft (0)	28/27/ACC-37	33,674 BTU/h	Est. Heating Discharge Air Temp: 108.4
/ 3/4 ft(0)	CMY-Y102SS-G2 59	532 BTU/h (42,100 BTU/h) 348 BTU/h		
	<u> </u>	TPLFYP030EM140B 10.0 ft 29/28/ACC-36	29,766 BTU/h (21,050 BTU/h) 33,674 BTU/h	Est. Cooling Discharge Air Temp: 55.5 Est. Heating Discharge Air Temp: 108.4
	3/8 / 5/8	TPLFYP030EM140B 10.0 ft	29,766 BTU/h (21,050 BTU/h)	Est. Cooling Discharge Air Temp: 55.5
	7.0ft (0)	30 / 28 / ACC-35	33,674 BTU/h	Est. Heating Discharge Air Temp: 108.4
1/2	TPLFYP008FM140A 10.0 ft	7,938 BTU/h (6,193 BTU/h)	Est. Cooling Discharge Air Temp	61.4
ft(0)	31/29/ACC-26	8,914 BTU/h	Est. Heating Discharge Air Temp	96.2
1/2	TPLFYP006EM142A 10.0 ft	5,953 BTU/h (5,069 BTU/h)	Est. Cooling Discharge Air Temp	: 70.3
ft(0)	32/30/ACC-25	6,636 BTU/h	Est. Heating Discharge Air Temp	: 82.5
1/2	TPLFYP006EM142A 10.0 ft	5,953 BTU/h (5,069 BTU/h)	Est. Cooling Discharge Air Temp	: 70.3
ft(0)	33/31/ACC-24	6,636 BTU/h	Est. Heating Discharge Air Temp	: 82.5
5/8 ft (0)	CMY-Y102SS-G2 47	626 BTU/h (33,570 BTU/h) 482 BTU/h		
	3/8 / 5/8	TPLFYP024EM140B 10.0 ft	23,813 BTU/h (16,785 BTU/h)	Est. Cooling Discharge Air Temp: 60.5
	3.0ft(0)	34/32/ACC-27	26,741 BTU/h	Est. Heating Discharge Air Temp: 100.5
	3/8 / 5/8	TPLFYP024EM140B 10.0 ft	23,813 BTU/h (16,785 BTU/h)	Est. Cooling Discharge Air Temp: 60.5
	3.0ft(0)	35/32/ACC-28	26,741 BTU/h	Est. Heating Discharge Air Temp: 100.5
5/8 ft(0)	CMY-Y102SS-G2 47	626 BTU/h (33,570 BTU/h) 482 BTU/h		
	3/8 / 5/8	TPLFYP024EM140B 10.0 ft	23,813 BTU/h (16,785 BTU/h)	Est. Cooling Discharge Air Temp: 60.5
	3.0ft (0)	36 / 33 / ACC-29	26,741 BTU/h	Est. Heating Discharge Air Temp: 100.5
	3/8 / 5/8	TPLFYP024EM140B 10.0 ft	23,813 BTU/h (16,785 BTU/h)	Est. Cooling Discharge Air Temp: 60.5
	3.0ft(0)	37/33/ACC-30	26,741 BTU/h	Est. Heating Discharge Air Temp: 100.5
5/8	TPLFYP036EM142A 10.0 ft	35,719 BTU/h (24,932 BTU/h)	Est. Cooling Discharge Air Temp	: 58.5
ft(0)	38/34/ACC-34	39,617 BTU/h	Est. Heating Discharge Air Temp	: 103.5
(0)	-			
(0)	-			

Indoor Units:		1/1 to 1		
Capacity:		12/6 to 12	(100.0%)	
* Connectable	capacity is not actual capacit	у.		
Total Pipe Len	gth:	63.9 / 165.0	feet	
Correction Fac	tors			
Temperature:	1.01			
Piping Length	n: 0.95			
User Derate:	1.00			
Total Derate:	0.95			
Additional Ref	rigerant: 0.00 lb			
Total Refrigera	int Amount: 4.44 lb			
Conditions (°F)			1
Cooling				
Indoor DB 8	30.0 Humidity 51.8%	Indoor WB 67.0		
Outdoor DB 9	95.0			
Hasting				
Indeer DP 7	0.0			
Outdays DR	0.0 17.0 Ubunidan 73.09/	Outdates MR 42.0		
Outdoor DB 4	11.0 Humidity /2.8%	Outdoor WB 45.0		

	TRUYA0121K	A70NA 0.0 ft
4		
1 m	1/4 / 1/2	TPKA0A0121LA10
39 ACCU-17	60.0ft(4)	39/36/ACC-17

Pipe Dia Liquid / Gas	Model Number Elevation Clg Total (Sens
Pipe Length (Elbows)	Hto Total

0A 8.0 ft 11,398 BTU/h (10,325 BTU/h) Est. Cooling Discharge Air Temp: 54.7



Diamond System Builder	
sw: 5.4.1.14 db: 5.4.1.10	
8/8/2024	-
11:13 PM	

ACC-6	ACC-5	ACC-4	ACC-3	ACC-2	ACC-1	ACCU-12	ACCU-7	ACCU-11	ACCU-13	
	REMARKS							1		
	Originator: Steven Jacobus Comments:	S								

AutoCAD Piping & Wiring Diagrams

course: Install twinning Y's within 15 degrees of level and with 20 inches of straight pipe on converging connection - reference installation manual for additional details including but not limited to special trapping requirements when twinning, and pipe slope require

-23	ACC-22	ACC-19	ACC-18	ACC-38	ACC-37	ACC-36	ACC-35	ACC-26	ACC-25	ACC-24	ACC-27	ACC-28	ACC-29	ACC-30

Submittal Documents

CITY**MULTI**®

22-TON TURYE2644BN41AN



Job Name:

System Reference:

460V OUTDOOR VRF HEAT RECOVERY SYSTEM



	Date:
UNIT OPTION Standard Model	TURYE2644BN41AN
ACCESSORIES	
Big Foot Stand	for details see Big Foot Stands submittals
Twinning Kit (Required)	CMY-R300NCBK
BC Controller (Required)	for details see BC Controller Submittals
Joint Kit	for details see Pipe Accessories Submittal
Low Ambient Kit	for details see Low Ambient Kit Submittal
Panel Heater Kit	for details see Panel Heater Kit Submittal
Snow/Hail Guards Kit	for details see Snow/Hail Guards Kit Submittal

Spe	System				
l	Jnit Type		TURYE2644BN41AN		
Cooling Capacity (Nominal)		BTU/H	264,000		
Heating Capacity (Nominal)		BTU/H	295,000		
Net Weight		Lbs. [kg]	1,372 [622]		
Definement Diving Disputer	Liquid (High Pressure)	In. [mm]	1-1/8 [28.58] Brazed		
Reingerant Piping Diameter	Gas (Low Pressure)	In. [mm]	1-3/8 [34.93] Brazed		
Max. Total Refrigerant Line Length		Ft.	3,116		
Max. Refrigerant Line Length (Between ODU & IDU)		Ft.	541		
Max. Control Wiring Length		Ft.	1,640		
Indeer Unit Connectable	Total Capacity		50.0~150.0% of outdoor unit capacity		
	Model/Quantity		P04~P96/2.0~50.0		
Sound Pressure Levels		dB(A)	66.5/67.5		
Sound Power Levels		dB(A)	87.0/87.0		
Compressor Operating Range			7.5% to 100.0%		
	EER		9.5/9.7		
ALUDI Defining (Durate d Aluge shugte d)	IEER		19.4/21.1		
ARKI Kalings (Ducled/Non-aucled)	COP		3.36/3.53		
	SCHE		22.3/25.7		

Sp	ecifications		Module 1	Module 2		
	Unit Type		TURYE1444AN41AN	TURYE1204AN41AN		
Cooling Capacity (Nominal)		BTU/H	144,000	120,000		
Heating Capacity (Nominal)		BTU/H	160,000	135,000		
Guaranteed Operating Range ¹	Cooling ²	°F [°C]	23~126 [-5.0~52.0]	23~126 [-5.0~52.0]		
Guaranteed Operating Range	Heating	°F [°C]	-13~60 [-25.0~15.5]	-13~60 [-25.0~15.5]		
Extended Operating Range	Heating	°F [°C]	-27.4~60 [-33.0~15.5]	-27.4~60 [-33.0~15.5]		
External Dimensions (H x W x	D)	ln. [mm]	71-5/8 x 48-7/8 x 29-3/16 [1,818 x 1,240 x 740]	71-5/8 x 48-7/8 x 29-3/16 [1,818 x 1,240 x 740]		
Net Weight		Lbs. [kg]	715 [324]	657 [298]		
External Finish			Pre-coated galvanized steel sheet (+powder coating for -BS type) [MUNSELL 5Y 8/1]	Pre-coated galvanized steel sheet (+powder coating for -BS type) [MUNSELL 5Y 8/1]		
Electrical Power Requirements Voltage, Phase, Hertz, Power Tolerance			460V, 3-phase, 60 Hz, ±10%	460V, 3-phase, 60 Hz, ±10%		
Minimum Circuit Ampacity A			34.0	26.0		
Maximum Overcurrent Protection A		A	50	40		
Recommended Fuse Size		A	35	30		
Recommended Minimum Wire	Size	AWG [mm]	8 [8.4]	10 [5.3]		
SCCR		kA	5	5		
	Type x Quantity		Propeller fan x 2	Propeller fan x 2		
	Airflow Rate	CFM	9,550	8,300		
FAN⁴	External Static Pressure	In. WG	Selectable; 0.00, 0.12, 0.24, 0.32, In. WG; factory set to 0 In. WG	Selectable; 0.00, 0.12, 0.24, 0.32, In. WG; factory set to 0 In. WG		
Compressor	Type x Quantity		Inverter scroll hermetic compressor x 1	Inverter scroll hermetic compressor x 1		
Refrigerant	Type x Original Charge		R410A x 23.0 lbs + 12.0 oz [10.8 kg]	R410A x 17.0 lbs + 10.0 oz [8.0 kg]		
Protection Devices	High Pressure Protection	l	High pressure sensor, High pressure switch at 4.15 MPa (601 psi)	High pressure sensor, High pressure switch at 4.15 MPa (601 psi)		
	Inverter Circuit (Comp./F	an)	Over-current protection	Over-current protection		
NOTEO						

NOTES: Nominal cooling conditions (Test conditions are based on AHRI 1230-2023) Indoor: 80°FD.B./67°FW.B. (26.7°CD.B./19.4°CW.B.), Outdoor: 95°FD.B. (35°CD.B.) Nominal heating conditions (Test conditions are based on AHRI 1230-2023) Indoor: 70°FD.B. (21.1°CD.B.), Outdoor: 47°FD.B./43°FW.B. (8.3°CD.B./6.1°CW.B.)

¹Harsh weather environments may demand performance enhancing equipment. Ask your Mitsubishi Electric representative for more details about your region ²For details on extended cooling operation range down to -10° F DB, see Low Ambient Kit Submittal ³When applying product below -4°F, consult your design engineer for cold climate application best practices, including the use of a backup source for heating ⁴Unit will continue to operate in extended operating range, but capacity is not guaranteed diual module

Each individual module requires a separate electrical connection. Refer to electrical data for each individual module.

OUTDOOR UNIT: TURYE2644BN41AN – DIMENSIONS

PURY-EP192, 216, 240, 264, 288T/YSNU-A1

Unit: mm(in)



2. Twinning pipes must be installed horizontally using a level vessel.

winning pipe

Be sure to see the Installation Manual for details of Twinning pipe installation.

3. The pipe section before the Twinning pipe (section "a" and "b" in the figure) must have at least 500mm(19-11/16) of straight section

(* including the straight pipe that is supplied with the Twinning pipe).

4. Only use the Twinning pipe by Mitsubishi (optional parts).

MODULE 1: TURYE1444AN41AN - DIMENSIONS

Unit: mm(in)



Refrigerant service va Bottom view

MODULE 2: TURYE1204AN41AN - DIMENSIONS

Unit: mm(in)



Refrigerant service va Bottom view

TWINNING KIT: CMY-R300NCBK – DIMENSIONS

CMY-R300NCBK

Unit: mm (in.)



Note 1. Reference the attitude angle of the twinning pipe below the fig.



The angle of the twinning pipe is within $\pm 15^{\circ}$ against the horizontal plane.

- 2. Use the attached pipe to braze the port-opening of the twinning pipe.
- 3. Pipe diameter is indicated by inside diameter.
- 4. Only use the Twinning pipe by Mitsubishi (optional parts) .





Data.

Job Name:

System Reference:

460V OUTDOOR VRF HEAT RECOVERY SYSTEM



	Dale.
UNIT OPTION Standard Model	TURYE3124BN41AN
ACCESSORIES	
Big Foot Stand	for details see Big Foot Stands submittals
Twinning Kit (Required)	CMY-R300NCBK
BC Controller (Required)	for details see BC Controller Submittals
Joint Kit	for details see Pipe Accessories Submittal
Low Ambient Kit	for details see Low Ambient Kit Submittal
Panel Heater Kit	for details see Panel Heater Kit Submittal
Snow/Hail Guards Kit	for details see Snow/Hail Guards Kit Submittal

S	System				
	Unit Type		TURYE3124BN41AN		
Cooling Capacity (Nominal)		BTU/H	312,000		
Heating Capacity (Nominal)		BTU/H	350,000		
Net Weight		Lbs. [kg]	1,522 [690]		
Defrigement Diving Disputer	Liquid (High Pressure)	In. [mm]	1-1/8 [28.58] Brazed		
Retrigerant Piping Diameter	Gas (Low Pressure)	In. [mm]	1-5/8 [41.28] Brazed		
Max. Total Refrigerant Line Length		Ft.	3,116		
Max. Refrigerant Line Length (Between ODU & IDU)		Ft.	541		
Max. Control Wiring Length		Ft.	1,640		
Indeer Unit Connectable	Total Capacity		50.0~150.0% of outdoor unit capacity		
	Model/Quantity		P04~P96/2.0~50.0		
Sound Pressure Levels		dB(A)	67.0/69.0		
Sound Power Levels		dB(A)	87.0/88.5		
Compressor Operating Range			7.5% to 100.0%		
	EER		9.3/9.4		
ALIDI Detinge (Dusted/Nen dusted)	IEER		19.3/20.3		
ARKI Kalings (Ducled/Non-ducled)	COP		3.24/3.37		
	SCHE		20.6/23.8		

Specifications			Module 1	Module 2		
	Unit Type		TURYE1684AN41AN	TURYE1444AN41AN		
Cooling Capacity (Nominal)		BTU/H	168,000	144,000		
Heating Capacity (Nominal)		BTU/H	188,000	160,000		
Guaranteed Operating Range	¹ Cooling ²	°F [°C]	23~126 [-5.0~52.0]	23~126 [-5.0~52.0]		
Guaranteed Operating Range	Heating	°F [°C]	-13~60 [-25.0~15.5]	-13~60 [-25.0~15.5]		
Extended Operating Range	Heating	°F [°C]	-27.4~60 [-33.0~15.5]	-27.4~60 [-33.0~15.5]		
External Dimensions (H x W >	(D)	ln. [mm]	71-5/8 x 68-15/16 x 29-3/16 [1,818 x 1,750 x 740]	71-5/8 x 48-7/8 x 29-3/16 [1,818 x 1,240 x 740]		
Net Weight		Lbs. [kg]	807 [366]	715 [324]		
External Finish			Pre-coated galvanized steel sheet (+powder coating for -BS type) [MUNSELL 5Y 8/1]	Pre-coated galvanized steel sheet (+powder coating for -BS type) [MUNSELL 5Y 8/1]		
Electrical Power Requirements Voltage, Phase, Hertz, Power Tolerance			460V, 3-phase, 60 Hz, ±10%	460V, 3-phase, 60 Hz, ±10%		
Minimum Circuit Ampacity A			35.0	34.0		
Maximum Overcurrent Protec	tion	A	50	50		
Recommended Fuse Size		A	40	35		
Recommended Minimum Wire	e Size	AWG [mm]	8 [8.4]	8 [8.4]		
SCCR		kA	5	5		
	Type x Quantity		Propeller fan x 2	Propeller fan x 2		
	Airflow Rate	CFM	14,850	9,550		
FAN⁴	External Static Pressure In. WG		Selectable; 0.00, 0.12, 0.24, 0.32, In. WG; factory set to 0 In. WG	Selectable; 0.00, 0.12, 0.24, 0.32, In. WG; factory set to 0 In. WG		
Compressor Type x Quantity		Inverter scroll hermetic compressor x 1	Inverter scroll hermetic compressor x 1			
Refrigerant Type x Original Charge		R410A x 23.0 lbs + 12.0 oz [10.8 kg]	R410A x 23.0 lbs + 12.0 oz [10.8 kg]			
Protection Devices	High Pressure Protection		High pressure sensor, High pressure switch at 4.15 MPa (601 psi)	High pressure sensor, High pressure switch at 4.15 MPa (601 psi)		
	Inverter Circuit (Comp./F	an)	Over-current protection	Over-current protection		
NOTEO						

NOTES: Nominal cooling conditions (Test conditions are based on AHRI 1230-2023) Indoor: 80°FD.B./67°FW.B. (26.°C°LD.B./19.4°CW.B.), Outdoor: 90°FD.B. (35°CD.B.) Nominal heating conditions (Test conditions are based on AHRI 1230-2023) Indoor: 70°FD.B. (21.1°CD.B.), Outdoor: 47°FD.B./43°FW.B. (8.3°CD.B./6.1°CW.B.)

¹Harsh weather environments may demand performance enhancing equipment. Ask your Mitsubishi Electric representative for more details about your region

²For details on extended cooling operation range down to -10° F DB, see Low Ambient Kit Submittal ³When applying product below -4°F, consult your design engineer for cold climate application best

Each individual module requires a separate electrical connection. Refer to electrical data for each individual module.

PURY-EP312T/YSNU-A1

Unit: mm(in)





Size
connection
pipe
Twinning

)P312T/YSNU)P168T/YNU)P144T/YNU	AY-R300NCBK	φ 28.58(1-1/8)	φ 41.28(1-5/8)	φ 22.2(7/8)		φ 22.2(7/8)		
	cor unit 1	oor unit 2	parts)	ressure a	ressure	ressure (ressure o	ressure e	ressure .	
	_ Outd	^c Outd	(optiona	High p	Low p	High p	Low p	High p	Low p	
Package unit name	Component unit nom		Outdoor Twinning Kil	BC controller	~Twinning pipe	Twinning pipe	~Outdoor unit 1	Twinning pipe	~Outdoor unit 2	

Note 1. Connect the pipes as shown in the figure above. Refer to the table above for the pipe size. 2. Twinning pipes must be installed horizontally using a level vessel. Be sure to see the installation Manual for details of Twinning pipe installation. 3. The pipe section before the Twinning pipe (section "a" and "b" in the figure) must have at least 500mm(19-11/16) of straight section (* including the straight pipe that is supplied with the Twinning pipe). 4. Only use the Twinning pipe by Mitsubishi (optional parts).

MODULE 1: TURYE1684AN41AN – DIMENSIONS

PURY-EP168T/YNU-A1 Unit: mm(in) *1 Connect the refrigerant pipe to the service valve according to the Installation Manual. 148(5-7/8) X 84(3-5/16) Knockout hole ottom through hole 150(5-15/16) X 94(3-3/4) Knockout hole Kneckout 1/2) or \$34.5(1-3/8) Knockc 3/4) or \$22.2(7/8) Knockout High pressure \$28.58(1-1/8) Specifications Bottom through hole | ø 52(2-1/16) Knockout hole Front through hale | d 34(1-3/8) Knackout hale Bottom through hele | # 34(1-3/8) Knackout hale # 28.58(1-1/8) Brazed Low pressure Diameter 6 42 P ¢ 62. 00 Refrigerant pipe *1 Front through hole ough hole ough hole da Connecting pipe specifications Usage transmission High pressure Brazed For pipes wires 5 For ¢ 22.2(7/8) 20000000 (E)P168 (1-3/18) (Se-13/16)(Se-3/10(Se-3/10)(1-3/18) S5² → (Se-13/16)(Se-3/1-Se-12/18)(1-3/18) Model (91/91-11) 1818(11-5/8) 303 (91/11-65)5151 Transformer box 5 (YNU Only) 216(8-9/16) 172(5-13/16) 207(8-3/16) 256(10-1/8) 1<4(2-JJ\J0) 132(5-1/4) Control box 140(56-3/10) 156(2-J/8) 80 (3-3/16) (91/S-L)S8 19.5 (13/16) -_____ ⊡_____ (m) 110(4-3/8) 152(6) (0) (4 (Mounting pitch) \odot 91/9-7) 795(31-5/16) (1) (--) 49(1-15/16) 831(32-60T 150(5-15/16) 166 (6) 166 (6) 166 (7) 148(5-7/8) 1750(68-15/16) Front view Bottom view Top view (\sim) y__ 0 795(31-5/16) (Mounting pitch) 650(25-5/8) 653(25-3/4) 32 CITY MULTI Intake 19.5 (13/16) (8/I-8) (1-3/4) air 2X3X14(9/16)X20(13/16) 0val hole Service 80(3-3/16) (91/91-9)091 84(3-2\JP) (9T/6-E)06 64 76 7X(2-J2\J9)(=53-2\8) 54 (2-3/16) (140)(56-3/10) O ⊒i utake tX120(=000) 10(5-J3\JE) $2XT \times \phi$ 4.6(3/16) Hole (Make hole at the plastic fan guard for snow hood attachment) 介 Discharge air 🖒 < Snow hood attachment hole > eft side view 20(13/16)592(23-5/16) ***** ₽.⊕ 아^{intake} 아 Note 1.Please refer to (2/2) for information regarding necessary 2¢(5-3/30) 54(2-3/16) spacing around the unit and foundation work. 2.At brazing of pipes, wrap the refrigerant service valve with wet cloth and keep the temperature of refrigerant service valve under 120°C(248°F). Refrigerant service valvi <Low press Service Valve Service Valve (91/E-2 Refrigerant service v 7 181 view ant Rear view Refri: (5-3/8) Refrigerant service valve _____ <High pressure> 768(30-1/4) 132 685(27) (91/8-2) 181

MODULE 2: TURYE1444AN41AN - DIMENSIONS

Unit: mm(in)



Refrigerant service va Bottom view

TWINNING KIT: CMY-R300NCBK – DIMENSIONS

CMY-R300NCBK

Unit: mm (in.)



Note 1. Reference the attitude angle of the twinning pipe below the fig.



The angle of the twinning pipe is within $\pm 15^{\circ}$ against the horizontal plane.

- 2. Use the attached pipe to braze the port-opening of the twinning pipe.
- 3. Pipe diameter is indicated by inside diameter.
- 4. Only use the Twinning pipe by Mitsubishi (optional parts) .







Job Name:

System Reference:

Date:



	System							
	TCMBM1016JA11N4							
Indoor Unit Capacity Connectable to 1 Branch		BTU/H	54,000					
Number Of Branches			16					
Electrical Power Requirements			208/230V, 1-phase, 60 Hz					
Minimum Circuit Ampacity (MCA)		A	1.6/1.8					
Maximum Overcurrent Protection (MOCP)		A	20					
Power Input (208 / 230V)	Cooling	kW	1.25 / 1.45					
Power Input (208/230V)	Heating	kW	0.66 / 0.77/					
Current Input (208/220)()	Cooling	A	0.258 / 0.333/					
	Heating	A	0.137 / 0.176					
External Dimensions		In. [mm]	9-7/8 x 44-11/16 x 21-1/2 [250 x 1,135 x 545]					
Net Weight		Lbs. [kg]	150 [68]					
External finish		Galvanized steel plate (Lower part drain pan: Pre-coated galvanized sheets + powder coating) ()						
Connectable Outdoor / Heat Source Unit Capacity			72,000 to 336,000					
Field drain pipe size		In. [mm]	3/4 NPT					
Refrigerant			R410A					
Sound power level (measured in anechoic room)	Defrost	dB(A)	50					
Sound processing lovel (macquired in apacheic room)	Rated operation	dB(A)	68.0					
Sound pressure level (measured in anechoic room)	Defrost	dB(A)	74					
Derivation OB(A) 74 NOTES: 1. The equipment is for use with R410A refrigerant only. 2. When possible, avoid installing the BC controller within 15 Ft. of sound sensitive areas. 3. Rated operation sound data is based on cooling mode. Sound data may vary depending on outdoor unit capacity and operation mode. 4. Sound pressure/power levels obtained via testing in an anechoic chamber. Actual sound pressure levels may be greater due to ambient noise and/or deflection 5. Sound pressure values were obtained at a test location approximately 5 Ft. from the unit 6. The solenoid valve switching sound pressure value is 56 dB(A) for all units 7. The unit is intended for installation in an indoor environment only 8. For details regarding installation specifics, please refer to the product's Installation Manual.								

INDOOR UNIT ACCESSORIES: TCMBM1016JA11N4

Poll Volvo	Ball Valve (3/8" SAE Brazed)	BV38BBSI
	Ball Valve (5/8" SAE Brazed)	BV58BBSI
	Blue Diamond (Advanced) Mini Condensate Pump w/ Reservoir & Sensor (208/230V) [recommended]	X87-721
Condensate	Blue Diamond (MicroBlue) Mini Condensate Pump (110/208/230V) up to 18,000 BTU/H	X86-003
	Sauermann Condensate Pump	SI30-230
Control Wire	M-Net Control Wire, 1,000' Roll (16-AWG, Standard, Twisted Pair, Shielded, Jacketed- Plenum rated)	CW162S-1000
	M-Net Control Wire, 250' Roll (16-AWG, Standard, Twisted Pair, Shielded, Jacketed- Plenum rated)	CW162S-250
Port Adapter	Joint Pipe Adapter	CMY-R160-J1
	Branch Joint (Downstream capacity 127,000-216,000 BTU/H)	CMY-R202S-G
	Branch Joint (Downstream capacity 217,000-234,000 BTU/H)	CMY-R203S-G
	Branch Joint (Downstream capacity 235,000-360,000 BTU/H)	CMY-R204S-G
	Branch Joint (Downstream capacity 73,000-96,000 BTU/H)	CMY-Y102LS-G2
Valuas Adaptors & Hoodors	Branch Joint (Downstream capacity ≤126,000 BTU/H)	CMY-R201S-G
valves Adaptors & neaders	Branch Joint (Downstream capacity ≤126,000 BTU/H)	CMY-Y202S-G2
	Branch Joint (Downstream capacity ≤72,000 BTU/H)	CMY-Y102SS-G2
	Branch Joint (Downstream capacity ≥316,000 BTU/H)	CMY-R205S-G
	Reducer (Between Main and Sub BC)	CMY-R303S-G1
	Reducer (Between ODU and BC)	CMY-R302S-G1

INDOOR UNIT DIMENSIONS: TCMBM1016JA11N4

TCMB0108, 1012, 1016JA





Low press. Pipe

Table-1. To outdoor/heat source unit (Note.6)

High press. Pipe

Connectable unit capacity

(Please give attention not to occupy service space by letting ducts and pipes through) 3. Please take service space for connection pipe of SUB BC CONTROLLER. 4. Install this product in a location where noise (refrigerant noise) e-mitted by the unit will not disturb the neighbors.

Unit: mm(in)

For the refrigerant pipe size, refer to Installation Manual of outdoor units/heat source units ø41.28(ø22.2(7/8) ø22.2(7/8) (ø28.58(1-1, ø28.58(1-1, ø28.58(1-1, 144 to 192 216 240 264 to 288 312 336

834.93(1-3/8) 834.93(1-3/8)

ø28.58(ø28.58(ø34.93(2(7

or ø28.58(1-1/8) or ø28.58(1-1/8)

when connecting plural indoor units with 1 branch. Refer to the Table 1.2 connection pipe of outdoor unit or SUB BC CONTROLLER diameter size or SUB BC CONTROLLER diameter size. 7. Refer to the installation Manual for insulation of connection pipe and

(For use in quiet environments with low background noise, position the BC CONTROLLER at least 5m away from any indoor units.) Refer to the Installation Manual for refrigerant piping diameter size

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drain piping. Do not place the BC controller directly on the floor.

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FORM# TCMBM1016JA11N4 - 202209

CITY**MULTI**®

TPLFYP008FM140A 8,000 BTU/H 22" X 22" 4-WAY CEILING CASSETTE



Date:

Job Name:

System Reference:



GENERAL FEATURES

- · Square edge, sleek design
- 3D i-see Sensor[™] available as an option
- Improved installation features* •
- · Occupancy detection*
- Energy saving features*
- · Improved occupant comfort
- Four fan speed settings including auto-fan
- · Individual vane settings
- 2' x 2' size matches size of many ceiling tiles
- · Corner-pocket design for simplified installation
- · Built-in condensate lift mechanism designed to provide up to 33" of lift
- · Ventilation air intake supported
- *Requires a PAR-33MAA-J controller

Specifications		System		
Unit Type		TPLFYP008FM140A		
Cooling capacity (Nominal) ¹		BTU/H	8,000	
Heating capacity (Nominal) ¹		BTU/H	9,000	
Power source		Voltage, Phase, Hertz	208/230V, 1-phase, 60 Hz	
Davies Consumption	Cooling	kW	0.02	
Power Consumption	Heating	kW	0.02	
Current	Cooling	A	.22	
Current	Heating	A	0.17	
MCA		A	0.28	
Maximum Overcurrent Protection (MOCP)		A	15	
External finish			Galvanized steel sheet	
External Dimensions		In. [mm]	22-7/16 x 22-7/16 x 8-3/16 [570 x 570 x 208]	
Net weight		Lbs [kg]	28.9 [13.1]	
Heat exchanger			Cross fin (Aluminum fin and copper tube)	
	Type x quantity		Turbo fan x 1	
	Airflow rate	CFM	230-280-315	
Fan	Motor type		DC motor	
	Motor Output	kW	0.05	
	Motor FLA	A	0.22	
Sound pressure level (Measured in anechoic room)		dB(A)	26-30-33	
Air filter			PP honeycomb fabric (long life type)	
Refrigerant	Туре		R410A	
	Liquid (High Pressure)	In. [mm]	1/4 [6.35] Flare	
Diameter of reingerant pipe (O.D.)	Gas (Low Pressure)	In. [mm]	1/2 [12.7] Flare	
Diameter of drain pipe		In. [mm]	O.D. 1-1/4 [32]	

NOTES:

¹Cooling / Heating capacity indicated at the maximum value at operation under the following conditions: Cooling | Indoor: 80° F (26.7° C) DB / 67° F (19.4° C) WB; Outdoor 95° F (35° C) DB Heating | Indoor: 70° F (21.1° C) DB; Outdoor 47° F (8.3° C) DB / 43° F (6.1° C) WB

INDOOR UNIT ACCESSORIES: TPLFYP008FM140A

	BACnet® and Modbus® Interface	PAC-UKPRC001-CN-1
	Connector cable for remote display	PAC-SA88HA-EP
Control Interface	IT Extender	PAC-WHS01IE-E
Control Internace	kumo station® for kumo cloud®	TAC-WHS01HC-E
	Thermostat Interface	PAC-US444CN-1
	Thermostat Interface	PAC-US445CN-1
	Flush Mount Remote Temperature Sensor	PAC-USSEN002-FM-1
Remote Sensor	Flush Mount Temperature Sensor	PAC-USSEN001-FM-1
	Remote Temperature Sensor	PAC-SE41TS-E
Terminal Signal Adapter	Terminal Signal Adapter	PAC-IT51AD-E
Terminal Signal Adapter	Terminal Signal Adapter	PAC-IT52AD-E
	Deluxe Wired MA Remote Controller [†]	TAR-40MAAU
Wired Demote Controller	Simple MA Remote Controller [†]	TAC-YT53CRAU-J
whea Remote Controller	Smart ME Remote Controller - Backlit touchscreen	TAR-U01MEDU-K
	Touch MA Controller [†]	TAR-CT01MAU-SB
	kumo touch [™] RedLINK [™] Wireless Controller	MHK2
	Wireless MA Receiver	PAR-SR32MA-E
Wireless Remote Controller	Wireless MA Remote Controller	TAR-FL32MA-E
	Wireless Receiver	PAR-WSC009FA-E
	Wireless Remote Contoller	PAR-SL101A-E
	Wireless Signal Receiver Panel	PAR-SR4LU-E
	Blue Diamond (Advanced) Mini Condensate Pump w/ Reservoir & Sensor (208/230V) [recommended]	X87-721
Condensate	Blue Diamond (MicroBlue) Mini Condensate Pump (110/208/230V) up to 18,000 BTU/H	X86-003
	Refco Condensate Pump (100-240 VAC) up to 120,000 BTU/H	COMBI
Control Interface	CN24 Relay Kit	CN24RELAY-KIT-CM3
	Remote Operation Adapter [‡]	PAC-SF40RM-E
i ana Canaar® Danal	3D i-see Sensor® Corner Panel	PAC-SF1ME-E
I-See Sensor" Panel	Grille with 3D i-see Sensor®	TLP-18FAEU

NOTES: *PAC-SF40RM-E (Unable to use with wireless remote controller)

INDOOR UNIT DIMENSIONS: TPLFYP008FM140A



Unit: inch



FORM# TPLFYP008FM140A - 202212

CITY**MULTI**®

TPLFYP005FM140A 5,000 BTU/H 22" X 22" 4-WAY CEILING CASSETTE



Date:

Job Name:

System Reference:



GENERAL FEATURES

- · Square edge, sleek design
- 3D i-see Sensor[™] available as an option
- Improved installation features* •
- · Occupancy detection*
- Energy saving features*
- · Improved occupant comfort
- · Four fan speed settings including auto-fan
- · Individual vane settings
- 2' x 2' size matches size of many ceiling tiles
- · Corner-pocket design for simplified installation
- · Built-in condensate lift mechanism designed to provide up to 33" of lift
- · Ventilation air intake supported
- *Requires a PAR-33MAA-J controller

Specifications		System		
Unit Type		TPLFYP005FM140A		
Cooling capacity (Nominal) ¹		BTU/H	5,000	
Heating capacity (Nominal) ¹		BTU/H	5,600	
Power source		Voltage, Phase, Hertz	208/230V, 1-phase, 60 Hz	
Bower Consumption	Cooling	kW	0.02	
Power Consumption	Heating	kW	0.02	
Current	Cooling	A	0.19	
Current	Heating	A	0.14	
MCA		A	0.24	
Maximum Overcurrent Protection (MOCP)		A	15	
External finish			Galvanized steel sheet	
External Dimensions		In. [mm]	22-7/16 x 22-7/16 x 8-3/16 [570 x 570 x 208]	
Net weight		Lbs [kg]	28.9 [13.1]	
Heat exchanger			Cross fin (Aluminum fin and copper tube)	
	Type x quantity		Turbo fan x 1	
	sirflow rate CFM		230–265–280	
Fan	Motor type		DC motor	
	Motor Output	kW	0.05	
	Motor FLA	A	0.19	
Sound pressure level (Measured in anechoic room)		dB(A)	26–28–30	
Air filter			PP honeycomb fabric (long life type)	
Refrigerant	Туре		R410A	
Diameter of refrigerent pipe (O.D.)	Liquid (High Pressure)	In. [mm]	1/4 [6.35] Flare	
Diameter of reingerant pipe (O.D.)	Gas (Low Pressure)	In. [mm]	1/2 [12.7] Flare	
Diameter of drain pipe In. [mm]		In. [mm]	O.D. 1-1/4 [32]	

NOTES:

¹Cooling / Heating capacity indicated at the maximum value at operation under the following conditions: Cooling | Indoor: 80° F (26.7° C) DB / 67° F (19.4° C) WB; Outdoor 95° F (35° C) DB Heating | Indoor: 70° F (21.1° C) DB; Outdoor 47° F (8.3° C) DB / 43° F (6.1° C) WB

INDOOR UNIT ACCESSORIES: TPLFYP005FM140A

Control Interface	Connector cable for remote display	PAC-SA88HA-EP
	IT Extender	PAC-WHS01IE-E
	kumo station® for kumo cloud®	TAC-WHS01HC-E
	Procon BACnet® and Modbus® Interface	PAC-UKPRC001-CN-1
	Thermostat Interface	PAC-US444CN-1
	Thermostat Interface	PAC-US445CN-1
	Flush Mount Remote Temperature Sensor	PAC-USSEN002-FM-1
Remote Sensor	Flush Mount Temperature Sensor	PAC-USSEN001-FM-1
	Remote Temperature Sensor	PAC-SE41TS-E
Terminal Signal Adapter	Terminal Signal Adapter	PAC-IT51AD-E
	Terminal Signal Adapter	PAC-IT52AD-E
	Deluxe Wired MA Remote Controller [†]	TAR-40MAAU
	Simple Ductless Wired Remote Controller	PAC-SDW01RC-1
Wired Remote Controller	Simple MA Remote Controller [†]	TAC-YT53CRAU-J
	Smart ME Remote Controller - Backlit touchscreen	TAR-U01MEDU-K
	Touch MA Controller [†]	TAR-CT01MAU-SB
	kumo touch [™] RedLINK [™] Wireless Controller	MHK2
	Wireless MA Receiver	PAR-SR32MA-E
Wireless Remote Controller	Wireless MA Remote Controller	TAR-FL32MA-E
Wireless Remote Controller	Wireless Receiver	PAR-WSC009FA-E
	Wireless Remote Contoller	PAR-SL101A-E
	Wireless Signal Receiver Panel	PAR-SR4LU-E
	Blue Diamond (Advanced) Mini Condensate Pump w/ Reservoir & Sensor (208/230V) [recommended]	X87-721
Condensate	Blue Diamond (MicroBlue) Mini Condensate Pump (110/208/230V) up to 18,000 BTU/H	X86-003
	Refco Condensate Pump (100-240 VAC) up to 120,000 BTU/H	COMBI
Control Interface	CN24 Relay Kit	CN24RELAY-KIT-CM3
	Remote Operation Adapter [‡]	PAC-SF40RM-E
Grille	Grille	TLP-18FAU
i ago Sangar® Danal	3D i-see Sensor® Corner Panel	PAC-SF1ME-E
	Grille with 3D i-see Sensor®	TLP-18FAEU

NOTES: **High efficiency filter requires use of multi-function casement: PAC-SJ41TM-E

INDOOR UNIT DIMENSIONS: TPLFYP005FM140A



Unit: inch

FORM# TPLFYP005FM140A - 202309

CITY**MULTI**®

TPLFYP018FM140A 18,000 BTU/H 22" X 22" 4-WAY CEILING CASSETTE



Date:

Job Name:

System Reference:



GENERAL FEATURES

- · Square edge, sleek design
- 3D i-see Sensor[™] available as an option
- Improved installation features* •
- · Occupancy detection*
- Energy saving features*
- · Improved occupant comfort
- · Four fan speed settings including auto-fan
- · Individual vane settings
- 2' x 2' size matches size of many ceiling tiles
- · Corner-pocket design for simplified installation
- · Built-in condensate lift mechanism designed to provide up to 33" of lift
- · Ventilation air intake supported
- *Requires a PAR-33MAA-J controller

Specifications		System		
Unit Type			TPLFYP018FM140A	
Cooling capacity (Nominal) ¹		BTU/H	18,000	
Heating capacity (Nominal) ¹		BTU/H	20,000	
Power source Vol		Voltage, Phase, Hertz	208/230V, 1-phase, 60 Hz	
	Cooling	kW	0.04	
Power Consumption	Heating	kW	0.04	
Current	Cooling	A	0.4	
Current	Heating	A	0.35	
MCA		A	0.5	
Maximum Overcurrent Protection (MOCP)		A	15	
External finish			Galvanized steel sheet	
External Dimensions		In. [mm]	22-7/16 x 22-7/16 x 8-3/16 [570 x 570 x 208]	
Net weight		Lbs [kg]	31.3 [14.2]	
Heat exchanger		Cross fin (Aluminum fin and copper tube)		
	Type x quantity		Turbo fan x 1	
	Airflow rate	rate CFM		
Fan	Motor type		DC motor	
	Motor Output	kW	0.05	
	Motor FLA	A	0.4	
Sound pressure level (Measured in anechoic room)		dB(A)	33–39–43	
Air filter			PP honeycomb fabric (long life type)	
Refrigerant	Туре		R410A	
Diameter of refrigerent size (O.D.)	Liquid (High Pressure)	In. [mm]	1/4 [6.35] Flare	
Diameter of reingerant pipe (O.D.)	Gas (Low Pressure)	In. [mm]	1/2 [12.7] Flare	
Diameter of drain pipe In. [mn		In. [mm]	O.D. 1-1/4 [32]	

NOTES:

¹Cooling / Heating capacity indicated at the maximum value at operation under the following conditions: Cooling | Indoor: 80° F (26.7° C) DB / 67° F (19.4° C) WB; Outdoor 95° F (35° C) DB Heating | Indoor: 70° F (21.1° C) DB; Outdoor 47° F (8.3° C) DB / 43° F (6.1° C) WB

INDOOR UNIT ACCESSORIES: TPLFYP018FM140A

	BACnet® and Modbus® Interface	PAC-UKPRC001-CN-1
	Connector cable for remote display	PAC-SA88HA-EP
Control Interface	IT Extender	PAC-WHS01IE-E
	kumo station® for kumo cloud®	TAC-WHS01HC-E
	Thermostat Interface	PAC-US444CN-1
	Thermostat Interface	PAC-US445CN-1
Remote Sensor	Remote Temperature Sensor	PAC-SE41TS-E
Terminal Signal Adapter	Terminal Signal Adapter	PAC-IT51AD-E
	Terminal Signal Adapter	PAC-IT52AD-E
	Deluxe Wired MA Remote Controller [†]	TAR-40MAAU
Wired Remote Controller	Simple MA Remote Controller [†]	TAC-YT53CRAU-J
When Remote Controller	Smart ME Remote Controller - Backlit touchscreen	TAR-U01MEDU-K
	Touch MA Controller [†]	TAR-CT01MAU-SB
	kumo touch [™] RedLINK [™] Wireless Controller	MHK2
Wireless Remote Controller	Wireless MA Receiver	PAR-SR32MA-E
	Wireless MA Remote Controller	TAR-FL32MA-E
	Wireless Receiver	PAR-WSC009FA-E
	Wireless Remote Contoller	PAR-SL101A-E
	Wireless Signal Receiver Panel	PAR-SR4LU-E
	Blue Diamond (Advanced) Mini Condensate Pump w/ Reservoir & Sensor (208/230V) [recommended]	X87-721
Condensate	Blue Diamond (MicroBlue) Mini Condensate Pump (110/208/230V) up to 18,000 BTU/H	X86-003
	Refco Condensate Pump (100-240 VAC) up to 120,000 BTU/H	COMBI
Control Interface	CN24 Relay Kit	CN24RELAY-KIT-CM3
	Remote Operation Adapter [‡]	PAC-SF40RM-E
i saa Sansar® Panal	3D i-see Sensor® Corner Panel	PAC-SF1ME-E

NOTES: [‡]PAC-SF40RM-E (Unable to use with wireless remote controller)

INDOOR UNIT DIMENSIONS: TPLFYP018FM140A



Unit: inch



FORM# TPLFYP018FM140A - 202212

CITY**MULTI**®

TCMBS0108KB21N4 8 BRANCH (SUB BC)



Date:

Job Name:

System Reference:



GENERAL FEATURES

- · Provides simultaneous heating and cooling
- · Used with Air Source or Water Source outdoor units
- · Used with a Main BC Controller to connect additional indoor units.
- A maximum of 11 Sub BC Controllers can be connected to one Main BC • Controller per system

	Specifications		System	
Unit Type		TCMBS0108KB21N4		
Indoor Unit Capacity Connectable to 1 Branch		BTU/H	54,000	
Number Of Branches			8	
Electrical Power Requirements			208/230V, 1-phase, 60 Hz	
Minimum Circuit Ampacity (MCA)		A	0.7/0.9	
Maximum Overcurrent Protection (MOCP)		A	20	
Bauran Janut (208/220) ()	Cooling	kW	0.59 / 0.69	
Power Input (208/230V)	Heating	kW	0.30 / 0.35	
Current Innut (208/220)()	Cooling	A	0.122 / 0.157	
Current input (208/230V)	Heating	A	0.061 / 0.078	
External Dimensions		In. [mm]	9-7/8 x 23-1/2 x 15-11/16 [250 x 596 x 398]	
Net Weight		Lbs. [kg]	69 [31]	
External finish			Galvanized steel plate (Lower part drain pan: Pre-coated galvanized sheets + powder coating)	
Connectable Outdoor / Heat Source Unit Capacity			126,000 to	
Field drain pipe size		In. [mm]	3/4 NPT	
Refrigerant		R410A		
Sound power level (measured in anechoic room)	Defrost	dB(A)	40	
Cound pressure lovel (measured in speeksis room)	Rated operation	dB(A)	59.0	
Sound pressure level (measured in anechoic room)	Defrost	dB(A)	71	

NOTES:

The equipment is for use with R410A refrigerant only.
 When possible, avoid installing the BC controller within 15 Ft. of sound sensitive areas.

3. Rated operation sound data is based on cooling mode. Sound data may vary depending on outdoor unit capacity and operation mode.
 4. Sound pressure/power levels obtained via testing in an anechoic chamber. Actual sound pressure levels may be greater due to ambient noise and/or deflection
 5. Sound pressure values were obtained at a test location approximately 5 Ft. from the unit

6. The solenoid valve switching sound pressure value is 55 dB(A) for all units
 7. The unit is intended for installation in an indoor environment only
 8. For details regarding installation specifics, please refer to the product's Installation Manual.

INDOOR UNIT ACCESSORIES: TCMBS0108KB21N4

	Ball Valve (3/8" SAE Brazed)	BV38BBSI
	Ball Valve (5/8" SAE Brazed)	BV58BBSI
	Blue Diamond (Advanced) Mini Condensate Pump w/ Reservoir & Sensor (208/230V) [recommended]	X87-721
Condensate	Blue Diamond (MicroBlue) Mini Condensate Pump (110/208/230V) up to 18,000 BTU/H	X86-003
	Sauermann Condensate Pump	SI30-230
Control Wire	M-Net Control Wire, 1,000' Roll (16-AWG, Standard, Twisted Pair, Shielded, Jacketed- Plenum rated)	CW162S-1000
Control Wile	M-Net Control Wire, 250' Roll (16-AWG, Standard, Twisted Pair, Shielded, Jacketed- Plenum rated)	CW162S-250
Port Adaptor	Joint Pipe Adapter	CMY-R160-J1
	Branch Joint (Downstream capacity 127,000-216,000 BTU/H)	CMY-R202S-G
	Branch Joint (Downstream capacity 217,000-234,000 BTU/H)	CMY-R203S-G
	Branch Joint (Downstream capacity 235,000-360,000 BTU/H)	CMY-R204S-G
	Branch Joint (Downstream capacity 73,000-96,000 BTU/H)	CMY-Y102LS-G2
Valuas Adaptors & Hoodors	Branch Joint (Downstream capacity ≤126,000 BTU/H)	CMY-R201S-G
valves Adaptors & Headers	Branch Joint (Downstream capacity ≤126,000 BTU/H)	CMY-Y202S-G2
	Branch Joint (Downstream capacity ≤72,000 BTU/H)	CMY-Y102SS-G2
	Branch Joint (Downstream capacity ≥316,000 BTU/H)	CMY-R205S-G
	Reducer (Between Main and Sub BC)	CMY-R303S-G1
	Reducer (Between ODU and BC)	CMY-R302S-G1



INDOOR UNIT DIMENSIONS: TCMBS0108KB21N4

Unit: mm (in)

FORM# TCMBS0108KB21N4 - 202405

CITY**MULTI**®

TPLFYP030EM140B 30,000 BTU/H 33" X 33" 4-WAY CEILING CASSETTE



Date:

Job Name:

System Reference:



GENERAL FEATURES

- · Square edge, sleek design
- · 3D turbo fan enabling increased airflow
- Built-in 3D i-see Sensor[®]*
- Improved installation features* •
- Occupancy detection*
- · Energy saving features*
- · Improved occupant comfort
- Four fan speed settings including auto-fan
- · Corner pocket design for simplified installation
- · Built-in condensate lift mechanism designed to provide up to 33-7/16" of lift
- · Ventilation air intake supported
- **3D i-See sensor® settings requires either TAR-40MAA controller

Specifications		System		
Unit Type		TPLFYP030EM140B		
Cooling capacity (Nominal) ¹		BTU/H	30,000	
Heating capacity (Nominal) ¹		BTU/H	34,000	
Power source		Voltage, Phase, Hertz	208/230V, 1-phase, 60 Hz	
Power Consumption	Cooling	kW	0.04	
Fower Consumption	Heating	kW	0.04	
Current	Cooling	A	0.5	
Current	Heating	A	0.4	
MCA		A	0.57	
Maximum Overcurrent Protection (MOCP)		A	15	
External finish			Galvanized steel sheet	
External Dimensions		In. [mm]	33-3/32 x 33-3/32 x 11-3/4 [840 x 840 x 298]	
Net weight		Lbs [kg]	55 [25]	
Heat exchanger			Cross fin (Aluminum fin and copper tube)	
	Type x quantity		Turbo fan x 1	
	Airflow rate	CFM	636-706-777-812	
Fan	Motor type		DC motor	
	Motor Output	kW	0.12	
	Motor FLA	A	0.45	
Sound pressure level (Measured in anechoic room)		dB(A)	28-31-33-35	
Air filter			PP honeycomb (long life filter, anti-bacterial type)	
Refrigerant	Туре		R410A	
Diameter of refrigerant pipe (O, D)	Liquid (High Pressure)	In. [mm]	3/8 [9.52] Flare	
Diameter of reingerant pipe (O.D.)	Gas (Low Pressure)	In. [mm]	5/8 [15.88] Flare	
Diameter of drain pipe		In. [mm]	O.D. 1-1/4 [32]	

NOTES:

¹Cooling / Heating capacity indicated at the maximum value at operation under the following conditions: Cooling | Indoor: 80° F (26.7° C) DB / 67° F (19.4° C) WB; Outdoor 95° F (35° C) DB Heating | Indoor: 70° F (21.1° C) DB; Outdoor 47° F (8.3° C) DB / 43° F (6.1° C) WB

INDOOR UNIT ACCESSORIES: TPLFYP030EM140B

	BACnet® and Modbus® Interface	PAC-UKPRC001-CN-1
Control Interface	CN24 Relay Kit	CN24RELAY-KIT-CM3
	IT Extender	PAC-WHS01IE-E
	kumo station® for kumo cloud®	TAC-WHS01HC-E
	Thermostat Interface	PAC-US444CN-1
	Thermostat Interface	PAC-US445CN-1
Demote Concer	Flush Mount Remote Temperature Sensor	PAC-USSEN002-FM-1
Remote Sensor	Flush Mount Temperature Sensor	PAC-USSEN001-FM-1
Terminal Signal Adapter	Terminal Signal Adapter	PAC-IT51AD-E
Terminal Signal Adapter	Terminal Signal Adapter	PAC-IT52AD-E
	Deluxe Wired MA Remote Controller [†]	TAR-40MAAU
Wired Demote Controller	Simple MA Remote Controller [†]	TAC-YT53CRAU-J
whed Remote Controller	Smart ME Remote Controller - Backlit touchscreen	TAR-U01MEDU-K
	Touch MA Controller [†]	TAR-CT01MAU-SB
	kumo touch [™] RedLINK [™] Wireless Controller	MHK2
	Wireless MA Receiver	PAR-SR32MA-E
Wireless Remote Controller	Wireless MA Remote Controller	TAR-FL32MA-E
	Wireless Remote Contoller	PAR-SL101A-E
	Wireless Signal Receiver Panel	PAR-SR4LU-E
Casement	Multi-function Casement	PAC-SJ41TM-E
	Blue Diamond (Advanced) Mini Condensate Pump w/ Reservoir & Sensor (208/230V) [recommended]	X87-721
	Blue Diamond (MegaBlue Advanced) Condensate Pump w/ Reservoir & Sensor	X87-835
Condensate	Blue Diamond MultiTank — collection tank for use with multiple pumps	C21-014
Condensale	Blue Diamond Sensor Extension Cable — 15 Ft.	C13-103
	Refco Condensate Pump (100-240 VAC) up to 120,000 BTU/H	COMBI
	Sauermann Condensate Pump	SI30-230
Filter	High Efficiency Filter Element**	PAC-SH59KF-E
Shutter Plate	Shutter Plate	PAC-SJ37SP-E

NOTES: **High efficiency filter requires use of multi-function casement: PAC-SJ41TM-E
INDOOR UNIT DIMENSIONS: TPLFYP030EM140B



Unit: in (mm)



FORM# TPLFYP030EM140B - 202211

CITY**MULTI**®

TPLFYP036EM142A 36,000 BTU/H 33" X 33" 4-WAY CEILING CASSETTE



Date:

Job Name:

System Reference:



GENERAL FEATURES

- Square edge, sleek design
- 3D turbo fan enabling increased airflow
- Built-in 3D i-see Sensor^{®*}
- Improved installation features*
- Occupancy detection*
- Energy saving features*
- Improved occupant comfort
- Four fan speed settings including auto-fan
- Corner pocket design for simplified installation
- · Built-in condensate lift mechanism designed to provide up to 33-7/16" of lift
- · Ventilation air intake supported
- **3D i-See sensor® settings requires either TAR-41MAA controller

Specifications		System	
Unit Type		TPLFYP036EM142A	
Cooling capacity (Nominal) ¹ BTU		BTU/H	36,000
Heating capacity (Nominal) ¹		BTU/H	40,000
Power source		Voltage, Phase, Hertz	208/230V, 1-phase, 60 Hz
Power Consumption	Cooling	kW	0.07
	Heating	kW	0.07
Current	Cooling	A	0.7
Current	Heating	A	0.7
MCA		A	0.92
Maximum Overcurrent Protection (MOCP)		A	15
External finish			Galvanized steel sheet
External Dimensions		In. [mm]	33-3/32 x 33-3/32 x 11-3/4 [840 x 840 x 298]
Net weight		Lbs [kg]	55 [25]
Heat exchanger		Cross fin (Aluminum fin and copper tube)	
	Type x quantity		Turbo fan x 1
	Airflow rate	CFM	777-883-989-1,095
Fan	Motor type		DC motor
	Motor Output	kW	0.12
	Motor FLA	A	0.73
Sound pressure level (Measured in anechoic room)		dB(A)	35–37–39–41
Air filter		PP honeycomb (long life filter, anti-bacterial type)	
Refrigerant	Туре		R410A
	Liquid (High Pressure)	In. [mm]	3/8 [9.52] Flare
	Gas (Low Pressure)	In. [mm]	5/8 [15.88] Flare
Diameter of drain pipe		In. [mm]	O.D. 1-1/4 [32]

NOTES:

Coling Indoor: 81° F (27° C) DB / 66° F (19°C) WB; Outdoor 95° F (35° C) DB Heating | Indoor: 68° F (20° C) DB; Outdoor 45° F (7° C) DB / 43° F (6° C) WB

INDOOR UNIT ACCESSORIES: TPLFYP036EM142A

Control Interface	CN24 Relay Kit	CN24RELAY-KIT-CM3
	Deluxe Wired MA Remote Controller	TAR-41MAAU
	IT Extender	PAC-WHS01IE-E
	kumo station® for kumo cloud®	TAC-WHS01HC-E
	Procon BACnet® and Modbus® Interface	PAC-UKPRC001-CN-1
	Thermostat Interface	PAC-US445CN-1
Remote Sensor	Flush Mount Remote Temperature Sensor	PAC-USSEN002-FM-1
Terminal Cianal Adaptar	Terminal Signal Adapter	PAC-IT51AD-E
Terminal Signal Adapter	Terminal Signal Adapter	PAC-IT52AD-E
	Simple Ductless Wired Remote Controller	PAC-SDW01RC-1
Wired Remote Controller	Simple MA Remote Controller [†]	TAC-YT53CRAU-J
When Remote Controller	Smart ME Remote Controller - Backlit touchscreen	TAR-U01MEDU-K
	Touch MA Controller [†]	TAR-CT01MAU-SB
	kumo touch [™] RedLINK [™] Wireless Controller	MHK2
	Wireless MA Receiver	PAR-SR32MA-E
Wireless Remote Controller	Wireless MA Remote Controller	TAR-FL32MA-E
	Wireless Remote Contoller	PAR-SL101A-E
	Wireless Signal Receiver Panel	PAR-SR4LU-E
Casement	Multi-function Casement	PAC-SJ41TM-E
	Blue Diamond (Advanced) Mini Condensate Pump w/ Reservoir & Sensor (208/230V) [recommended]	X87-721
	Blue Diamond (MegaBlue Advanced) Condensate Pump w/ Reservoir & Sensor	X87-835
Condensate	Blue Diamond MultiTank — collection tank for use with multiple pumps	C21-014
	Blue Diamond Sensor Extension Cable — 15 Ft.	C13-103
	Refco Condensate Pump (100-240 VAC) up to 120,000 BTU/H	COMBI
	Sauermann Condensate Pump	SI30-230
Filter	High Efficiency Filter Element**	PAC-SH59KF-E
Shutter Plate	Shutter Plate	PAC-SJ37SP-E

NOTES: **High efficiency filter requires use of multi-function casement: PAC-SJ41TM-E

INDOOR UNIT DIMENSIONS: TPLFYP036EM142A



Unit: in (mm)

FORM# TPLFYP036EM142A - 202405

CITY**MULTI**®

TPKFYP012LM140A 12,000 BTU/H WALL MOUNT



Date:

Job Name:

System Reference:



GENERAL FEATURES

- · Dual set point functionality
- · Compact, lightweight, flat-white, flat-panel, modern design
- Quiet operation
- · Multiple fan speed settings
- · Easily removed intake grille filter for cleaning
- Back and right-side wiring take-out
- · Wireless receiver on board

Specifications		System	
Unit Type		TPKFYP012LM140A	
Cooling capacity (Nominal) ¹		BTU/H	12,000
Heating capacity (Nominal) ¹		BTU/H	13,500
Power source		Voltage, Phase, Hertz	208/230V, 1-phase, 60 Hz
Power Consumption	Cooling	kW	0.04
	Heating	kW	0.03
Current	Cooling	A	0.4
Current	Heating	A	0.3
MCA		A	0.2
Maximum Overcurrent Protection (MOCP)		A	15
Recommended Fuse Size		A	15
External finish			Plastic, MUNSELL (0.7PB 9.2/0.4)
External Dimensions		In. [mm]	30-7/16 x 9-11/32 x 11-25/32 [733 x 237 x 299]
Net weight		Lbs [kg]	24.5 [11.1]
Heat exchanger			Cross fin (Aluminum fin and copper tube)
Type x quantity			Line flow fan x 1
	Airflow rate	CFM	152-191-244-297
Fan	Motor type	Motor type	
	Motor Output	kW	.03
	Motor FLA	A	0.19
Sound pressure level (Measured in anechoic room)		dB(A)	24-31-37-41
Air filter			PP honeycomb
Refrigerant	Туре		R410A
	Liquid (High Pressure)	In. [mm]	1/4 [6.35] Flare
Diameter of refrigerant pipe (O.D.)	Gas (Low Pressure)	In. [mm]	1/2 [12.70] Flare
Diameter of drain nine		In [mm]	LD 5/8 [16]

NOTES:

¹Cooling / Heating capacity indicated at the maximum value at operation under the following conditions: Cooling | Indoor: 80° F (26.7° C) DB / 67° F (19.4° C) WB; Outdoor 95° F (35° C) DB Heating | Indoor: 70° F (21.1° C) DB; Outdoor 47° F (8.3° C) DB / 43° F (6.1° C) WB

INDOOR UNIT ACCESSORIES: TPKFYP012LM140A

	3-Pin Connector	PAC-715AD
	BACnet [®] and Modbus [®] Interface	PAC-UKPRC001-CN-1
	CN24 Relay Kit	CN24RELAY-KIT-CM3
	Connector and wire for Operation status/error using CN51	PAC-725AD
Control Interface	IT Extender	PAC-WHS01IE-E
	kumo station® for kumo cloud®	TAC-WHS01HC-E
	Thermostat Interface	PAC-US444CN-1
	Thermostat Interface	PAC-US445CN-1
	Wireless Interface for kumo cloud®	PAC-USWHS002-WF-2
	Flush Mount Remote Temperature Sensor	PAC-USSEN002-FM-1
Pomoto Sonoor	Flush Mount Temperature Sensor	PAC-USSEN001-FM-1
Remote Sensor	Remote Temperature Sensor	PAC-SE41TS-E
	Wireless temperature and humitity sensor for kumo cloud®	PAC-USWHS003-TH-1
Terminal Signal Adapter	Terminal Signal Adapter	PAC-IT51AD-E
Terminal Signal Adapter	Terminal Signal Adapter	PAC-IT52AD-E
	Deluxe Wired MA Remote Controller [†]	TAR-40MAAU
Wired Remote Controller	Simple MA Remote Controller [†]	TAC-YT53CRAU-J
	Touch MA Controller [†]	TAR-CT01MAU-SB
Wireless Remote Controller	kumo touch [™] RedLINK [™] Wireless Controller	MHK2
	Blue Diamond MultiTank — collection tank for use with multiple pumps	C21-014
	Blue Diamond Sensor Extension Cable — 15 Ft.	C13-103
	Drain Pan Level Sensor/Control	SS610E
Condensate	Fascia Kit for MicroBlue Pump, mounts the MicroBlue and sensor directly beneath indoor unit	T18-016
	Refco Condensate Pump (100-240 VAC) up to 120,000 BTU/H	COMBI
	Refco Condensate Pump (100-240 VAC) up to 120,000 BTU/H	GOBI-II
	Sauermann Condensate Pump	SI30-230
Disconnect Switch	(30A/600V/UL) [fits 2" X 4" utility box] - Black	TAZ-MS303
	(30A/600V/UL) [fits 2" X 4" utility box] - White	TAZ-MS303W
Drain Hose	Flexible Mini-Split Drain Hose	DRX-16

INDOOR UNIT DIMENSIONS: TPKFYP012LM140A



Unit: in(mm)



FORM# TPKFYP012LM140A - 202209

CITY**MULTI**®

TPLFYP012FM140A





Job Name:

System Reference:

Date:



GENERAL FEATURES

- Square edge, sleek design
- 3D i-see Sensor[™] available as an option
- Improved installation features¹
- Occupancy detection¹
- Energy saving features¹
- Improved occupant comfort
- Four fan speed settings including auto-fan
- · Individual vane settings
- 2' x 2' size matches size of many ceiling tiles
- · Corner-pocket design for simplified installation
- · Built-in condensate lift mechanism designed to provide up to 33" of lift
- Ventilation air intake supported

¹Requires a PAR-33MAA-J controller

SPECIFICATIONS: TPLFYP012FM140A

Model		TPLFYP012FM140A		
Nominal Capacity ¹				
Cooling	Btu/h	12,000		
Heating	Btu/h	13,500		
Electrical				
Electrical Power Requirements		1-phase 208-230V 60Hz		
Minimum Circuit Ampacity (MCA)	A	0.29		
Recommended Fuse Size	A	15		
External Dimensions (H x W x D)	4			
Unit	in. (mm)	8-3/16 x 22-7/16 x 22/7-16 (208 x 570 x 570)		
Grill (SLP-18FAU)	in. (mm)	13/32 x 24-19/32 x 24-19/32 (10 x 625 x 625)		
Net Weight				
Unit	lbs (kg)	31.3 (14.2)		
Grill (SLP-18FAU)	lbs (kg)	5.3 (2.4)		
External Finish				
Unit		Galvanized steel sheet		
Grill (SLP-18FAU)		Munsell 1.0Y 9.2/0.2		
Coil Type		Cross fin (Aluminum fin and copper tube)		
Fan				
Type x Quantity		Turbo fan x 1		
Airflow rate	CFM	245-280-335		
Motor Type	1	DC motor		
Motor Output	kW	0.05		
Motor F.L.A.	A	0.23		
Air Filter		PP honeycomb fabric (long life type)		
Refrigerant Piping Diameter				
Liquid (High Pressure)	in. (mm)	1/4 (6.35) Flare		
Gas (Low Pressure)	in. (mm)	1/2 (12.7) Flare		
Field Drain Pipe Size	in. (mm)	O.D. 1-1/4 (32)		
Sound Pressure Level (Low-Mid-High)	dB(A)	26-30-34		

¹ Cooling / Heating capacity indicated at the maximum value at operation under the following conditions:

Cooling | Indoor: 81° F (27° C) DB / 66° F (19°C) WB; Outdoor 95° F (35° C) DB

Heating | Indoor: 68° F (20° C) DB; Outdoor 45° F (7° C) DB / 43° F (6° C) WB

ACCESSORIES: TPLFYP012FM140A

Grille (required)	TLP-18FAU
Grille with 3D i-see Sensor™	TLP-18FAEU
Corner Panel with 3D i-see Sensor™	□ PAC-SF1ME-E
Signal Receiver Corner Panel	□ PAR-WSC009FA-E
Wireless Remote Controller	□ TAR-FL32MA-E
Wireless Remote Controller	□ PAR-SL100A-E
Wireless Remote Receiver	□ PAR-FA32MA-E
Wired MA Controller	D PAR-33MAA-J
Simple MA Controller	□ TAC-YT53CRAU-J
Smart ME Remote Controller	□ TAR-U01MEDU-K
Wired Remote Sensor	D PAC-SE41TS-E
Thermostat Interface	Derived PAC-US444CN-1
Wireless Interface	□ PAC-WHS01WF-E
Connector cable for remote display	D PAC-SA88HA-EP
Connector for CN32 (remote on/off)	D PAC-SE55RA-E
Remote Operation Adapter (with wire terminals for remote ON/OFF and operation status/ error)	□ PAC-SF40RM-E ¹
External Fan / Heater Control Relay Adapter	CN24RELAY-KIT-CM3
Drain Pan Level Sensor (Control for indoor unit shut off to prevent drain pan overflow)	DPLS2

¹ Unable to use with wireless remote controller

Model: TPLFYP012FM140A – DIMENSIONS









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Specifications are subject to change without notice.

CITY**MULTI**®

TPLFYP006EM142A 6,000 BTU/H 33" X 33" 4-WAY CEILING CASSETTE



Date:

Job Name:

System Reference:



GENERAL FEATURES

- Square edge, sleek design
- 3D turbo fan enabling increased airflow
- Built-in 3D i-see Sensor[®]*
- Improved installation features*
- Occupancy detection*
- Energy saving features*
- Improved occupant comfort
- Four fan speed settings including auto-fan
- Corner pocket design for simplified installation
- Built-in condensate lift mechanism designed to provide up to 33-7/16" of lift
- · Ventilation air intake supported
- **3D i-See sensor® settings requires either TAR-41MAA controller

Specifications		System	
Unit Type		TPLFYP006EM142A	
Cooling capacity (Nominal) ¹		BTU/H	6,000
Heating capacity (Nominal) ¹		BTU/H	6,700
Power source		Voltage, Phase, Hertz	208/230V, 1-phase, 60 Hz
Power Consumption	Cooling	kW	0.02
	Heating	kW	0.02
Current	Cooling	A	0.2
Current	Heating	A	0.1
MCA		A	0.24
Maximum Overcurrent Protection (MOCP)		A	15
External finish			Galvanized steel sheet
External Dimensions		In. [mm]	33-3/32 x 33-3/32 x 10-3/16 [840 x 840 x 258]
Net weight		Lbs [kg]	46 [21]
Heat exchanger		Cross fin (Aluminum fin and copper tube)	
	Type x quantity		Turbo fan x 1
	Airflow rate	CFM	300-424-459-494
Fan	Motor type		DC motor
	Motor Output	kW	0.05
	Motor FLA	A	0.19
Sound pressure level (Measured in anechoic room)		dB(A)	19–23–25–27
Air filter		PP honeycomb (long life filter, anti-bacterial type)	
Refrigerant	Туре		R410A
Diamatas of softiansant size (O.D.)	Liquid (High Pressure)	In. [mm]	1/4 [6.35] Flare
Diameter of reingerant pipe (O.D.)	Gas (Low Pressure)	In. [mm]	1/2 [12.7] Flare
Diameter of drain pipe		In. [mm]	O.D. 1-1/4 [32]

NOTES:

Coling Indoor: 81° F (27° C) DB / 66° F (19°C) WB; Outdoor 95° F (35° C) DB Heating | Indoor: 68° F (20° C) DB; Outdoor 45° F (7° C) DB / 43° F (6° C) WB

INDOOR UNIT ACCESSORIES: TPLFYP006EM142A

Control Interface	CN24 Relay Kit	CN24RELAY-KIT-CM3
	Deluxe Wired MA Remote Controller	TAR-41MAAU
	IT Extender	PAC-WHS01IE-E
	kumo station® for kumo cloud®	TAC-WHS01HC-E
	Procon BACnet [®] and Modbus [®] Interface	PAC-UKPRC001-CN-1
	Thermostat Interface	PAC-US445CN-1
Remote Sensor	Flush Mount Remote Temperature Sensor	PAC-USSEN002-FM-1
Terminal Cirnal Adapter	Terminal Signal Adapter	PAC-IT51AD-E
Terminal Signal Adapter	Terminal Signal Adapter	PAC-IT52AD-E
	Simple Ductless Wired Remote Controller	PAC-SDW01RC-1
Wined Demote Controller	Simple MA Remote Controller [†]	TAC-YT53CRAU-J
Wiled Remote Controller	Smart ME Remote Controller - Backlit touchscreen	TAR-U01MEDU-K
	Touch MA Controller [†]	TAR-CT01MAU-SB
	kumo touch [™] RedLINK [™] Wireless Controller	MHK2
	Wireless MA Receiver	PAR-SR32MA-E
Wireless Remote Controller	Wireless MA Remote Controller	TAR-FL32MA-E
	Wireless Remote Contoller	PAR-SL101A-E
	Wireless Signal Receiver Panel	PAR-SR4LU-E
Casement	Multi-function Casement	PAC-SJ41TM-E
	Blue Diamond (Advanced) Mini Condensate Pump w/ Reservoir & Sensor (208/230V) [recommended]	X87-721
	Blue Diamond (MicroBlue) Mini Condensate Pump (110/208/230V) up to 18,000 BTU/H	X86-003
Condensate	Blue Diamond MultiTank — collection tank for use with multiple pumps	C21-014
	Blue Diamond Sensor Extension Cable — 15 Ft.	C13-103
	Refco Condensate Pump (100-240 VAC) up to 120,000 BTU/H	COMBI
	Sauermann Condensate Pump	SI30-230
Filter	High Efficiency Filter Element**	PAC-SH59KF-E
Shutter Plate	Shutter Plate	PAC-SJ37SP-E

NOTES: **High efficiency filter requires use of multi-function casement: PAC-SJ41TM-E

INDOOR UNIT DIMENSIONS: TPLFYP006EM142A



Unit: in (mm)

FORM# TPLFYP006EM142A - 202405

CITY**MULTI**®

TPLFYP008FM140B 8,000 BTU/H 22" X 22" 4-WAY CEILING CASSETTE



Date:

Job Name:

System Reference:



GENERAL FEATURES

- · Square edge, sleek design
- 3D i-see Sensor[™] available as an option
- Improved installation features* •
- · Occupancy detection*
- Energy saving features* •
- · Improved occupant comfort
- Four fan speed settings including auto-fan
- · Individual vane settings
- 2' x 2' size matches size of many ceiling tiles
- · Corner-pocket design for simplified installation
- Built-in condensate lift mechanism designed to provide up to 33" of lift
- · Ventilation air intake supported
- *Requires a TAR-41MAAU controller

Specifications		System	
Unit Type		TPLFYP008FM140B	
Cooling capacity (Nominal) ¹		BTU/H	8,000
Heating capacity (Nominal) ¹		BTU/H	9,000
Power source		Voltage, Phase, Hertz	208/230V, 1-phase, 60 Hz
Bower Consumption	Cooling	kW	0.02
Power Consumption	Heating	kW	0.02
Current	Cooling	A	.22
Current	Heating	A	0.17
MCA		A	0.28
Maximum Overcurrent Protection (MOCP)		A	15
External finish			Galvanized steel sheet
External Dimensions		In. [mm]	22-7/16 x 22-7/16 x 8-3/16 [570 x 570 x 208]
Net weight		Lbs [kg]	28.9 [13.1]
Heat exchanger			Cross fin (Aluminum fin and copper tube)
	Type x quantity		Turbo fan x 1
	Airflow rate	CFM	230–280–315
Fan	Motor type		DC motor
	Motor Output	kW	0.05
	Motor FLA	A	0.22
Sound pressure level (Measured in anechoic room)		dB(A)	26–30–33
Air filter			PP honeycomb fabric (long life type)
Refrigerant	Туре		R410A
Diameter of refrigerent size (O.D.)	Liquid (High Pressure)	In. [mm]	1/4 [6.35] Flare
Diameter of reingerant pipe (O.D.)	Gas (Low Pressure)	In. [mm]	1/2 [12.7] Flare
Diameter of drain pipe		In. [mm]	O.D. 1-1/4 [32]

NOTES: Cooling | Indoor: 81° F (27° C) DB / 66° F (19°C) WB; Outdoor 95° F (35° C) DB Heating | Indoor: 68° F (20° C) DB; Outdoor 45° F (7° C) DB / 43° F (6° C) WB

INDOOR UNIT ACCESSORIES: TPLFYP008FM140B

	Connector cable for remote display	PAC-SA88HA-EP
	Deluxe Wired MA Remote Controller	TAR-41MAAU
Control Interface	IT Extender	PAC-WHS01IE-E
	kumo station® for kumo cloud®	TAC-WHS01HC-E
	Procon BACnet [®] and Modbus [®] Interface	PAC-UKPRC001-CN-1
	Thermostat Interface	PAC-US445CN-1
Demote Concer	Flush Mount Remote Temperature Sensor	PAC-USSEN002-FM-1
Remote Sensor	Remote Temperature Sensor	PAC-SE41TS-E
Terminal Signal Adapter	Terminal Signal Adapter	PAC-IT51AD-E
Terminal Signal Adapter	Terminal Signal Adapter	PAC-IT52AD-E
	Simple Ductless Wired Remote Controller	PAC-SDW01RC-1
Wired Remete Controller	Simple MA Remote Controller [†]	TAC-YT53CRAU-J
When Remote Controller	Smart ME Remote Controller - Backlit touchscreen	TAR-U01MEDU-K
	Touch MA Controller [†]	TAR-CT01MAU-SB
	kumo touch [™] RedLINK [™] Wireless Controller	MHK2
	Wireless MA Receiver	PAR-SR32MA-E
Wireless Remote Controller	Wireless MA Remote Controller	TAR-FL32MA-E
Wileless Remote Controller	Wireless Remote Contoller	PAR-SL101A-E
	Wireless Signal Receiver for PAR-SL101A-E	PAR-WSC009FA-E
	Wireless Signal Receiver Panel	PAR-SR4LU-E
	Blue Diamond (Advanced) Mini Condensate Pump w/ Reservoir & Sensor (208/230V) [recommended]	X87-721
Contensate	Blue Diamond (MicroBlue) Mini Condensate Pump (110/208/230V) up to 18,000 BTU/H	X86-003
	Refco Condensate Pump (100-240 VAC) up to 120,000 BTU/H	COMBI
	CN24 Relay Kit	CN24RELAY-KIT-CM3
	Remote Operation Adapter [‡]	PAC-SF40RM-E
i see Sensor® Papel	3D i-see Sensor® Corner Panel	PAC-SF1ME-E
I-see Sensor [®] Panel	Grille with 3D i-see Sensor®	TLP-18FAEU

NOTES: **High efficiency filter requires use of multi-function casement: PAC-SJ41TM-E

INDOOR UNIT DIMENSIONS: TPLFYP008FM140B



Unit: inch(mm)

FORM# TPLFYP008FM140B - 202405

CITY**MULTI**®

TPLFYP024EM140B 24,000 BTU/H 33" X 33" 4-WAY CEILING CASSETTE



Date:

Job Name:

System Reference:



GENERAL FEATURES

- · Square edge, sleek design
- · 3D turbo fan enabling increased airflow
- Built-in 3D i-see Sensor^{®*}
- Improved installation features* •
- Occupancy detection*
- · Energy saving features*
- · Improved occupant comfort
- Four fan speed settings including auto-fan •
- Corner pocket design for simplified installation
- · Built-in condensate lift mechanism designed to provide up to 33-7/16" of lift
- · Ventilation air intake supported
- **3D i-See sensor® settings requires either TAR-40MAA controller

Specifications		System	
Unit Type		TPLFYP024EM140B	
Cooling capacity (Nominal) ¹ BT		BTU/H	24,000
Heating capacity (Nominal) ¹		BTU/H	27,000
Power source		Voltage, Phase, Hertz	208/230V, 1-phase, 60 Hz
Power Consumption	Cooling	kW	0.04
	Heating	kW	0.04
Current	Cooling	A	0.4
Current	Heating	A	0.4
MCA		A	0.54
Maximum Overcurrent Protection (MOCP)		A	15
External finish			Galvanized steel sheet
External Dimensions		In. [mm]	33-3/32 x 33-3/32 x 11-3/4 [840 x 840 x 298]
Net weight		Lbs [kg]	55 [25]
Heat exchanger			Cross fin (Aluminum fin and copper tube)
	Type x quantity		Turbo fan x 1
	Airflow rate	CFM	636-671-742-812
Fan	Motor type		DC motor
	Motor Output	kW	0.12
	Motor FLA	A	0.43
Sound pressure level (Measured in anechoic room)		dB(A)	28-30-32-34
Air filter		PP honeycomb (long life filter, anti-bacterial type)	
Refrigerant	Туре		R410A
Diameter of refrigerant pipe (O, D)	Liquid (High Pressure)	In. [mm]	3/8 [9.52] Flare
Diameter of reingerant pipe (O.D.)	Gas (Low Pressure)	In. [mm]	5/8 [15.88] Flare
Diameter of drain pipe		In. [mm]	O.D. 1-1/4 [32]

NOTES:

¹Cooling / Heating capacity indicated at the maximum value at operation under the following conditions: Cooling | Indoor: 80° F (26.7° C) DB / 67° F (19.4° C) WB; Outdoor 95° F (35° C) DB Heating | Indoor: 70° F (21.1° C) DB; Outdoor 47° F (8.3° C) DB / 43° F (6.1° C) WB

Specifications are subject to change without notice.

INDOOR UNIT ACCESSORIES: TPLFYP024EM140B

	BACnet® and Modbus® Interface	PAC-UKPRC001-CN-1
	CN24 Relay Kit	CN24RELAY-KIT-CM3
Control Interface	IT Extender	PAC-WHS01IE-E
Control Interface	kumo station® for kumo cloud®	TAC-WHS01HC-E
	Thermostat Interface	PAC-US444CN-1
	Thermostat Interface	PAC-US445CN-1
Pomoto Sonoor	Flush Mount Remote Temperature Sensor	PAC-USSEN002-FM-1
Remote Sensor	Flush Mount Temperature Sensor	PAC-USSEN001-FM-1
Terminal Signal Adapter	Terminal Signal Adapter	PAC-IT51AD-E
Terminal Signal Adapter	Terminal Signal Adapter	PAC-IT52AD-E
	Deluxe Wired MA Remote Controller [†]	TAR-40MAAU
Wired Remote Controller	Simple MA Remote Controller [†]	TAC-YT53CRAU-J
When Remote Controller	Smart ME Remote Controller - Backlit touchscreen	TAR-U01MEDU-K
	Touch MA Controller [†]	TAR-CT01MAU-SB
	kumo touch [™] RedLINK [™] Wireless Controller	MHK2
	Wireless MA Receiver	PAR-SR32MA-E
Wireless Remote Controller	Wireless MA Remote Controller	TAR-FL32MA-E
	Wireless Remote Contoller	PAR-SL101A-E
	Wireless Signal Receiver Panel	PAR-SR4LU-E
Casement	Multi-function Casement	PAC-SJ41TM-E
	Blue Diamond (Advanced) Mini Condensate Pump w/ Reservoir & Sensor (208/230V) [recommended]	X87-721
	Blue Diamond (MegaBlue Advanced) Condensate Pump w/ Reservoir & Sensor	X87-835
Condonasta	Blue Diamond MultiTank — collection tank for use with multiple pumps	C21-014
Condensate	Blue Diamond Sensor Extension Cable — 15 Ft.	C13-103
	Refco Condensate Pump (100-240 VAC) up to 120,000 BTU/H	COMBI
	Sauermann Condensate Pump	SI30-230
Filter	High Efficiency Filter Element**	PAC-SH59KF-E
Shutter Plate	Shutter Plate	PAC-SJ37SP-E

NOTES: **High efficiency filter requires use of multi-function casement: PAC-SJ41TM-E

INDOOR UNIT DIMENSIONS: TPLFYP024EM140B



Unit: in (mm)



FORM# TPLFYP024EM140B - 202211

TPKA0A0121LA10A & TRUYA0121KA70NA 12,000 BTU/H WALL MOUNT 12,000 BTU/H COOLING ONLY OUTDOOR





Job Name: System Reference:

Date:



Indoor Unit	TPKA0A0121LA10A
Outdoor Unit	TRUYA0121KA70NA



INDOOR UNIT FEATURES

- · Selectable high sensible vs high latent capacity mode
- UL 60335-2-40 compliant
- Sleek, compact design
- Simple installation
- Airflow direction control
- Auto fan mode
- · Suitable for: server rooms, daycare centers, classrooms, churches, small offices, and more
- · Multiple control options available:
 - kumo cloud[®] smart device app for remote access
 - Third-party interface options
 - Wired or wireless controllers

OUTDOOR UNIT FEATURES

- Variable speed INVERTER-driven compressor
- Pre-charged with refrigerant volume for piping length up to 70 ft
- Low ambient cooling down to -40°F providing 100% capacity (with wind baffles)
- 24-hour continuous operation (cooling mode)
- High pressure protection
- Fast restart
- Superior energy and operational efficiency
- Seacoast protection*
 - External Outer Panel: Phosphate coating + Acrylic-Enamel coating
 - Fan Motor Support: Epoxy resin coating (at edge face)
 - Separator Assembly Valve Bed: Epoxy resin coating (at edge face)
 - Blue Fin treatment is an anti-corrosion treatment that is applied to the Heat exchanger coil to protect it against airborne contaminants.
 - Heat exchanger coil and base panel rated for 2,000 hours in accordance with ASTM B117 testing

*Seacoast protection standard from 2022 production

SPECIFICATIONS: TPKA0A0121LA10A & TRUYA0121KA70NA

	Maximum Capacity	BTU/H	12,000
	Rated Capacity	BTU/H	12,000
	Minimum Capacity	BTU/H	4,400
	Maximum Power Input	W	900
Cooling at 95°F ¹	Rated Power Input	W	900
	Moisture Removal	Pints/h	27
	Sensible Heat Factor		0.88
	Power Factor [208\/ / 230\/]	%	92 5 / 92 5
	SEER2	70	21.3
	EEP21		13.3
Efficiency			13.5
	ENERCY STAP® Contified		 Vac
	Voltage Phase Frequency		200/220_1_60
	Cuerenteed Voltage Bange	VAC	109 252
	Voltage: Indeer Outdeer S1 S2	VAC	308/330
	Voltage: Indoor - Outdoor, S1-52	VAC	208/230
Electrical	Voltage: Indoor - Outdoor, 52-53	V DC	24
	Short-circuit Current Rating [SCCR]	KA	5
	Recommended Fuse/Breaker Size (Oudoor)	A	15
	Recommended Wire Size [Indoor - Outdoor]	AWG	14
	Power Supply		Indoor unit is powered by the outdoor unit
	MCA	A	1.0
	Fan Motor Full Load Amperage	A	0.19
	Fan Motor Output	W	30
	Fan Motor Type		DC Motor
	Airflow Rate at Cooling, Dry	CFM	265–290–325–385
	Airflow Rate at Cooling, Wet	CFM	215–255–320–375
	Airflow Rate at Heating, Dry	CFM	265–290–325–385
Indeor Linit	Sound Pressure Level [Cooling]	dB[A]	34–39–44–48
	Sound Pressure Level [Heating]	dB[A]	34–37–40–43
	Drain Pipe Size	In. [mm]	5/8 [16]
	Coating on Heat Exchanger		_
	External Finish Color		White Munsell 0.7PB 9.2/0.4
	Unit Dimensions	W x D x H: In. [mm]	35-23/64 x 9-11/32 x 11-25/32 [898 x 237 x 299]
	Package Dimensions	W x D x H: In. [mm]	38-3/16 x 13-25/64 x 14-11/64 [970 x 340 x 360]
	Unit Weight	Lbs. [kg]	28 [12.7]
	Package Weight	Lbs. [kg]	32 [14.4]
Indoor Unit Operating Temperature	Cooling Intake Air Temp [Maximum / Minimum]*	°F	90 DB, 73 WB / 66 DB, 59 WB
	MCA	Δ	11 0
	MOCP	Δ	28
	Ean Motor Full Load Amperage	A	0.5
	Fan Motor Output	W	0.5
	Airflow Bate [Cooling / Hosting]	CEM	40
	Annow Rate [Cooling / Heating]	CI WI	1590
	Defrect Method		Reverse Cycle
	Centing on Heat Exchanger		Reverse Cycle
	Coating on Heat Exchanger	dP(A)	
		UD(A)	
Outdoor Unit	Compressor Type		
	Compressor Model	•	SNB092FQCMC
	Compressor Rated Load Amps	A	1
	Compressor Locked Rotor Amps	A	12.0
	Compressor Oil [Type // Charge]	OZ.	FV50S // 12
	External Finish Color		Ivory Munsell 3Y 7.8/1.1
	Base Pan Heater		N/A
	Unit Dimensions	W x D x H: In. [mm]	31-13/16 (+2-7/16) x 11-13/16 x 24-13/16 [809 (+62) x 300 x 630]
	Package Dimensions	W x D x H: In. [mm]	37-1/16 x 16-3/16 x 27-7/16 [941 x 411 x 697]
	Unit Weight	Lbs. [kg]	92 [41]
	Package Weight	Lbs. [kg]	103 [46]
Outdoor Unit Operating Temperature Range	Cooling Air Temp [Maximum / Minimum]*	°F	115 DB / -40 DB

NOTES: AHRI Rated Conditions

¹Cooling (Indoor // Outdoor)

°F 80 DB, 67 WB // 95 DB, 75 WB

Select high sensible versus high latent capacity mode via function setting mode 08, "Fan speed" (accessible through Touch MA, Deluxe MA, kumo touch and kumo cloud app control options):

• "High ceiling" mode = high sensible capacity

» Mode 08, setting 3 (factory default)
•"Standard" mode = high latent capacity
» Mode 08, setting 2

*Indoor/Outdoor Unit Operating Temperature Range (Cooling Air Temp [Maximum / Minimum]):
 Wind baffles required to operate below 23°F DB in cooling mode.
 Heat pump system with wind baffle: 0°F - 115°F.
 Refer to wind baffle documentation for further information.

**Outdoor Unit Operating Temperature Range (Cooling Thermal Lock-out / Re-start Temperatures; Heating Thermal Lock-out / Re-start Temperatures): • System cuts out in heating mode to avoid thermistor error and automatically restarts at these temperatures.

***Blue Fin Coating Standard from 2022 production:
 • PU(Y/Z)-A(12/18)NKA7 - Beginning with serial number 12U*****
 • PU(Y/Z)-A(24/30/36/42)NKA7 - Beginning with serial number 1ZU*****

SPECIFICATIONS: TPKA0A0121LA10A & TRUYA0121KA70NA

	Туре		R410A
Pofrigorant	Pre-Charged Refrigerant Amount	Lbs, oz	4.0, 7.0
Reingerant	Maximum Pre-Charged Piping Length	Ft. [m]	70.0 [21.0]
	Additional Refrigerant Charge Per Additional Piping Length	oz./Ft. [g/m]	.1 [1]
	Gas Pipe Size O.D. [Flared]	In.[mm]	1/2 [12.7]
	Liquid Pipe Size O.D. [Flared]	In.[mm]	1/4 [6.35]
Piping	Maximum Piping Length	Ft. [m]	165 [50]
	Maximum Height Difference	Ft. [m]	100 [30]
	Maximum Number of Bends		15

NOTES: AHRI Rated Conditions

¹Cooling (Indoor // Outdoor)

°F 80 DB, 67 WB // 95 DB, 75 WB

*Indoor/Outdoor Unit Operating Temperature Range (Cooling Air Temp [Maximum / Minimum]):
Wind baffles required to operate below 23°F DB in cooling mode.
Heat pump system with wind baffle: 0°F - 115°F.
Refer to wind baffle documentation for further information.

**Outdoor Unit Operating Temperature Range (Cooling Thermal Lock-out / Re-start Temperatures; Heating Thermal Lock-out / Re-start Temperatures): • System cuts out in heating mode to avoid thermistor error and automatically restarts at these temperatures.

***Blue Fin Coating Standard from 2022 production:
 • PU(Y/Z)-A(12/18)NKA7 - Beginning with serial number 12U*****
 • PU(Y/Z)-A(24/30/36/42)NKA7 - Beginning with serial number 1ZU*****

INDOOR UNIT ACCESSORIES: TPKA0A0121LA10A

	3-Pin Connector	PAC-715AD
	IT Extender	PAC-WHS01IE-E
	kumo station® for kumo cloud®	TAC-WHS01HC-E
Control Interface	Procon BACnet® and Modbus® Interface	PAC-UKPRC001-CN-1
	Thermostat Interface	PAC-US445CN-1
	USNAP Adapter	PAC-WHS01UP-E
	Wireless Interface for kumo cloud®	PAC-USWHS002-WF-2
	Flush Mount Remote Temperature Sensor	PAC-USSEN002-FM-1
Pemote Sensor	Flush Mount Temperature Sensor	PAC-USSEN001-FM-1
Remote Sensor	Remote Temperature Sensor	PAC-SE41TS-E
	Wireless temperature and humidity sensor for kumo cloud®	PAC-USWHS003-TH-1
	Deluxe Wired MA Remote Controller [†]	TAR-40MAAU
Wined Demote Controller	Simple Ductless Wired Remote Controller	PAC-SDW01RC-1
whed Remote Controller	Simple MA Remote Controller [†]	TAC-YT53CRAU-J
	Touch MA Controller [†]	TAR-CT01MAU-SB
	kumo touch [™] RedLINK [™] Wireless Controller	MHK2
Wireless Remote Controller	Lockdown bracket for remote controller	RCMKP1CB
	Wireless MA Remote Controller	TAR-FL32MA-E
	Blue Diamond (Advanced) Mini Condensate Pump w/ Reservoir & Sensor (208/230V) [recommended]	X87-721
	Blue Diamond (MicroBlue) Mini Condensate Pump (110/208/230V) up to 18,000 BTU/H	X86-003
	Blue Diamond Sensor Extension Cable — 15 Ft.	C13-103
Condensate	Drain Pan Level Sensor/Control	SS610E
Condensale	Fascia Kit for MicroBlue Pump, mounts the MicroBlue and sensor directly beneath indoor unit	T18-016
	Refco Condensate Pump (100-240 VAC)	GOBI-II
	Refco Condensate Pump (100-240 VAC) up to 120,000 BTU/H	COMBI
	Sauermann Condensate Pump	SI30-230
Disconnect Quitch	(30A/600V/UL) [fits 2" X 4" utility box] - Black	TAZ-MS303
Disconnect Switch	(30A/600V/UL) [fits 2" X 4" utility box] - White	TAZ-MS303W
	100' x 1/4" x 100' / 1/2" Lineset (Twin-Tube Insulation)	MLS141212T-100
	15' x 1/4" x 15' / 1/2" Lineset (Twin-Tube Insulation)	MLS141212T-15
Lineset	30' x 1/4" x 30' / 1/2" Lineset (Twin-Tube Insulation)	MLS141212T-30
	50' x 1/4" x 50' / 1/2" Lineset (Twin-Tube Insulation)	MLS141212T-50
	65' x 1/4" x 65' / 1/2" Lineset (Twin-Tube Insulation)	MLS141212T-65
	14 Gauge, 4 wire MiniSplit Cable—250 ft. roll	SW144-250
Mini Split Wire	14 Gauge, 4 wire MiniSplit Cable—50 ft. roll	SW144-50
	16 Gauge, 4 wire MiniSplit Cable—250 ft. roll	SW164-250
	16 Gauge, 4 wire MiniSplit Cable—50 ft. roll	SW164-50

OUTDOOR UNIT ACCESSORIES: TRUYA0121KA70NA

Air Outlet Guide	Air Outlet Guide	PAC-SJ07SG-E
Controlized Drain Dan	Centralized Drain Pan	PAC-SG63DP-E
	Drain Pan	PAC-SG64DP-E
	Control/Service Tool	PAC-SK52ST
Control/Service Tool	M- & P-Series Maintenance Tool Cable Set	M21EC0397
	USB/UART Conversion Cable (Required for all laptop connection)	M21EC1397
Drain Socket	Drain Socket	MAC-871DS
Hail Guards	Hail Guard	HG-A5
M-NET Converter	M-NET Converter	PAC-SJ96MA-E
	14 Gauge, 4 wire MiniSplit Cable—250 ft. roll	S144-250
Mini Culit Wine	14 Gauge, 4 wire MiniSplit Cable—50 ft. roll	S144-50
Mini-Spiit Wire	16 Gauge, 4 wire MiniSplit Cable—250 ft. roll	S164-250
	16 Gauge, 4 wire MiniSplit Cable—50 ft. roll	S164-50
Mounting Pad	Condensing Unit Mounting Pad: 16" x 36" x 3"	ULTRILITE1
	18" Single Fan Stand	QSMS1801M
	24" Single Fan Stand	QSMS2401M
Stand	Condenser Wall Bracket	QSWB2000M-1
	Condenser Wall Bracket - Stainless Steel Finish	QSWBSS
	Outdoor Unit Stand — 12" High	QSMS1201M
	Front Wind Baffle	WB-PA4
Wind Baffle	Rear Wind Baffle	WB-RE4
	Side Advanced Wind Baffle	WB-SD4

INDOOR UNIT DIMENSIONS: TPKA0A0121LA10A



Unit: inch (mm)

OUTDOOR UNIT DIMENSIONS: TRUYA0121KA70NA

Unit: mm<in>



Free space around the outdoor unit (basic example)



FOUNDATION BOLTS

Please secure the unit firmly with 4 foundation (M10<W3/8>) bolts. (Bolts, washers and nut must be purchased locally).

<Foundation bolt height>



PIPING-WIRING DIRECTION

Piping and wiring connection can be made from the rear direction only.



FORM# TPKA0A0121LA10A & TRUYA0121KA70NA - 202310

CITY**MULTI**®

Snow/Hail Guards Kit for CITY MULTI® Modular Outdoor Units Designed for TURY(H/E/P) and TUHY(H/E/P) Series Units

TRANE



Job Name:

System Reference:

Date:

SGN-1 SGN-2 SGN-3 SGN-4 SGN-5 HK-1 and SHN-1



• Protects outdoor unit fan guard and coil surfaces from hail damage and snow build-up in severe climates

- 20-gauge, hot-dipped galvanized G-90 steel construction
- Heavy-duty polyester-based powder paint finish to match equipment

SGN SERIES

- SGN installs easily using existing wire guard fasteners
- · SHK and SHN installs easily using existing fasteners and provided brackets and screws

NOTES:

- Outdoor unit must be mounted at least 12" off the ground or 12" above the highest average snow depth, whichever is greater
- For SGN clearances for the sides and back of the outdoor unit must be at least 9" greater than standard installation guidelines
- For best coil protection, two and three module units must be mounted with the minimum 1-3/16" separation
- If you exceed the 1-3/16" module separation listed above, additional SGN-1, SGN-2, SGN-3, SGN-4, and SGN-5 assemblies may be required or when
 installing Heater Panel Kits which requires reference back to the Heater Panel submittal for minimum clearance allowed
- For best snow and hail protection use SHK-1 or SHN-1 with SGN series snow/hail guards.

SPECIFICATIONS

Kit Number	Description	Net Weight (lbs.)	Ship Weight (lbs.)	Carton Dimensions
SGN-1	Side snow/hail guards (2 per kit) 25.1" wide (All ODUs)	31	35	3" H x 40" L x 23" W
SGN-2	Front and Rear snow/hail guard (2 per kit) 32" wide (Small and XL ODU)	37	41	3" H x 40" L x 23" W
SGN-3	Front and Rear snow/hail guard (2 per kit) 21.9" wide (Large ODU)	27	31	3" H x 40" L x 23" W
SGN-4	Side snow/hail guards (2 per kit) 25.25" wide (EXL ODU)	40	48	3" H x 57" L x 23" W
SGN-5	Rear snow/hail guard (2 per kit) 32.25" wide (EXL ODU)	50	58	3" H x 57" L x 23" W
SHK-1	Snow Hood for Snow/Hail Protection 33.38" wide (Small and XL ODU)	41	47	30-1/2" H x 34" L x 32" W
SHN-1	Snow Hood for Snow/Hail Protection 24.3" wide (Large ODU)	33	41	32" H x 33" L x 26-1/4" W

COMPONENTS

TURYP SERIES

Linit model		Modul	e Size		Component Qty								
Onit model	S	L	XL	EXL	SGN-1	SGN-2	SGN-3	SGN-4	SGN-5	SHK-1	SHN-1		
TURYP072(3/4)AN40A(N/B)	1				1	1				1			
TURYP096(3/4)AN40A(N/B)		1			1		2				2		
TURYP120(3/4)AN40A(N/B)		1			1		2				2		
TURYP144(3/4)AN40A(N/B)		1			1		2				2		
TURYP168(3/4)AN40A(N/B)			1		1	2				2			
TURYP192(3/4)BN40A(N/B)		2			1		4				4		
TURYP216(3/4)BN40A(N/B)		2			1		4				4		
TURYP240(3/4)BN40A(N/B)		2			1		4				4		
TURYP264(3/4)BN40A(N/B)		2			1		4				4		
TURYP288(3/4)BN40A(N/B)		2			1		4				4		
TURYP312(3/4)BN40A(N/B)		1	1		1	2	2			2	2		
TURYP336(3/4)BN40A(N/B)			2		1	4				4			

TURYE SERIES

l Init model		Modu	le Size		Component Qty							
Unit model	S	L	XL	EXL	SGN-1	SGN-2	SGN-3	SGN-4	SGN-5	SHK-1	SHN-1	
TURYE072(3,4)AN40A(N/B)	1				1	1				1		
TURYE096(3,4)AN40A(N/B)		1			1		2				2	
TURYE120(3,4)AN40A(N/B)		1			1		2				2	
TURYE144(3,4)AN40A(N/B)		1			1		2				2	
TURYE168(3,4)AN40A(N/B)			1		1	2				2		
TURYE192(3,4)AN40A(N/B)				1		1		1	1	2		
TURYE192(3,4)BN40A(N/B)		2			1		4				4	
TURYE216(3,4)AN40A(N/B)				1		1		1	1	2		
TURYE216(3,4)BN40A(N/B)		2			1		4				4	
TURYE240(3,4)AN40A(N/B)				1		1		1	1	2		
TURYE240(3,4)BN40A(N/B)		2			1		4				4	
TURYE264(3,4)BN40A(N/B)		2			1		4				4	
TURYE288(3,4)BN40A(N/B)		2			1		4				4	
TURYE312(3,4)BN40A(N/B)		1	1		1	2	2			2	2	
TURYE336(3,4)BN40A(N/B)			2		1	4				4		
TURYE384(3,4)BN40A(N/B)				2		2		1	2	4		
TURYE432(3,4)BN40A(N/B)				2		2		1	2	4		

TUHYH SERIES

Unit model	Module Size				Component Qty							
	S	L	XL	EXL	SGN-1	SGN-2	SGN-3	SGN-4	SGN-5	SHK-1	SHN-1	
TUHYH072(3/4)AN40AN		1			1		2				2	
TUHYH096(3/4)AN40AN		1			1		2				2	
TUHYH120(3/4)AN40AN		1			1		2				2	
TUHYH144(3/4)BN40AN		2			1		4				4	
TUHYH192(3/4)BN40AN		2			1		4				4	
TUHYH240(3/4)BN40AN		2			1		4				4	

Specifications are subject to change without notice.

COMPONENTS, contd.

TUHYP SERIES

Linit model	I	Module Size	e	Component Qty							
Onit model	S	L	XL	SGN-1	SGN-2	SGN-3		SHK-1	SHN-1		
TUHYP072(3/4)AN40A(N/B)	1			1	1			1			
TUHYP096(3/4)AN40A(N/B)		1		1		2			2		
TUHYP120(3/4)AN40A(N/B)		1		1		2			2		
TUHYP144(3/4)AN40A(N/B)		1		1		2			2		
TUHYP168(3/4)AN40A(N/B)			1	1	2			2			
TUHYP192(3/4)BN40A(N/B)		2		1		4			4		
TUHYP216(3/4)BN40A(N/B)		2		1		4			4		
TUHYP240(3/4)BN40A(N/B)		2		1		4			4		
TUHYP264(3/4)BN40A(N/B)	1	2		1	1	4		1	4		
TUHYP288(3/4)BN40A(N/B)	1	2		1	1	4		1	4		
TUHYP312(3/4)BN40A(N/B)	1	2		1	1	4		1	4		
TUHYP336(3/4)BN40A(N/B)		3		1		6			6		
TUHYP360(3/4)BN40A(N/B)		3		1		6			6		
TUHYP384(3/4)BN40A(N/B)		3		1		6			6		
TUHYP408(3/4)BN40A(N/B)		3		1		6			6		
TUHYP432(3/4)BN40A(N/B)		3		1		6			6		

TUHYE SERIES

Linit model		Modu	le Size		Component Qty							
Chit niddel	S	L	XL	EXL	SGN-1	SGN-2	SGN-3	SGN-4	SGN-5	SHK-1	SHN-1	
TUHYE072(3/4)AN40A(N/B)	1				1	1				1		
TUHYE096(3/4)AN40A(N/B)		1			1		2				2	
TUHYE120(3/4)AN40A(N/B)		1			1		2				2	
TUHYE144(3/4)AN40A(N/B)		1			1		2				2	
TUHYE168(3/4)AN40A(N/B)			1		1	2				2		
TUHYE192(3/4)AN40A(N/B)			1		1	2				2		
TUHYE192(3/4)BN40A(N/B)		2			1		4				4	
TUHYE216(3/4)AN40A(N/B)				1		1		1	1	2		
TUHYE216(3/4)BN40A(N/B)		2			1		4				4	
TUHYE240(3/4)AN40A(N/B)				1		1		1	1	2		
TUHYE240(3/4)BN40A(N/B)		2			1		4				4	
TUHYE264(3/4)BN40A(N/B)	1	2			1	1	4			1	4	
TUHYE288(3/4)BN40A(N/B)	1	2			1	1	4			1	4	
TUHYE312(3/4)BN40A(N/B)	1	2			1	1	4			1	4	
TUHYE336(3/4)BN40A(N/B)		3			1		6				6	
TUHYE360(3/4)BN40A(N/B)		3			1		6				6	
TUHYE384(3/4)BN40A(N/B)		3			1		6				6	
TUHYE408(3/4)BN40A(N/B)		3			1		6				6	
TUHYE432(3/4)BN40A(N/B)		3			1		6				6	

TURYH SERIES

Linit model		Modul	e Size		Component Qty							
	S	L	XL	ELX	SGN-1	SGN-2	SGN-3	SGN-4	SGN-5	SHK-1	SHN-1	
TURYH072(3/4)AN40AN		1			1		2				2	
TURYH096(3/4)AN40AN		1			1		2				2	
TURYH120(3/4)AN40AN		1			1		2				2	
TURYH144(3/4)BN40AN		2			1		4				4	
TURYH192(3/4)BN40AN		2			1		4				4	
TURYH240(3/4)BN40AN		2			1		4				4	

Specifications are subject to change without notice.

SGN-1, SGN-2, SGN-3, SGN-4, AND SGN-5: EXTERNAL DIMENSIONS



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EXTERNAL DIMENSIONS: SHK-1 and SHN-1



FORM# T_Submittal_Snow-Hood_Hail-Guard - 202010



Job Name:

System Reference:

Date:



GENERAL FEATURES

- Front Wind Baffles allow outdoor units to operate at full capacity down to the temperature ranges shown in the table below.
- Prevents wind from reversing outdoor fan rotation when unenergized.
- Durable and low maintenance construction.

PLEASE NOTE

- · Install outdoor units with the back surface facing wall side to eliminate the effects of external wind
- Outdoor units should not be installed in an orientation or site where the wind blows directly at the back of the unit
- Wind baffle should not be used where there is any obstacle at either side or above the outdoor unit as the discharged air will be blocked
- · Refer to outdoor unit for detailed installation instructions

SPECIFICATIONS

Exterior					
Color	Surface Treatment	Material	Weight		
Matches P-Series Outdoor Unit (Ivory Munsell 3Y 7.8/1.1)	Polyester Powder Coating	Alloy Hot-Dip Zinc Coated Carbon Steel Sheet	7 Lbs. 7.9 Oz.		

APPLICATION

- The Wind Baffles are used to extend the cooling temperature operation range of the TRUY, TRUZ and MX models
- · The information below outlines which wind baffles to utilize per required operation range
- Please refer to the installation manual of the appropriate outdoor unit for correct installation requirements

COOLING TEMPERATURE OPERATION RANGE WITH WIND BAFFLES

Model Series	Operation Range Without Wind Baffles	Front Wind Baffles	Front + Advanced Side + Advanced Rear Wind Baffles
TRUZ	23ºF - 115ºF	0°F	N/A
TRUY	23ºF - 115ºF	0°F	-40°F
MX	23ºF - 115ºF	0°F	N/A

**If unit is exposed without wall surfaces surrounding for protection from wind, then side and rear wind baffles will be required. Please refer to installation dimensions and outdoor unit installation manual for appropriate requirements.

COMPATIBILITY

Single Zone	WB-PA4 (Qty)
TRUYA0121KA70(N/B)A	1
TRUYA0181KA70(N/B)A	1
TRUZA0121KA70(N/B)A	1
TRUZA0181KA70(N/B)A	1

APPENDIX - PREVIOUS GENERATION COMPATIBILITY

	Front Wind Baffles		Advanced Side Wind Baffles		Advanced Rear Wind Baffles				
Models	WB-PA3	WB-PA4	WB-PA5	WB-SD4	WB-SD5	WB-SD6	WB-RE4	WB-RE5	WB-RE6
TUMYH0361AK41NA	2								
TUMYH0481AK41NA	2								

COOLING TEMPERATURE OPERATION RANGE WITH WIND BAFFLES

Model Series	Operation Range Without Wind Baffles	Front Wind Baffles	Front + Advanced Side + Advanced Rear Wind Baffles
TUMY*	23ºF - 115ºF	5°F	N/A

*Operation range varies based on indoor unit connected, refer to service manual for applicable indoor units

DIMENSIONS: WB-PA4



WB-SD4

Side Advanced Wind Baffle



Job Name:

System Reference:

Date:



GENERAL FEATURES

- Front Wind Baffles allow outdoor units to operate at full capacity down to the temperature ranges shown in the table below.
- · Prevents wind from reversing outdoor fan rotation when unenergized.
- Durable and low maintenance construction.

SPECIFICATIONS

Exterior				
Color	Surface Treatment	Material	Weight	
Matches P-Series Outdoor Unit (Ivory Munsell 3Y 7.8/1.1)	Polyester Powder Coating	Alloy Hot-Dip Zinc Coated Carbon Steel Sheet	6 Lbs.	

DIMENSIONS



APPLICATION

- The Wind Baffles are used to extend the cooling temperature operation range of the TRUY, TRUZ and MX models
- The information below outlines which wind baffles to utilize per required operation range
- Please refer to the installation manual of the appropriate outdoor unit for correct installation requirements

COOLING TEMPERATURE OPERATION RANGE WITH WIND BAFFLES

Model Series	Operation Range Without Wind Baffles	Front Wind Baffles	Front + Advanced Side + Advanced Rear Wind Baffles
TRUZ	23ºF - 115ºF	0°F	N/A
TRUY	23ºF - 115ºF	0°F	-40°F
MX	23ºF - 115ºF	0°F	N/A

**If unit is exposed without wall surfaces surrounding for protection from wind, then side and rear wind baffles will be required. Please refer to installation dimensions and outdoor unit installation manual for appropriate requirements.

COMPATIBILITY

Single Zone	WB-SD4 (Qty)
TRUYA0121KA70(N/B)A	1
TRUYA0181KA70(N/B)A	1
TRUZA0121KA70(N/B)A	1
TRUZA0181KA70(N/B)A	1
APPENDIX - PREVIOUS GENERATION COMPATIBILITY

	Front Wind Baffles		Advanced Side Wind Baffles			Advanced Rear Wind Baffles			
Models	WB-PA3	WB-PA4	WB-PA5	WB-SD4	WB-SD5	WB-SD6	WB-RE4	WB-RE5	WB-RE6
TUMYH0361AK41NA	2								
TUMYH0481AK41NA	2								

COOLING TEMPERATURE OPERATION RANGE WITH WIND BAFFLES

Model Series	Operation Range Without Wind Baffles	Front Wind Baffles	Front + Advanced Side + Advanced Rear Wind Baffles
TUMY*	23ºF - 115ºF	5°F	N/A

*Operation range varies based on indoor unit connected, refer to service manual for applicable indoor units

FORM# WB-SD4 - 202208

WB-RE4

Rear Wind Baffle

Job Name:

System Reference:

TRANE



GENERAL FEATURES

- Front Wind Baffles allow outdoor units to operate at full capacity down to the temperature ranges shown in the table below.
- · Prevents wind from reversing outdoor fan rotation when unenergized.
- Durable and low maintenance construction.

SPECIFICATIONS

Exterior					
Color	Surface Treatment	Material	Weight		
Matches P-Series Outdoor Unit (Ivory Munsell 3Y 7.8/1.1)	Polyester Powder Coating	Alloy Hot-Dip Zinc Coated Carbon Steel Sheet	11 Lbs.		

DIMENSIONS



24-15/32"

APPLICATION

- The Wind Baffles are used to extend the cooling temperature operation range of the TRUY, TRUZ and MX models
- · The information below outlines which wind baffles to utilize per required operation range
- Please refer to the installation manual of the appropriate outdoor unit for correct installation requirements

COOLING TEMPERATURE OPERATION RANGE WITH WIND BAFFLES

Model Series	Operation Range Without Wind Baffles	Front Wind Baffles	Front + Advanced Side + Advanced Rear Wind Baffles
TRUZ	23ºF - 115ºF	0°F	N/A
TRUY	23ºF - 115ºF	0°F	-40°F
MX	23ºF - 115ºF	0°F	N/A

**If unit is exposed without wall surfaces surrounding for protection from wind, then side and rear wind baffles will be required. Please refer to installation dimensions and outdoor unit installation manual for appropriate requirements.

COMPATIBILITY

Single Zone	WB-RE4 (Qty)
TRUYA0121KA70(N/B)A	1
TRUYA0181KA70(N/B)A	1
TRUZA0121KA70(N/B)A	1
TRUZA0181KA70(N/B)A	1



APPENDIX - PREVIOUS GENERATION COMPATIBILITY

	Front Wind Baffles		Advanced Side Wind Baffles			Advanced Rear Wind Baffles			
Models	WB-PA3	WB-PA4	WB-PA5	WB-SD4	WB-SD5	WB-SD6	WB-RE4	WB-RE5	WB-RE6
TUMYH0361AK41NA	2								
TUMYH0481AK41NA	2								

COOLING TEMPERATURE OPERATION RANGE WITH WIND BAFFLES

Model Series	Operation Range Without Wind Baffles	Front Wind Baffles	Front + Advanced Side + Advanced Rear Wind Baffles
TUMY*	23ºF - 115ºF	5°F	N/A

*Operation range varies based on indoor unit connected, refer to service manual for applicable indoor units

FORM# WB-RE4 - 202208

PAC-SJ95MA-E/PAC-SJ96MA-E

M-NET CONTROL ADAPTER FOR P-SERIES OUTDOOR UNITS

Job Name:

System Reference:

Date:

PAC-SJ95MA-E	PAC-SJ96MA-E

TABLE 1. LIST OF MODELS (PAC-SJ95MA-E)

TABLE 2. LIST OF MODELS (PAC-SJ96MA-E)

TRANE

Group A	Group B	Group C
	TRUYA0421KA70(N/B)A	TRUYA0241HA70(N/B)A
	TRUZA0421KA70(N/B)A	TRUZA0241HA70(N/B)A
	TRUZH0241HA10NA	TRUYA0301HA70(N/B)A
	TRUZH0301KA00NA	TRUZA0301HA70(N/B)A
	TRUZH0361KA00NA	
	TRUZH0421KA10NA	

FEATURES

- Allows the P-Series outdoor units to communicate with the CITY MULTI[®] Controls Network
- Connects to outdoor unit
- · Requires one converter per outdoor unit

Group A	
TRUYA0121KA70(N/B)A	
TRUZA0121KA70(N/B)A	
TRUYA0181KA70(N/B)A	
TRUZA0181KA70(N/B)A	



Maximum power feeding length for the centralized control line:

L1 $\leq 200 \text{ m} (656 \text{ ft})$ L2 + L3 $\leq 200 \text{ m} (656 \text{ ft})$

L2 + L3 = 200 m (000 ll)

FORM# T_SUBMITTAL_PAC-SJ95MA-E_and_PAC-SJ96MA-E_en - 202103

<u>CITY**MULTI**®</u>

MODEL: AE-200A



Date:

Job Name:

System Reference:



AE-200A

- AE-200A is the Master Controller
- . Master Controller can operate and monitor up to 50 indoor units
- . Expansion Controllers can expand an AE-200A to operate and monitor up to 50 additional indoor units through the touchscreen or web browser
- Network up to three AE-50A or EW-50A to one AE-200A to allow the AE-200A to manage up to 200 indoor units

OPTIONAL LICENSES

- LIC-BACnet Master: BACnet Function
 - Connected air conditioning units can be monitored and operated not only from the existing web browser or the AE-200/AE-50's LCD, but also from the building management system using the BACnet® communication protocol. See LIC-BACnet Data Sheet for more information
- · LIC-Charge Master: Energy Allocation
- The apportioned electricity billing function is an electric energy
 - apportionment system that apportions electric energy using input from electricity meters with a pulse generator function. The respective amounts of electric energy can be apportioned based on the operating status and capacity of each tenant. See LIC-Charge Data Sheet for more information.
- LIC-PWeb Master: Online Personal Browser
 - Allows tenant managers and general users to control their respective zone conditions via a networked PC, tablet, or mobile phone with or without local remote controllers installed in the space. See LIC-PWeb Data Sheet for more information.

SPECIFICATIONS

- Supports dual set point functionality (connected equipment dependent)
- Displays:
 - CITY MULTI® compressor speed and hi/low pressure
 - . AdvancedHVAC Controller (DC-A2IO) input/output status
 - Indoor unit free contact input/output status
 - Space temperature and humidity (from Smart ME or AI controller)
 - Error code (Can be emailed automatically to specified recipients)
 - Unoccupied setback up temperature range
- Functions
 - Hold function (temporarily disables schedules indoor unit model dependent)
 - Initial setting
 - Operation data back-up
 - Permits or prohibits remote controller functions:
 - On/Off
 - Change Operation Mode -
 - Change Set Point Temperature
 - Filter Status
 - Change Fan Speed
 - Change Air Direction
- · External input/output signals can be used for batch operations such as Start/Stop and Emergency Stop (requires PAC-YG10HA)
- Pulse signal input can obtain watt-hour meter, billing data and energy management data based on the cumulative number of pulse signal pulse signals directly input from a metering device
- · Temperature set point range limits can be set for local remote controllers
- User defined indoor unit functions:
 - On/Off
 - Monitoring and Operation
 - Operation mode
 - Auto* (Dual or Single set point)
 - Heat
 - Fan 0
 - Drying
 - Setback*
 - Note: *R2 Series only (connected equipment dependent)
 - Temperature Setting
 - Fan Speed
 - Airflow Direction
- · Monitoring and Control:
- CITY MULTI® indoor units
- M & P Series units (requires M-Net adapter)
- Lossnay[®] units
- PWFY hydronic heat pump units - DIDO controllers
- CITY MULTI® DOAS
- -
- Interlock setting enables integration of general equipment inputs/outputs and indoor units
- · Scheduling
 - Dailv
 - Annually -
 - Five pattern of weekly seasonal schedule
- · Twenty four scheduled events per day, indoor unit model dependent:

 - Temperature Setting -Vane Direction
- **Operation Prohibits** Trend data:
 - Fan operation time
 - Thermo-on time
 - Set temperature
 - -Room temperature
 - Al Controller temperature and humidity (requires PAC-YG63-MCA, 2 inputs total for each
 - controller)
- · Memory back up via USB (universal serial bus)
- Memory back up via LAN (local area network) port

- ON/OFF
- Mode
- Fan
- -Speed

AE-200A - SPECIFICATIONS, CONT.

TE-200A CENTRALIZED CONTROLLER

Item	Specifications	Specifications			
	Rated input		100–240 VAC ± 10%; 0.3–0.2 A 50/60 Hz Single-phase		
Power Supply	Fuse		250 VAC 6.3 A Time-Lag type (IEC 60127-2S.S.5)		
M-NET power feeding capability			No specifications**Only an MN converter can be connected.		
	Tomonounture	Operating Range	0° C to +40° C (+32° F to +104° F)		
Ambient conditions	remperature	Non-operating Range	-20° C to +60° C (-4° F to +140° F)		
	Humidity		30% to 90% RH (no condensation)		
Weight			2.3 kg (5-5/64 lbs)		
Dimensions (W x H x D)			11-5/32 × 7-55/64 × 2-17/32 in. (284 × 200 × 65 mm)		
Installation conditions			Indoor only **To be used in a business office or similar environment		

WEB BROWSER REQUIREMENTS

Item		Requirements
	CPU	1 GHz or faster (2 GHz or faster recommended)
	Memory	2 GB or more
	Screen Resolution	1024 x 768 or higher recommended
PC	OS/Java® execution environment	Microsoft® Windows® 8.1 Microsoft® Windows® 10 Mac OS® X10.11 or later (Only CSV File Download Tool is not guaranteed to work.) Java® execution environment (Oracle® Java or AdoptOpenJDK) is required. Verified to work properly on Oracle® Java8 (https://www.java.com/download/) and AdoptOpenJDK11H otoSpot (https://adoptopenjdk.net/). * The version of the Oracle® Java can be verified by clicking [Java] in the Control Panel. * Install the Java® execution environment that is appropriate for your Air Conditioner Control Tool. When using a 64-bit Air-conditioner Control Tool, install 64-bit Oracle® Java or AdoptOpenJDK
	Browser	 Microsoft[®] Internet Explorer[®] 11 Microsoft[®] Edge[®] Google Chrome[™] Ver. 83 Safari[®] 13
	Microsoft® Excel®	Microsoft [®] Excel [®] 2010 or later

	Item	Requirements
Smartphone	Safari® 12	 iPhone 6s (Plus) (iOS 10.1.1 or later) iPhone 7 (Plus) (iOS 10.1.1 or later) iPhone SE (iOS 10.1.1 or later) iPhone XR (iOS 12.1.1 or later)
	Google Chrome™ Ver. 83	 Galaxy SC-04J (Android™ 8.0.0) HUAWEI P9 (Android™ 6.0 or later) Xperia Z5 (Android™ 6.0 or later)
Tablet	Safari [®] 13	• iPad Air 2 (iOS 12.2.2 or later) • 9.7-inch iPad Pro (iOS 10.1.1 or later)
	Google Chrome™ Ver. 83	MediaPad T2 7.0 Pro (Android ™ 5.1.1)

Note: Registered trademarks

- Android is a registered trademark of Google LLC. in the U.S. and other countries.
- Apple is a trademark of Apple Inc., registered in the U.S. and other countries.
- Google is a registered trademark of Google LLC.
- Google Chrome is a registered trademark of Google LLC. in the U.S. and other countries.
- Edge is a trademark or registered trademark of Microsoft Corporation in the U.S. and other countries.
- Internet Explorer is a trademark or registered trademark of Microsoft Corporation in the U.S. and other countries.
- The official name of Internet Explorer is "Microsoft® Internet Explorer Internet browser".
- iOS is a trademark or registered trademark of Cisco in the U.S. and other countries and is used under license.
- iPad is a trademark of Apple Inc., registered in the U.S. and other countries.
- · Mac OS is a trademark of Apple Inc., registered in the U.S. and other countries.
- Microsoft Office Excel is a product name of Microsoft Corporation in the U.S.
- · Windows is a trademark or registered trademark of Microsoft Corporation in the U.S. and other countries.
- The official name of Windows is "Microsoft® Windows® Operating System".
- Safari is a trademark or registered trademark of Apple Inc. in the U.S.
- Nexus is a registered trademark of Google LLC. in the U.S. and other countries.
- · Galaxy is a trademark or registered trademark of Samsun Co., Ltd.

Note: Company name or product name that is described in this manual may be a trademark or a registered trademark of each company

MODEL: AE-200A - SYSTEM CONFIGURATION

CONTROLLING 50 OR FEWER UNITS OF EQUIPMENT

*AE-200A is indicated as AE-200 *AE-50A is indicated as AE-50



CONTROLLING MORE THAN 50 UNITS OF EQUIPMENT (WITH CONNECTION TO AN AE-200 CONTROLLER) Note

AE-200 is required when using AE-50



WHEN USING AN APPORTIONED ELECTRICITY BULLING FUNCTION Notes

AE-200 is required to use a billing function.

AE-200 M-NET cannot be used when a billing function is used "Charge" license is requited to use a billing function.



AE-200A - DIMENSIONS



FORM# M_SUBMITTAL_AE-200A - 202104

Specifications are subject to change without notice.

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MODEL: PAC-YT53CRAU-J



Job Name:

System Reference:



Date:

SIMPLE MA REMOTE CONTROLLER (PAC-YT53CRAU-J) SPECIFICATIONS

- PAC-TISSCRAU-J) SPECIFICATIONS
- Controls group operation for up to 16 indoor units in a single group
- Supports both Fahrenheit and Celsius
- User defined functions:
- ON/OFF
- Operation mode: AUTO (R2-Series only), COOL, HEAT, FAN, DRY, SETBACK, or ADD
- Set temperature
- Fan speed settingAir flow direction
- All now direction
 Set temperature range: depending on operation mode and indoor unit connected.
- Set temperature range limit: Simple MA allowable set temperature range can be reduced for cool and heat modes.
- LOSSNAY®: Simple MA for interlocked system can set high/low/Stop on LOSSNAY.
- · Room temperature can be sensed either at the indoor unit (default) or at the remote controller.
- · Diagnostics: Displays four-digit error code and error unit address.
- Grouping: Same group use only with other PAC-YT53CRAU-J Simple MA Controllers with up to two remote controllers per group.
- Addressing: No addressing required.
- Wiring: Uses two-wire, stranded, non-polar control wire for connecting TB15 connection terminal on the indoor unit.
- · Requires crossover wiring for grouping across indoor units.
- Dimensions: 2-3/4 x 9/16 x 4-3/4" (70 x 14.5 x 120mm).

NOTE: A MAC-334IF-E may be needed in order to connect to the indoor unit. Please see the compatibility charts for more information.

SAMPLE SYSTEM



System example

NOTES:			

DIMENSIONS: PAC-YT53CRAU-J



1340 Satellite Boulevard. Suwanee, GA 30024 Toll Free: 800-433-4822 www.mehvac.com

Warranty Document

MITSUBISHI ELECTRIC TRANE HVAC US LLC

1340 Satellite Boulevard Suwanee, GA 30024

LIMITED WARRANTY STATEMENT Mitsubishi Electric CITY MULTI[®] Split Air-conditioner and Heat-pump Systems

Subject to the terms and conditions of this Limited Warranty Statement (the "Limited Warranty"), MITSUBISHI ELECTRIC TRANE HVAC US LLC ("METUS") warrants to the original purchaser of this CITY MULTI system (as used herein, "System" shall mean CITY MULTI outdoor and indoor components connected via refrigerant piping and electrical wiring) purchased on or after **May 1, 2019**, from a licensed HVAC contractor and installed by such contractor in the continental United States, Alaska and Hawaii, that:

- A. The parts are warranted to the original owner for a period of one (1) year from the date of installation by a licensed contractor. If it should prove defective due to improper workmanship and/or material for a period of one (1) year from the date of installation, METUS will replace any defective part without charge for the part. Replacement parts are warranted for the remainder of the original 1-year warranty period. Parts used for replacement may be of like kind and quality and may be new or remanufactured. Defective parts must be made available to METUS in exchange for the replacement part and become the property of METUS.
- B. The compressor is warranted to the original owner for a period of seven (7) years from the date of installation by a licensed contractor. If the compressor should prove defective due to improper workmanship and/or material for a period of seven (7) years from the date of installation, METUS will replace any defective compressor without charge for the compressor. Replacement compressors are warranted for the remainder of the original 7-year warranty period. Compressors used for replacement may be of like kind and quality and may be new or remanufactured. Defective compressors must be made available to METUS in exchange for the replacement compressor and become the property of METUS.
- C. Notwithstanding the foregoing, the parts and compressor will be warranted to the original owner for a period of ten (10) years from the date of installation if (1) the System is designed by a Diamond Designer using the Diamond System Builder™ (2) the installing contractor has successfully completed all METUS-approved CITY MULTI training courses, and (3) the contractor has timely submitted a completed and approved Diamond System Builder™ file per the METUS Extended Warranty Process. If any parts and/or the compressor should prove defective due to improper workmanship and/or material for a period of ten (10) years from the date of installation, METUS will replace any defective parts or compressor without charge for the part or compressor. The replacement parts and/or compressor are warranted for the remainder of the original 10-year warranty period. Parts and/or compressors used for replacement may be of like kind and quality and may be new or remanufactured. Defective parts and/or compressors must be made available to METUS in exchange for the replacement parts and become the property of METUS.
- D. NO LABOR. This Limited Warranty does NOT include labor or any other costs incurred for service, maintenance, repair, removing, replacing, installing, complying with local building and electric codes, shipping, handling or replacement of the System, compressors or any other parts. The owner is solely responsible for all labor and other costs of maintaining, installing, replacing, disconnecting or dismantling the System and any parts (such as filters) in connection with owner-required maintenance, including but not limited to cleaning and/or replacing air filters for each indoor unit of the System, and this Limited Warranty does not cover labor or other costs associated with such owner-required maintenance. Please consult the Operations Manual and other applicable technical documentation for air filter cleaning and other maintenance procedures.
- E. PROPER INSTALLATION; PROOF OF PURCHASE. This Limited Warranty applies only to Systems that are installed by licensed HVAC contractors who have completed all METUS-required CITY MULTI training classes and who install the Systems in accordance with (i) all applicable building codes and permits; (ii) METUS installation and operation instructions; and (iii) good trade practices. METUS may require satisfactory proof of purchase, proper installation and start-up of the System as a condition to providing replacement parts or compressors under this Limited Warranty.

BEFORE REQUESTING SERVICE, please review the Operations Manual and technical documentation for your System to confirm the electric power supply and that user controls are properly adjusted for the System.

1) TO OBTAIN WARRANTY SERVICE:

- a) Contact the licensed HVAC contractor who installed your System or another licensed HVAC contractor or servicer, or an authorized CITY MULTI distributor (whose name and address may be obtained on the METUS website at www.mehvac.com) within the applicable warranty time period.
- b) Proof of the installation date is required when requesting warranty service. Present the sales receipt, building permit or other document which establishes the date of installation. In the absence of acceptable proof, this Limited Warranty shall be deemed to begin one hundred twenty (120) days after the date of manufacture stamped on the System.
- c) This Limited Warranty applies only to Systems purchased on or after **May 1, 2019**, only while the System remains at the site of the original installation, and only to locations within the continental United States, Alaska and Hawaii.
- d) All repairs under this Limited Warranty must be made by a licensed HVAC contractor or servicer.
- 1) THIS LIMITED WARRANTY DOES NOT COVER: property damages, malfunction or failure of the System, or personal injury caused by or resulting from: (a) accident, abuse, negligence or misuse; (b) operating the System in a corrosive or wet environment, including those containing chlorine, fluorine or any other hazardous or harmful chemicals or environmental factors, including sea- or salt-water; (c) installation, alteration, repair or service by anyone other than a licensed contractor or other than pursuant to the manufacturer's instructions; (d) improper matching of System components; (e) improper sizing of the System; (f) improper or deferred maintenance contrary to the manufacturer's instructions; (g) physical abuse to or misuse of the System (including failure to perform any maintenance as described in the Operation manual such as air filter cleaning, or any System damaged by excessive physical or electrical stress); (h) Systems that have had a serial number or any part thereof altered, defaced or removed; (i) System used in any manner contrary to the Operation Manual; (j) freight damage; or (k) events of force majeure or damage caused by other external factors such as lightning, power surges, fluctuations in or interruptions of electrical power, rodents, vermin, insects, or other animal- or pest-related issues.
- 2) THIS LIMITED WARRANTY ALSO EXCLUDES: (a) SERVICE CALLS WHERE NO DEFECT IN THE SYSTEM COVERED UNDER THIS WARRANTY IS FOUND: (b) System installation or set-ups; (c) Adjustments of user controls; (d) Systems purchased or installed outside the continental United States, Alaska and Hawaii; or (e) Systems purchased or installed prior to May 1, 2018. Consult the Operations Manual for information regarding user controls.
- 3) This Limited Warranty shall not be enlarged, extended or affected by, and no obligation or liability shall arise or grow out of, METUS providing, directly or indirectly, any technical advice, information and/or service to the original owner, contractor, distributor, or otherwise providing assistance in connection with the System.
- 4) EXCEPT AS OTHERWISE PROVIDED IN THIS LIMITED WARRANTY, METUS MAKES NO OTHER WARRANTIES OF ANY KIND WHATSOEVER REGARDING THE SYSTEM. METUS DISCLAIMS AND EXCLUDES ALL WARRANTIES NOT EXPRESSLY PROVIDED HEREIN AND ALL REMEDIES WHICH, BUT FOR THIS PROVISION, MIGHT ARISE BY IMPLICATION OR OPERATION OF LAW, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF MERCHANTABILITY, NON-INFRINGEMENT OF THIRD PARTY RIGHTS, AND OF FITNESS FOR ANY PARTICULAR PURPOSE. NO ONE IS AUTHORIZED TO CHANGE THIS LIMITED WARRANTY IN ANY RESPECT OR TO CREATE ANY OTHER OBLIGATION OR LIABILITY FOR METUS IN CONNECTION WITH THE SYSTEM. METUS DISCLAIMS ALL LIABILITY FOR THE ACTS, OMISSIONS AND CONDUCT OF ALL THIRD PARTIES (INCLUDING, WITHOUT LIMITATION, THE INSTALLING CONTRACTOR) IN CONNECTION WITH OR RELATED TO THE SYSTEM.
- 5) UNDER NO CIRCUMSTANCES SHALL METUS BE LIABLE FOR ANY INDIRECT, INCIDENTAL, SPECIAL, PUNITIVE OR CONSEQUENTIAL DAMAGES INCLUDING, WITHOUT LIMITATION, INFRINGEMENT OF THIRD PARTY RIGHTS, LOST GOODWILL, LOST REVENUES OR PROFITS, WORK STOPPAGE, SYSTEM FAILURE, IMPAIRMENT OF OTHER GOODS, COSTS OF REMOVAL AND REINSTALLATION OF THE SYSTEM, LOSS OF USE, INJURY TO PERSONS OR PROPERTY ARISING OUT OR RELATED TO THE SYSTEM WHETHER BASED ON BREACH OF WARRANTY, BREACH OF CONTRACT, TORT OR OTHERWISE, EVEN IF METUS HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGE. IN NO EVENT SHALL METUS' LIABILITY EXCEED THE ACTUAL PURCHASE PRICE OF THE SYSTEM WITH RESPECT TO WHICH ANY CLAIM IS MADE.

6) SOME STATES DO NOT ALLOW LIMITATIONS ON WARRANTIES OR EXCLUSIONS OR LIMITATION OF DAMAGES, SO THE ABOVE LIMITATIONS OR EXCLUSIONS MAY NOT APPLY.

- 7) DISPUTE RESOLUTION. For any dispute with METUS, you agree to first contact us by phone (800-433-4822) or e-mail (CustomerCare@hvac.mea.com) or U.S. Mail at MITSUBISHI ELECTRIC TRANE HVAC US LLC ATTN: Customer Care, 1340 Satellite Blvd., Suwanee, GA 30024, and attempt to resolve the dispute with us informally by providing your name, address, and contact information and describing the nature of the dispute. In the unlikely event that METUS has not been able to resolve a dispute with you within 60 days of your original informal claim (or sooner if, in METUS' opinion, a dispute is not likely to be resolved within 60 days), we each agree to resolve any claim, dispute, or controversy arising out of or in connection with or relating to this Limited Warranty, or the breach or alleged breach thereof (collectively, "Claims"), by binding arbitration before an arbitrator from Judicial Mediation and Arbitration Services ("JAMS") located in Gwinnett County, Georgia. JAMS may be contacted at www.jamsadr.com and will require you to pay an initial filing fee set by JAMS (unless you successfully apply for a waiver of this fee from JAMS). All other JAMS costs associated with the arbitration will be borne by METUS. The arbitration will be conducted in Gwinnett County, Georgia, unless you request an in-person hearing where you live, or if you and METUS agree otherwise. If the arbitrator decides in your favor, the award may include your costs of arbitration, your reasonable attorneys' fees and your reasonable costs for any expert and other witnesses, and any judgment on the award rendered by the arbitrator may be entered in any court of competent jurisdiction. If the arbitrator makes an award in your favor greater than METUS's last written offer, METUS will pay you the greater of the award or \$500, plus your reasonable attorney's fees, if any, and reimburse any reasonable expenses (including reasonable expert witness fees and costs) that are reasonably accrued for investigating, preparing, and pursuing your claim in arbitration, as determined by the arbitrator or as agreed to by you and METUS. Any judgment on the award rendered by the arbitrator may be entered in any court of competent jurisdiction. You may sue under state law in a small claims court of competent jurisdiction without first engaging in arbitration, but you must engage in arbitration before suing under the Federal Magnuson-Moss Act.
- 8) All claims must be brought in the parties' individual capacity, and not as a plaintiff or class member in any purported class or representative proceeding. This waiver applies to class arbitration unless such arbitration is necessary to effectuate the enforcement of the court class action waiver or in the event that class arbitration is expressly agreed to by METUS. You agree that you and METUS are each waiving the right to a trial by jury or to participate in a class action.
- 9) You may opt-out of the foregoing arbitration and class action/jury trial waiver provision of this Limited Warranty by notifying METUS in writing within 30 days of purchase. Such written notification must be sent to MITSUBISHI ELECTRIC TRANE HVAC US LLC ATTN: MEUS Legal Department, 5900-A Katella Avenue, Cypress, CA 90630, and must include (1) your name, (2) your address, (3) your warranted product's serial number, and (4) a clear statement indicating that you do not wish to resolve disputes through arbitration and demonstrating compliance with the 30-day time limit to opt-out.
- 10) If any clause herein is found to be illegal or unenforceable, that clause will be severed from this Limited Warranty and the remainder of the Limited Warranty will be given full force and effect. As noted above, if a class action waiver of both court and arbitration class actions is found unenforceable, class arbitration will be expressly allowed under the Limited Warranty.
- 11) This Limited Warranty gives the original owner specific legal rights and the original owner may also have other rights that vary from state to state.
- 12) This Limited Warranty is valid only in the continental United States, Alaska and Hawaii, and it is not transferable.



DOAS Unit Submittal

Prepared For: NORR Date: August 01, 2024

Job Name: TCNJ - Roscoe Hall Lower Level

Trane U.S. Inc. is pleased to provide the following submittal for your review and approval. Submittal is based upon drawings dated 06/21/2024

Product Summary

Qty Product

1 Horizon DOAS Unit

Coordination Notes:

- 1. Voltage must be confirmed before release to production.
- 2. Please confirm electrical data. MCA and MOP are higher than schedule on drawings.
- 3. Horizontal Discharge Curb will be submitted in separate submittal
- 4. Unit will be shipped as submitted unless otherwise in writing

Mithil Parikh, Application Engineer

Trane U.S. Inc. 19 Chapin Road, Bldg B, Suite 200 Pine Brook, NJ 07058 E-mail: mithil.parikh@trane.com Office Phone: (973) 244-7000 Fax: (973) 887-8844 The attached information describes the equipment we propose to furnish for this project and is submitted for your approval.

Submittal acceptance and return is a critical step, so please ensure submittals are returned with approval to release to production within <u>14 days</u> of submittal date.

Product performance and submittal data is valid for a period of 6 months from the date of submittal generation. If six months or more has elapsed between submittal generation and equipment release, the product performance and submittal data will need to be verified. It is the customer's responsibility to obtain such verification.

Tag Data - Horizon DOAS Unit (Qty: 1)

Item	Tag(s)	Qty	Description	Model No.
A1	DOAS-1	1	Horizon DOAS Unit	OADG017C3-DAB50JL00-J1AGE1AE3-21D21E12AA00C00A00-
				AA1A000A0-00AK00000

Product Data - Horizon DOAS Unit

Item: A1 Qty: 1 Tag(s): DOAS-1

Airflow Configuration: Vertical Discharge/Vertical Return Indoor Coil Type: DX 6-Row Reheat: Fin & Tube Modulating HGRH Compressor: Digital Scroll-1st Circuit Only Outdoor Coil Type: ASHP Fin & Tube Heat Type - Primary: Electric - SCR Modulating Heat Capacity - Primary: 68 kW Supply Fan Motor Type: Direct Drive w/VFD Exhaust Fan Motor Type: Direct Drive w/VFD Fan Piezo Rings: Supply & Exhaust Fan Piezo Rings/Taps Unit Controls: Discharge Air Control - UC600 Building Interface: BACnet Filter Options: MERV-8 30%, MERV-13 80% Energy Recovery: ERV-Composite Construction with Frost Protection w/ VFD Energy Recovery Wheel Options: Purge Energy Recovery Wheel Size: ERC-5262C ERV Rotation sensor: Rotation sensor Damper Options: 100% OA 2-Position Damper w/RA 2-Position Damper Exhaust Dampers: Gravity Dampers Electrical Options: Non-Fused Disconnect "Circuit Breaker" Condenser Fan Options: Active (VFD) Head Pressure Low Ambient Control Hailguards: Hailguards Installation: Outdoor Convenience Outlet: Convenience Outlet Controls Display: TD7 Factory Installed Cooling Controls: Reliatel Condensate Overflow Switch: Condensate Overflow Switch Supply Discharge Air Sensor (FLD) 2 inch Double Wall Construction Stainless Steel Drip Pan Horizontal discharge Curb – Energy Recovery Cabinet (FLD) Startup & 1st year labor warranty by New Jersey Trane Services Blower HP - 5 Blower RPM - 1827 Supply Fan - ANPA 18 Exhaust RPM - 1818 Exhaust HP - 2 Exhaust Fan - ANPA 16 Unit Amps - FLA: 121.6 Amps Min Circuit Ampacity - MCA: 124.8 Amps Maximum Fuse Size - MFS: 125 Amps

NOT Included: Smoke detectors, integration into controls, control wiring, external vibration isolation, rigging/receiving, sheave changes, spare parts and service labor.

		Comments:			
Unit Information		<u>Tag:</u> [DOAS-1		
Model: Horizon™	(OAD/N Unit Length:	176 in Weid	iht Operati	na: 4	479 lb*
Rev	6 -	Note	: Weiaht	does not in	clude CURB weight.
Size D017	V Unit Width	95 in	See CU	RB submitte	al for actual
Quantity:	Unit Height:	68 in Refriger	ant Charg	ge - R-410A	
Supply Airflow: 4.300	CFM Elevation:	0 ft Circui	it 1:	46 lbs	
Outside Airflow: 4.300	CFM Ambient Air DB:	95 F			
Minimum Airflow: 2.673	CFM	•••			
Cooling Performance					
Gross Total Capacity:	202.2 MBh	Evaporato	or Face Ar	ea: 17	′.36 sa ft
Gross Sensible Capacity:	135.1 MBh	Evaporato	r Rows / F	PI: 6/	14
Net Total Capacity:	Condense	er Face Ar	ea: 29	.33 sq ft	
Net Sensible Capacity:	127.9 MBh	Condenser	Rows / Fl	PI: 3 /	12
Entering Air DB / WB (Coil):	81.7 / 68 F		Air Veloc	ity:	247 fpm
Leaving Air DB / WB (Coil):	52.4 / 52.2 F		Coil Air F	PD: 0	
Leaving Air DB / WB (Reheat):	55 / 53.32 F		EE	ER: 1	6.9
Leaving Air DB / WB (Unit):	56.8 / 54.1 F		Wa	tts: 18	162
Leaving DP:	51.8 F		MF	RE: 6	5.86 lb/kWh
MRC:	124.50 lb/h				
Heating Performance					
Heat Type: Heat Pu	Imp COP:	4.5			
Capacity: 191.	4 MBh Entering Air DB:	42.5 F			
Ambient Air DB: 3	5 F Leaving Air DB:	79.9 F			
Heating Performance					
Heat Type: Electric	Heat				
Capacity 6	8 kW	Voltage-Ph-Hz:	460-3-60		
Entering Air DB: 42.	5 F	Coil Air PD:	0.01	in H2O	
Leaving Air DB: 92.	5 F				
Energy Recovery Wheel ER	C-5262C	** TAB Outs	ide airflow	through OA	Intake to this value
Summer Condition	ons	Wi	inter Cor	nditions	
Ventilation Supply	Outside	Ventilation Supply	<u>v</u>	<u>0</u>	utside
Airflow: 4,300 CFM Air	flow: 4,522 CFM**	Airflow: 4,300 CFI	м	Airflow:	4,522 CFM**
DB: 81.7 F	DB: 92.0 F	DB: 42.5 F		DB:	0.0 F
WB: 68.0 F	WB: 75.0 F	WB: 39.0 F	E	WB:	-2.0 F
PD: 0.74 in H20		PD: 0.74 in H	120		
Return	Exhaust	Return	R	E	chaust
	<u> </u>	<u> </u>	v		
Airflow: 3,200 CFM Air	TIOW: 3,422 CFM	Airflow: 3,200 CFI	M	Airflow:	3,422 CFM
DB: 75.0 F	DB: 88.5 F	DB: 70.0 F		DB:	19.0 F
WD: 02.0 F FSP: 1 00 in H20 ED	VVD: /2.0 F / PD: 0.47 in H20	WB: 58.0 F	120		18.7 F
Total Capacity: 112.02 MB	H Eff. 77.0%	Total Capacity:	261.06	MBH	Eff. 73.0%
Sensible Capacity: 45.96 MB	H Ett. 79.0%	Sensible Capacity:	175.15	MBH	Eff: 72.0%
Latent Capacity: 66.06 MB	H Eff: 75.0%	Latent Capacity:	85.91	MBH	Eff: 76.0%



Standard R	adiated	I Sound F	ower Lo	evel (dBA)					
<u>63</u>	<u>125</u>	<u>250</u>	<u>500</u>	<u>1000</u>	2000	<u>4000</u>	<u>8000</u>	Total dBA		
61.4	71.4	78.4	83.4	83.4	83.4	84.4	80.4	90.4		
Sound power levels are listed for informational purposes only and are not guaranteed.										
Unit Electr	ical Dat	<u>a</u>								
Unit Voltage-Ph-Hz: 460-3-60					Min Circ	uit Ampacit	124.8 Amps			
	Unit	Amps - FLA	:	121.6 Amp	S	Maximu	m Fuse Siz	e - MFS:	125.0 Amps	
Electrical S	Summai	·У								
<u>Component</u>		Fan Ser	<u>vice</u>	Qty	<u>HP (ea.)</u>	<u>FLA (ea.)</u>	<u>RLA (ea</u>	.) <u>LRA (ea.)</u>		
ERV/HRV				1	0.17	0.44				
Scroll				1			12.	8 100		
Digital Scroll				1			12.	8 100		
		Exhaust	t	1	2	3				
		Supply		1	5	6.3				
		Conden	ser	3	1	2.1				
Controls				1		1				
Electric Heat				1		85.3				
Notes										
• Unit E	Electrical a	amps include	the greate	er of compres	sor or electri	cal heat amps				

• Unit's electrical as shown above are for single point power.

Drawing Accurate for OAD DX and OAD ASHP

Qty: 1 Tag(s): DOAS-1





Drawing Accurate for OAD DX and OAD ASHP

Qty: 1 Tag(s): DOAS-1



REFER TO LOCAL BUILDING CODES TO ENSURE INSTALLATION MEETS ALL NECESSARY REQUIREMENTS

Drawing Accurate for OAD DX and OAD ASHP

Qty: 1 Tag(s): DOAS-1



Drawing Accurate for OAD DX and OAD IDX and OAD ASHP

Qty: 1 Tag(s): DOAS-1



DUAL DIMENSIONS: [CM.]

Mechanical Specifications - Tag(s): DOAS-1

Casing

Unit casing shall be constructed of zinc coated, heavy gauge, galvanized steel. Exterior surfaces shall be cleaned, phosphatized, and finished with a weather-resistant baked enamel finish. Unit's surface shall be tested 672 hours in a salt spray test in compliance with ASTM B117. Unit shall have 2 inch thick Antimicrobial two component rigid polyurethane foam insulation, metal encapsulated with no exposed edges. Initial R value of 6.7 per inch of thickness. The unit's base pan shall have no penetrations within the perimeter of the curb other than the raised downflow supply/return openings to provide an added water integrity precaution, if the condensate drain backs up.

Unit Top

The top cover shall be one piece construction or, where seams exist, it shall be double-hemmed and gasket-sealed. The ribbed top adds extra strength and enhances water removal from unit top

Sensors

A factory installed combination outdoor air sensor located in the outdoor air hood is designed to sense both outdoor air temperature and relative humidity for use by the microprocessor controller to make required ventilation, cooling, dehumidification and heating decisions. Refer to the Sequence of Operations section of the Installation, Operation and Maintenance manual for detailed unit control and operational modes. A factory installed sensing tube is designed to sense the supply air temperature downstream of the indoor fan section.

Indoor Coil Type: DX 6-Row

Internally finned, inch copper tubes mechanically bonded to a configured aluminum plate fin shall be standard. Coils shall be leak tested at the factory to ensure the pressure integrity. The evaporator coil shall be leak tested to 500 psig and pressure tested to 500 psig. A Stainless Steel double-sloped condensate drain pan with provision for through the unit wall condensate drain is standard. Evaporator coil will have 6 interlaced rows for superior sensible and latent cooling.

Reheat: Fin & Tube Modulating HGRH

This option shall consist of a modulating hot-gas reheat coil located on the leaving air side of the evaporator coil prepiped and circuited with a low pressure switch. Refer to the Sequence of Operations section of the Installation, Operation and Maintenance manual for detailed unit control and operational modes.

Compressor: Digital Scroll-1st Circuit Only

All units shall have direct-drive, hermetic, digital scroll type compressors with centrifugal type oil pumps. Motor shall be suction gas-cooled and shall have a voltage utilization range of plus or minus 10 percent of unit nameplate voltage. Internal overloads shall be provided with the scroll compressors. Crankcase heaters shall be included. Compressor shall be able to fully modulate from 20%-100%.

Outdoor Coil Type: ASHP Fin & Tube

(Fin and Tube Coil) - Internally finned, copper tubes mechanically bonded to a configured aluminum plate fin shall be standard. Coils shall be leak tested at the factory to ensure the pressure integrity. The condenser coil shall be leak tested to 500 psig and pressure tested to 500 psig. The condenser coil shall have a fin design with slight gaps for ease of cleaning.

Outdoor Fans: Shall be direct drive vertical discharge design with low-noise corrosion resistant glass reinforced polypropylene props, powder coated wire discharge guards and electro-plated motor mounting brackets. Fans shall be statically and dynamically balanced.

Heat Type - Primary: Electric - SCR Modulating

TCNJ - Roscoe Hall Lower Level

Primary heat is supplied using Electric Resistance heaters. Heaters shall meet the requirements of the National Electrical Code and shall be listed by Underwriters Laboratories for zero clearance to combustible surfaces and for use with heat pumps and air conditioning equipment. Heating elements shall be open coil, 80% nickel, 20% chromium, Type A resistance wire, Type C alloys containing iron or other alloys are not acceptable. Coils shall be machine crimped into stainless steel terminals extending at least 1" into the air stream and all terminal hardware shall be stainless steel. Coils shall be supported by ceramic bushings staked into supporting brackets. Brackets are not to be spaced more than 4-1/2" apart. Heater frames and terminal boxes shall be corrosion resistant steel. Unless otherwise indicated, the terminal box shall be NEMA 1 construction and shall be provided with a hinged, latching cover. Open coil heaters shall be furnished with an airflow switch, disconnecting contactors, fuses (if over 48 amps), control circuit transformer (with primary fusing on Class I circuits as required), built-in, snap acting, door interlock disconnect switch, and a disk type, automatic reset thermal cutout for primary overtemperature protection. Heaters shall also be furnished with disk type, load-carrying manual reset thermal cutouts, factory wired in series with heater stages for secondary protection. Heat limiters or other fusible overtemperature devices are not acceptable. For modulating heaters, control will be SCR type. For staged heaters, 5kW capacity will be 2 stage and all heaters above 5kW will be 4 stage. Unit shall be suitable for use with Electric Resistance Heat.

Heat Capacity - Primary: 68 kW

Primary heat is supplied using Electric Resistance heaters. Heaters shall meet the requirements of the National Electrical Code and shall be listed by Underwriters Laboratories for zero clearance to combustible surfaces and for use with heat pumps and air conditioning equipment. Heating elements shall be open coil, 80% nickel, 20% chromium, Grade A resistance wire. Type C alloys containing iron or other alloys are not acceptable. Coils shall be machine crimped into stainless steel terminals extending at least 1 inch into the air stream and all terminal hardware shall be stainless steel. Coils shall be supported by ceramic bushings staked into supporting brackets. Heater frames and terminal boxes shall be corrosion resistant steel. Unless otherwise indicated, the terminal box shall be NEMA 1 construction and shall be provided with a hinged, latching cover. Heaters shall be furnished with a disc type, automatic reset thermal cutout for primary over temperature protection. All heaters shall also be furnished with disc type, load-carrying manual reset thermal cutouts, factory wired in series with heater stages for secondary protection. Heat limiters or other fusible over temperature devices are not acceptable. Unit shall be suitable for use with Electric Resistance Heat.

Supply Fan Motor Type: Direct Drive w/VFD

Supply Fan motor shall be direct drive type with factory installed Variable Frequency Drive (unless no controls option is selected, VFD can be provided by others). All motors shall be thermally protected. All indoor fan motors meet the U.S. Energy Policy Act of 2005 (EPACT). All Fans shall be mounted on rubber vibration isolators, to reduce the transmission of noise.

Exhaust Fan Motor Type: Direct Drive w/VFD

Exhaust Fan motor shall be direct drive type with factory installed Variable Frequency Drive (unless no controls option is selected, VFD can be provided by others). All motors shall be thermally protected. All indoor fan motors meet the U.S. Energy Policy Act of 2005 (EPACT). All Fans shall be mounted on rubber vibration isolators, to reduce the transmission of noise.

Fan Piezo Rings: Supply & Exhaust Fan Piezo Rings/Taps

Air flow measurement will be accomplished through the use of Piezo Ring/Tap technology installed in the supply and Exhaust fan wheel area.

Unit Controls: Discharge Air Control - UC600

Unit is completely factory wired with necessary controls and contactor pressure lugs for power wiring. Units will provide an external location for mounting fused disconnect device. PLC controls are provided for all 24 volt control functions. The resident control algorithms will make all heating, cooling and/or ventilating decisions in response to electronic signals from sensors measuring outdoor temperature and humidity. The control algorithm maintains accurate temperature control, minimizes drift from set point and provides better building comfort. A centralized PLC (UC600) will provide anti-short cycle timing for a higher level of machine protection. Terminals are provided for a field installed dry contact or switch closure to put the unit in the Occupied or Unoccupied modes.

Filter Options: MERV-8 30%, MERV-13 80%

Aluminum Mesh Filters (D, K and N Cabinets) and Galvanized Mesh Bird Screen (B and G Cabinets)shall be installed on the intake of the unit. In addition, one row of 2 inch MERV-8 rated prefilters (30 percent) and 2 inch MERV-13 final filter (80 percent) installed prior to the evaporator coil. Unit shall be equipped with a 6" filter rack upstream of the evaporator. Frame shall be field-adjustable to match any filter combination specified in the attached selection. Energy recovery wheel performance shall be AHRI 1060 certified and bear the AHRI certified label. The rotating wheel heat exchanger is composed of a rotating cylinder in an insulated cassette frame complete with removable energy transfer media, seals, drive motor and drive belt. Energy transfer media shall be constructed of a durable synthetic lightweight polymer. The total energy recovery wheel is coated with a desiccant tat shall be either Type-A silica gel or 3A molecular sieve and permanently bonded to the energy transfer media without the use of binders or adhesives. The lightweight polymer substrate will not degrade nor require additional coatings for application in marine or coastal environments. Coated segments are cleanable outside of the cabinet with detergent or alkaline coil cleaner and water. Desiccant will not dissolve nor deliquesce in the presence of water or high humidity.

ERV Rotation sensor: Rotation sensor

Inductive Proximity Sensors detect metal objects without contact and are characterized by a long service life and extreme ruggedness. With the latest ASIC technology, the manufacture's sensors offer the ultimate in precision and reliability. Their sensors are the intelligent, reliable route to implementing wheel rotation.

Damper Options: 100% OA 2-Position Damper w/RA 2-Position Damper

The unit shall have a factory installed and integrated 100% outdoor air hood with damper controlled a by direct coupled actuator and 2 inch permanent and washable aluminum mesh filters accessible through a hinged access panel. The unit is factory equipped with a return air damper controlled by a direct coupled actuator that is electrically interlocked with the outdoor air damper to allow 100% return air recirculation in the Unoccupied cooling mode.

Electrical Options: Non-Fused Disconnect "Circuit Breaker"

A 3-pole, molded case, HACR circuit breaker with provisions for through the base electrical connections shall be factory installed. Wiring will be provided from the circuit breaker to the unit high voltage terminal block. The switch will be UL/CSA agency recognized. The circuit breaker will be sized per NEC and UL guidelines.

Factory wired Voltage/Phase monitor shall be included as standard. In the event of any of the following, the units will be shut down and upon correction of the fault condition the unit will reset and restart automatically.

- 1. Phase Unbalance Protection: Factory set 2%
- 2. Over/Under/Brown Out Voltage Protection: +/-10% of nameplate voltage
- 3. Phase Loss/Reversal

Hailguards: Hailguards

Hail guards shall be installed on the outside of the condenser coil. The guards shall consist of perforated metal, of the same gauge and color as the unit itself. Airflow through the hail guards shall not be restricted due to location or size of the perforations. Guards shall be removable to accommodate coil cleaning.

Convenience Outlet: Convenience Outlet

A powered 120 volt, 15 amp, 2 plug convenience outlet shall be factory installed. A service receptacle disconnect shall be installed. The convenience outlet is powered from the line side of the disconnect or circuit breaker, and therefore will not be affected by the position of the disconnect or circuit breaker.



FEATURES & SPECIFICATIONS

INTENDED USE — Available in 2X2, 2X4, and 1X4 configurations, STACK Switch provides both functionality and efficiency. Selectable lumens allows for a variety of mounting heights and switchable color temperature allow you to fine tune the look of your space. The wide center basked and curved matter reflector allow STACK Switch to deliver a high quality of light while maintaining optimal performance.

• Lumen and color switching make the STACK switch a distributors dream! Go from stocking 108 configurations to just Twelve!

• 0-10V dimming to 10%

• Long-life LEDs deliver 80% lumen maintenance at 60,000 hours

The STACK Switch troffer delivers glare-free, ambient lighting in a popular center-basket design. The slim profile of the luminaire, coupled with energy-saving LED technology make the STACK Switch an ideal choice for renovation or new construction. The STACK Switch troffer offers a high-quality, cost-effective LED lighting solution for schools, offices, retail, healthcare facilities and other commercial spaces.

CONSTRUCTION — The reflector is finished with a glare reducing matte white paint for improved aesthetics and increased light diffusion. End plates contain easy-to-position integral T-bar clips to securely attach the luminaire to the T-grid. Diffusers are extruded from impact modified acrylic for increased durability. LED boards are accessible from the room-side and drivers are accessible from the plenum.

INSTALLATION — With a depth of only 1.9" for standard models and XX" for CP/EM models, the STACK Switch makes for an easy installation, especially in restrictive plenum applications. The STACK Switch fits into standard 15/16" and narrow 9/16" T-grid ceiling systems. Suitable for damp location.

ELECTRICAL — Long-life LED's, coupled with high-efficiency drivers provide superior quality of light and an extended service life. 80% LED lumen maintenance at 60,000 hours (L80/60,000). 0-10 volt dimming driver, dims to 10%.

Lumen and Color Switching: Integrated lumen and color switching module is easily accessible and mounted on the driver box on the back of the fixture. Simply adjust the toggle switch for low, medium, and high lumen and color settings.

OPTICS — Volumetric illumination is achieved by creating an optimal mix of light to walls, partitions and vertical and horizontal work surfaces – rendering the interior space, objects and occupants in a more balanced, complimentary luminous environment. A high performance acrylic diffuser conceals LED's and efficiently delivers light in a volumetric distribution.

LISTINGS — CSA certified to meet US and Canadian standards. Damp location listed. IC rated. DesignLights Consortium® (DLC) Premium qualified product and DLC qualified product. Not all versions of this product may be DLC Premium qualified or DLC qualified. Please check the DLC Qualified Products List at <u>www.</u> <u>designlights.org/QPL</u> to confirm which versions are qualified.

WARRANTY — 5-year limited warranty. This is the only warranty provided and no other statements in this specification sheet create any warranty of any kind. All other express and implied warranties are disclaimed. Complete warranty terms located at: <u>www.acuitybrands.com/support/warranty/terms-and-conditions</u>

Note: Actual performance may differ as a result of end-user environment and application. All values are design or typical values, measured under laboratory conditions at 25 °C. Specifications subject to change without notice. Catalog Number

Notes

Туре

LED Center Element Lay-In



Length 1X4: 47-3/4 (121.3) Width 1X4: 11-3/4 Length 2X2: 23-3/4 (60.3) Width 2X2: 23-3/4 (60.3) Length 2X4: 47-3/4 (121.3) Width 2X4: 23-3/4 (60.3) Depth 1X4, 2X2, 2X4: 1.9 (4.8) Depth 1X4, 2X2, 2x4 CP: 3-3/8 (8.57) Depth 1X4, 2x2, 2x4 EM: 3-5/8 (9.2)

Specifications





All dimensions are inches (centimeters) unless otherwise specified.



ORDERING INFORMATION Example: STAKS 2X4 ALO6 SWW7 IE10WCP Lead times will vary depending on options selected. Consult with your sales representative. Series Size & Lumens Switchable Options STAKS STAK Switchable 1X4 ALO6 Switchable Lumens - 4000LM, 5000LM, and 6000LM SWW7 Switchable CCT - 35K, 40K, 50K (BLANK) No Option * 2X2 ALO3 Switchable Lumens - 3000LM, 4000LM, and 5000LM CP Chicago Plenum Rated * IE10WCP 10W Emergency backup, 10W * 2X4 ALO6 Switchable Lumens - 4000LM, 5000LM, and 6000LM IE10WCP UVOLT 120-347 *

* Only one option may be selected, multiple options can not be combined

ACCESSORIES

Accessories: Order as separate catalog number.		
DGA14 Drywall grid adapter for 1x4 recessed fixture. DGA22 Drywall grid adapter for 2x2 recessed fixture. DGA24 Drywall grid adapter for 2x4 recessed fixture. 1X45MKSHP PAF Multi-Use Surface Mount Kit 1X4 Post-Paint 2X25MKSHP PAF Multi-Use Surface Mount Kit 2X2 Post-Paint 2X45MKSHP PAF Multi-Use Surface Mount Kit 2X4 Post-Paint 1LB CP10 A LED emergency battery pack, 10W 50VDC (Noncompliant with CA T20) ILBLP CP10 HE SD A LED emergency battery pack, 10W Constant Power, Self-Diagnostic,	ELA PSRME IC *27005E RK8BDP 2P J40 *270055 RK8BDP 2P J10 *270052 RK8BDP 2P U	Remote enclosure for battery for insulated ceiling Disconnect Plug (BDP) package of 40 Disconnect Plug (BDP) Package of 10 Disconnect Plug (BDP) Unit Pack

STACK Switch WSXA D and SPODMA D wall switches.





PERFORMANCE DATA

SWITCH	SWITCHABLE TABLE *When adding an EM Battery Option, input wattage is increased by 2-4 Watts										
Size	Nomenclature	Lumen Package	ССТ	Lumens	Wattage	Efficacy					
			35K	4212	31.18	135					
		Low Lumens	40K	4369	30.32	144					
			50K	4251	31.26	136					
			35K	5205	39.92	130					
1X4	STAKS 1X4 ALO6 SWW7	Medium Lumens	40K	5413	38.54	140					
			50K	5229	39.85	131					
			35K	6034	48.15	125					
		High Lumens	40K	6328	46.22	137					
			50K	6077	48.57	125					
			35K	3561	26.92	132					
	STAKS 2X2 ALO3 SWW7	Low Lumens	40K	3683	26.18	141					
			50K	3583	27.01	133					
			35K	4371	34.23	128					
2X2		Medium Lumens	40K	4563	33.13	138					
			50K	4375	34.22	128					
			35K	5035	40.92	123					
		High Lumens	40K	5297	39.41	134					
			50K	5053	40.99	123					
			35K	4325	31.5	137					
		Low Lumens	40K	4470	30.61	146					
			50K	4369	31.6	138					
			35K	5310	40.09	132					
2X4	STAKS 2X4 ALO6 SWW7	Medium Lumens	40K	5517	38.71	143					
			50K	5357	40.26	133					
			35K	6170	48.51	127					
		High Lumens	40K	6492	46.6	139					
			50K	6228	48.39	129					

Emergency Battery Delivered Lumens

Total delivered lumens will differ when in emergency power, this can be calculated by using the following formula **Delivered Lumens = 1.25 x 10 x LPW**

Lumens Per Watt (LPW) is calculated by Lumens / Wattage.

LITHONIA LIGHTING

STACK SWITCH

PHOTOMETRICS

See STACK - Low-Profile Recessed LED Luminaire (acuitybrands.com) for photometry reports.



Standard STAKS Switch Box



Chicago Plenum Option



Chicago Plenum Wiring Access



Emergency Option



Chicago Plenum Cover Opening

Audiovisual Space and Systems Summary Sheet				
Project	The College of New Jersey - Roscoe Hall			
Project Location	2000 Pennington Rd, Ewing, NJ			

Responding Bidder & Contact Information

Note: This summary and the following descriptions is intended to provide the Owner with line item pricing of major system components and total systems costs. This document is not to be treated as a complete bill of materials and it is the bidders responsibility to capture all costs for a complete and working system as described in the drawings and specification. Please refer to specification for "or equal" substitution requirements.

Non-Equipment Costs are to be inclusive of all site labor, shipping, storage, engineering, warrantee, bond and other fees. Bidder is responsible for verifying formulas and all system and equipment counts as part of their response.

			1							
									System	
Item #	Systems	Enlarged Plan Callout	E	quipment	Non-	Equipment	Cost pe	r System	Count	Total Systems Cost
1	Student Lounge	TA6.02	\$	-	\$	-	\$	-	1	\$-
2	Elevator Lobby	TA6.03	\$	-	\$	-	\$	-	1	\$-
3	Classroom G25	TA6.07	\$	-	\$	-	\$	-	1	\$-
4	Classroom - Typical	TA6.14 & TA6.06	\$	-	\$	-	\$	-	4	\$-
5	Classroom - G26	TA6.12	\$	-	\$	-	\$	-	1	\$-
6	CETL Learning Studio	TA6.08	\$	-	\$	-	\$	-	1	\$-
7	Mentoring Center	TA6.13	\$	-	\$	-	\$	-	1	\$-
8	CETL Seminar Room	TA6.11	\$	-	\$	-	\$	-	1	\$-
9	Main Lobby	TA6.01	\$	-	\$	-	\$	-	1	\$-
10	Seminar	TA6.05	\$	-	\$	-	\$	-	1	\$-
11	Office		\$	-	\$	-	\$	-	5	\$-
12	12 Small Group Study (refer to 'Small' tab)			-	\$	-	\$	-	2	\$-
13	Large Group Study (refer to 'Large' tab)		\$	-	\$	-	\$	-	2	\$-
14	Typical Classroom Second display		\$	-	\$	-	\$	-	4	\$-
15	Seminar Second display (refer to 'Semir	nar ALT' tab)	\$	-	\$	-	\$	-	1	\$-
16	CETL Seminar Room Second Display		\$	-	\$	-	\$	-	1	\$-
			Т	OTALS						
							Equip	ment Cost	Summary	\$-
						N	on-Equipn	nent Costs	Summary	\$-
						G	rand Tota	al (Basis o	f Award)	\$-
	All equipment marked as OEE has	boon nurchasod sonarai	toly b	the college	and ch	uld not ho i	ncludod ir	the total	oquinmon	t cost
	An equipment marked as OFE has	been purchased separat	Lely D	y the conege	and sh		included ii		equipinen	1 COSI.
		WARRANTEES, SER	VICE	AGREEMENT	S & LAB	OR COSTS				
First year	warrantee to be included in base scope	equipment and non-equip	oment	costs. Provid	de costs	for the seco	nd and thi	rd year wa	rrantee m	atching the base
								Warrantee	Year Two	\$-
							W	'arrantee Y	ear Three	\$ -
				Quarter	y One D	ay Service A	opointmer	nt (per app	ointment)	\$-

Space Type	Student lounge	tudent lounge									
Description	Lounge display ru	unge display running owner standard signage platform on OFE PC									
Supported Use Cases	Digital Signage	gital Signage									
Notable Features	OFE PC to be conf	igured to run owner s	tandard signage platform. TCNJ to configure								
External Interfaces	None	ne									
Description	Manufacturer	Model	Notes	Unit Co	ost	Quantity	Total Cost				
Display System											
65" Flat Panel Display; 16x7	NEC or equal	E658 or equal		\$	-	1	. \$	-			
Flat Panel Display 5 year extended warranty	NEC or equal	ADVEXMX-5Y-12 or	equal	\$	-	1	. \$	-			
Flat Panel Display Articulating Wall Mount	Chief or equal	MWRIWUB or equa	I	\$	-	1	\$	-			
Video Sources											
Media Player License	Visix or equal	VX-S-CPO or equal		\$	-	1	\$	-			
1 Year Maintenance contract	Visix or equal	VX-S-SMX or equal		\$	-	1	. \$	-			
OFE signage PC	OFE	OFE	Running OFE Visix signage platform	\$		θ	\$				
Accessories											
Compact surge protector	SurgeX or equal	SA-82 or equal		\$	-	1	\$	-			
Cabling & Accessories	Per Contractor	Per Contractor		\$	-	1	\$	-			
					Equip	ment Totals	\$	-			
	Non-Equi	pment Costs (project i	management, engineering, shipping, onsite install	ation, commiss	ioning,	warrantee)	\$	-			
					Sy	stem Totals	\$	-			

Space Type	Elevator Lobby											
Description	Lobby display runni	obby display running owner standard signage platform on Mersive Solstice, includes a wireless presentation device for screen casting										
Supported Use Cases	Digital Signage, wire	eless presentation, wirel	ess collaboration									
Notable Features	Signage to run on t	he Mersive POD. TCNJ t	o configure this									
External Interfaces	None											
Description	Manufacturer	Model	Notes	Unit Cost	Quantity	Total Cost						
Display System												
65" Flat Panel Display; 16x7	NEC or equal	E658 or equal		\$ -	1	\$-						
Flat Panel Display 5 year extended warranty	NEC or equal	ADVEXMX-5Y-12 or e	qual	\$ -	1	\$-						
Flat Panel Display Articulating Wall Mount	Chief or equal	MWRIWUB or equal		\$ -	1	\$-						
Video Sources												
HTML5 playlist license and viewer license	Visix or equal	VX-S-PVO or equal		\$ -	1	\$-						
Remote implementation support service	Visix or equal	VX-S-IMW or equal		\$ -	1	\$-						
Wireless Collaboration Device	Mersive or equal	SP-8100-E5 or equal	Unlimited Enterprise - 5 year	\$ -	1	\$-						
Accessories												
Compact surge protector	SurgeX or equal	SA-82 or equal		\$ -	1	\$-						
Cabling & Accessories	Per Contractor	Per Contractor		\$ -	1	\$-						
						ł						
				Equipr	nent Totals	\$-						
	Non-Equipment Cost	s (project management,	engineering, shipping, onsite installa	tion, commissioning,	warrantee)	\$-						
		· · · ·		Sys	stem Totals	\$ -						
				•								

Space Type	Classroom G25											
	Standard Classroom spa	ce with dual wall mounted displays,	dual wall mounted PTZ came	eras, overhea	d speakers ar	nd microphone	arrays,					
	dual channel wireless m	icrophone system, OFE pc, wall mou	inted touchpanel and connec	tions for gue	st instructor l	aptop. System	includes a					
	wireless collaboration d	vireless collaboration device. All video transmitted via AV over IP system with a local network switch. System includes a USB sharing switc										
	to allow the room dsp a	allow the room dsp and cameras to be switched between the OFE pc and a guest instructor laptop. All equipment will be rack mounted a										
Description	the teachers station.	e teachers station.										
Supported Use Cases	Presentation, video con	ferencing										
Notable Features	room resources will be s	sharable to both an installed pc and	a guest laptop connection									
External Interfaces	Connection to building f	ire alarm system for muting										
Description	Manufacturer	Model	Notes	Unit Cost	Quantity	Total Cost						
Display System												
98" Flat Panel Display; 16x7 450 nit	NEC or equal	E988 or equal		\$-	2	\$	-					
Flat Panel Display 5 year extended warranty	NEC or equal	ADVEXMX-5Y-12 or equal		\$-	2	\$	-					
ADA compliant in wall scissor mount for 98"												
display	RPVisuals or equal	RPWM-32MAXBF-XMS-ADA-NB		\$-	2	\$	-					
in wall box for ADA scissor mount	RPVisuals or equal	RPWM-32MAXBF-BOX-KIT	to be installed by EC	\$-	2	\$	-					
4K60 4:4:4 HDR Network AV Decoder	Crestron or equal	DM-NVX-D30 or equal		\$-	2	\$	-					
Video Conferencing System												
4k USB PTZ camera with face tracking /		910-2100-012 or equal	Unite 160 4k									
autoframing	Clearone or equal			\$-	2	\$	-					
Thin Profile wall mount		910-2100-104 or equal	Wall mount for Unite 160									
	Clearone or equal		4k camera	\$-	2	\$	-					
Camera Extension system	SCT or equal	RCU2S-B10 or equal		\$ -	2	\$	-					
Video Sources												
			Includes wireless keyboard									
Room PC	OFE	OFE	and mouse and display	\$	1	\$						
			Unlimited Enterprise - 5									
Wireless Collaboration Device	Mersive or equal	SP-8000-E5 or equal	year	\$-	1	\$	-					
Video Distribution												
4K60 4:4:4 HDR Network AV Encoder	Crestron or equal	DM-NVX-E30 or equal		\$-	4	\$	-					
2-input USB 3.2 Data Matrix Switcher	Crestron or equal	USB-SW-200 or equal		\$ -	1	\$	-					
Audio System												
12 in/8 out audio dsp with USB audio, GPIO,												
and dante audio networking	Clearone or equal	910-3200-101-D or equal	Converge Pro 2 128SRD	\$-	1	\$	-					
Ceiling mic array	Clearone or equal	910-3200-208-U or equal	BMA 360 Microphone	\$-	2	\$	-					
Dual Channel Digital Wireless Receiver	Shure or equal	ULXD4D or equal		\$-	1	\$	-					
Handheld Transmitter w/ SM58 cartridge	Shure or equal	ULXD2/SM58 or equal		\$-	1	\$	-					
Wireless Bodypack Transmitter	Shure or equal	ULXD1 or equal		\$-	1	\$	-					
Lavalier Microphone	Shure or equal	MX150B/C-TQG or equal		\$-	1	\$	-					
Dual Docking recharging station	Shure or equal	SBC200 or equal		\$ -	1	\$	-					

			includes C-ring and rails					
6.5" Two-way low-profile ceiling speaker,			for blind mount					
70/100V transformer with 16Ω bypass, 135°			installation, Ø305 mm cut-					
conical DMT coverage	QSC or equal	AD-C6T-LP or equal	out	\$	-	12	\$	-
Assistive Listening System								
LISTENIR IDSP LEVEL II SYSTEM	Listen or equal	LS-91 or equal		\$	-	1	\$	-
Control Components]				
4-Series [®] Room Media Controller	Crestron or equal	RMC4 or equal		\$	-	1	\$	-
			Color Selection					
			Black/white by					
Table top 7" Touch Screen	Crestron or equal	TS-770-X-S or equal	Owner/Architect	\$	-	1	\$	-
24 port POE+ managed Network Switch	Netgear or equal	XSM4216F-100NAS or equal		\$	-	1	\$	-
Instructors Desk								
			Includes integrated 16ru					
	Miller's Presentation		rack. Color selection by					
Custom	Furniture or equal	TCNJ-4002 or equal	owner/architect	\$	-	1	\$	-
Equipment Racks								
Dual LED Worklight	Middle Atlantic or equal	LT-CABUTL-DUAL or equal		\$	-	1	\$	-
Horizontal Power Distribution Unit w/ integra	Middle Atlantic or equal	PDCOOL-1115R or equal		\$	-	1	\$	-
Accessories								
Compact surge protector	SurgeX or equal	SA-82 or equal		\$	-	2	\$	-
Universal 4K HDMI [®] Dongle Adapter Ring								
with Color Coded Mini DisplayPort™ and								
USB-C	Cables2Go or equal	C2G30044 or equal		\$	-	1	\$	-
Cabling & Accessories	Per Contractor	Per Contractor		\$	-	1	\$	-
Equipment Totals								-
Non-Equipment Costs (project management, engineering, shipping, onsite installation, commissioning, warrantee)								-
System Totals								-

Space Type	Typical Classroom								
	Standard Classroom snace with single wall mounted display, dual wall mounted DTZ cameras, overhead speakers and microphone								
	stanuary classicities with single wan mounted uspidy, dual wan mounted PTZ cameras, overneda speakers and micro								
	All video transmitted via AV over IP system with a local network switch. System includes a USB sharing switch to allow the room don and								
Description	An vice transmitted vid AV over it'system with a local network switch, system includes a use sharing switch to allow the room dsp a								
Sunnorted Use Cases	Presentation video conferencing								
Notable Features	resonation, video conferencing								
External Interfaces	Connection to building fire alarm system for muting								
	connection to building								
Description	Manufacturer	Model	Notes	Unit Cost	Quantity	Total Cost			
Display System									
98" Flat Panel Display; 16x7 450 nit	NEC or equal	E988 or equal		\$-	1	\$ -			
Flat Panel Display 5 year extended warranty	NEC or equal	ADVEXMX-5Y-12 or equal		\$ -	1	\$ -			
ADA compliant in wall scissor mount for 98"				- <i>'</i>					
display	RPVisuals or equal	RPWM-32MAXBF-XMS-ADA-NB		\$-	1	\$-			
in wall box for ADA scissor mount	RPVisuals or equal	RPWM-32MAXBF-BOX-KIT	to be installed by EC	\$ -	1	\$ -			
4K60 4:4:4 HDR Network AV Decoder	Crestron or equal	DM-NVX-D30 or equal		\$ -	1	\$ -			
Video Conferencing System		•							
4k USB PTZ camera with face tracking /		910-2100-012 or equal	Unite 160 4k	1					
autoframing	Clearone or equal			\$-	2	\$-			
Thin Profile wall mount		910-2100-104 or equal	Wall mount for Unite						
	Clearone or equal		160 4k camera	\$-	2	\$-			
			In wall mount for						
In Wall camera enclosure	Vaddio or equal	999-2225-020 or equal	Unite 160 4k camera	\$-	2	\$-			
Camera Extension system	SCT or equal	RCU2S-B10 or equal		\$-	2	\$-			
Video Sources									
			Includes wireless						
			keyboard and mouse						
Room PC	OFE	OFE	and display	\$	1	\$			
			Unlimited Enterprise -						
Wireless Collaboration Device	Mersive or equal	SP-8000-E5 or equal	5 year	\$-	1	\$-			
Video Distribution									
4K60 4:4:4 HDR Network AV Encoder	Crestron or equal	DM-NVX-E30 or equal		\$ -	4	\$-			
2-input USB 3.2 Data Matrix Switcher	Crestron or equal	USB-SW-200 or equal		\$ -	1	\$ -			
Audio System									
12 in/8 out audio dsp with USB audio, GPIO,			Converge Pro 2						
and dante audio networking	Clearone or equal	910-3200-101-D or equal	128SRD	\$ -	1	\$-			
Ceiling mic array	Clearone or equal	910-3200-208-0 or equal	BMA 360 Microphone	Ş -	2	Ş -			
			includes C-ring and						
70/100// transformer with 160 hypers 125°			installation d205 mm						
20/1000 transformer with 160 bypass, 135			installation, Ø305 mm	ć		ć			
	USC or equal	AD-COI-LP of equal		Ş -	6	- Ç			
	Constant of the					<u> </u>			
4-Series® Koom Media Controller	crestron or equal	KIVIC4 or equal		Ş -	1	Ş -			

			Color Selection				
			Black/white by				
7" Wall Mounted Touch Screen	Crestron or equal	TSW-770-X-S or equal	Owner/Architect	\$	-	1	\$ -
24 port POE+ managed Network Switch	Netgear or equal	XSM4216F-100NAS or equal		\$	-	1	\$ -
Instructors Desk							
			Includes integrated				
			16ru rack. Color				
	Miller's Presentation		selection by				
Custom	Furniture or equal	TCNJ-4002 or equal	owner/architect	\$	-	1	\$ -
Equipment Racks							
Dual LED Worklight	Middle Atlantic or equal	LT-CABUTL-DUAL or equal		\$	-	1	\$ -
Horizontal Power Distribution Unit w/ integrated	Middle Atlantic or equal	PDCOOL-1115R or equal		\$	-	1	\$ -
Accessories							
Compact surge protector	SurgeX or equal	SA-82 or equal		\$	-	1	\$ -
Universal 4K HDMI® Dongle Adapter Ring with							
Color Coded Mini DisplayPort™ and USB-C	Cables2Go or equal	C2G30044 or equal		\$	-	1	\$ -
Cabling & Accessories	Per Contractor	Per Contractor		\$	-	1	\$ -
Equipment Totals							\$ -
Non-Equipment Costs (project management, engineering, shipping, onsite installation, commissioning, warrantee)							\$ -
System Totals							\$ -
Single display Classroom space with dual wall mounted PTZ cameras, overhead speakers and microphone arrays, OFE pc, wall n touchpanel and connections for guest instructor laptop. System includes a wireless collaboration device. All video switched by format video switch and extended to display. Includes local control processor and network switch. System includes a USB shari	ounted small og switch						
---	------------------------------						
to allow the room dsp and cameras to be switched between the OFE pc and a guest instructor laptop. All equipment will be rac	mounted						
Description at the teachers station.							
Supported Use Cases Presentation, video conferencing							
Notable Features room resources will be sharable to both an installed pc and a guest laptop connection							
External Interfaces Connection to building fire alarm system for muting							
Description Manufacturer Model Notes Unit Cost Quantity Total Cost							
Display System							
98" Flat Panel Display: 16x7 450 nit NEC or equal F988 or equal \$ - 1 \$	_						
Flat Panel Display 5 year extended warranty NEC or equal ADVEXMX-5Y-12 or equal \$ - 1 \$	_						
ADA compliant in wall scissor mount for 98"							
display RPVisuals or equal RPWM-32MAXBF-XMS-ADA-NB S - 1 S	-						
in wall box for ADA scissor mount RPVisuals or equal RPWM-32MAXBF-BOX-KIT to be installed by EC S - 1 S	-						
4K60 4:4:4 HDR Network AV Decoder Crestron or equal DM-NVX-D30 or equal \$ - 1 \$	-						
Video Conferencing System							
4k USB PTZ camera with face tracking / 910-2100-012 or equal Unite 160.4k							
autoframing Clearone or equal S - 2 S	-						
Thin Profile wall mount 910-2100-104 or equal Wall mount for Unite 160							
Clearone or equal Clearone or equal 4k camera 5 - 2 5	-						
In wall mount for Unite							
In Wall camera enclosure Vaddio or equal 999-2225-020 or equal 160 4k camera Ś - 2 Ś	-						
Camera Extension system SCT or equal RCU2S-B10 or equal \$ - 2 \$	-						
Video Sources							
Includes wireless keyboard and mouse and							
Room PC UFE UFE alspiay + + +							
Wireless Collaboration Device Mersive or equal SP-8000-E5 or equal year \$ - 1 \$	_						
Video Distribution							
4K60 4:4:4 HDR Network AV Encoder Crestron or equal DM-NVX-E30 or equal							
2-input LISB 3 2 Data Matrix Switcher Crestron or equal LISB SW 200 or equal							
Audio System							
12 in/8 out audio den with LISB audio. GPIO							
and dante audio usp with osb addio, GFIO,							
Colling mic array	-						
clear offic array clear offic	-						
6.5" Two-way low-profile ceiling speaker, 70/100/ transformer with 160 humans 125°							
conical DMT coverage							
Control Components	-						

4-Series [®] Room Media Controller	Crestron or equal	RMC4 or equal		\$	-	1	\$ -
			Color Selection				
			Black/white by				
7" Wall Mounted Touch Screen	Crestron or equal	TSW-770-X-S or equal	Owner/Architect	\$	-	1	\$ -
24 port POE+ managed Network Switch	Netgear or equal	XSM4216F-100NAS or equal		\$	-	1	\$ -
Instructors Desk							
			Includes integrated 16ru	-			
	Miller's Presentation		rack. Color selection by				
Custom	Furniture or equal	TCNJ-4002 or equal	owner/architect	\$	-	1	\$ -
Equipment Racks							
Dual LED Worklight	Middle Atlantic or equal	LT-CABUTL-DUAL or equal		\$	-	1	\$ -
Horizontal Power Distribution Unit w/ integrate Middle Atlantic or equal		PDCOOL-1115R or equal		\$	-	1	\$ -
Accessories							
Compact surge protector	SurgeX or equal	SA-82 or equal		\$	-	1	\$ -
Universal 4K HDMI® Dongle Adapter Ring with							
Color Coded Mini DisplayPort™ and USB-C	Cables2Go or equal	C2G30044 or equal		\$	-	1	\$ -
Cabling & Accessories	Per Contractor	Per Contractor		\$	-	1	\$ -
				E	Equipmo	ent Totals	\$ -
	Non-Equipment Costs (proje	ct management, engineering, ship	pping, onsite installation, com	missic	ning, w	varrantee)	\$ -
					Syst	em Totals	\$ -

Space Type	CETL Learning Stu	dio								
	Learning space wi	th multiple OFE display	s each with wireless collaboration	n device. Space	will include	overhead speakers				
Description	attached to wirele	ess collaboration device	2.							
Supported Use Cases	Wireless collabora	Vireless collaboration								
Notable Features	Wireless collabora	tion units must be able	e to bridge together							
External Interfaces	Connection to bui	lding fire alarm system	for muting							
Description	Manufacturer	Model	Notes	Unit Cost	Quantity	Total Cost				
Display System										
Owner furnished (6) 55" display OFE (ELF										
FUNDED)	NEC	E558	OFE (ELF FUNDED)	<u>\$</u>	0	<u>\$</u>				
Flat Panel Display 5 year extended warranty	NEC or equal	ADVEXMX-5Y-12 or e	qual	\$-	6	\$-				
Flat Panel Display Articulating Wall Mount	Chief or equal	MWRIWUB or equal		\$-	6	\$-				
Video Sources										
Wireless Collaboration Device OFE (ELF			Unlimited Enterprise - 5 year							
FUNDED)	Mersive or equal	SP-8100-E5 or equal	OFE (ELF FUNDED)	<u>\$ </u>	0	\$				
Active Learning Module OFE (ELF FUNDED)	Mersive or equal		OFE (ELF FUNDED)	\$	0	\$				
Audio System										
Two Channel Amp, 60 watts at 8 or 4 ohms or										
70v	QSC or equal	SPA4-60 or equal		\$-	1	\$-				
6.5" Two-way low-profile ceiling speaker,			includes C-ring and rails for	-						
70/100V transformer with 16Ω bypass, 135°			blind mount installation, Ø305							
conical DMT coverage	QSC or equal	AD-C6T-LP or equal	mm cut-out	\$-	6	\$-				
Accessories										
Compact surge protector	SurgeX or equal	SA-82 or equal		\$-	6	\$-				
Cabling & Accessories	Per Contractor	Per Contractor		\$-	1	\$-				
				_						
				Equip	ment Totals	\$-				
Non-Equip	ment Costs (project	management, engineer	ing, shipping, onsite installation,	commissioning	, warrantee)	\$-				
				S	stem Totals	\$-				

Space Type	Mentoring Center	Mentoring Center							
	Mentoring space wit	Mentoring space with wall mounted display with a camera/mic/speaker USB bar and wireless collaboration device. Display							
Description	switching and volum	e control via wall moun	ted button panel						
Supported Use Cases	wireless collaboratio	n, presentation, soft co	dec conferencing						
Notable Features	None								
External Interfaces	None								
	•								
Description	Manufacturer	Model	Notes	Unit Cost	Quantity	Total Cost			
Display System									
75" Flat Panel Display; 16x7	NEC or equal	E758 or equal		\$-	1	\$-			
Flat Panel Display 5 year extended warranty	NEC or equal	ADVEXMX-5Y-12 or ec	jual	\$ -	1	\$-			
Flat Panel Display Articulating Wall Mount	Chief or equal	PWRIWUB or equal		\$ -	1	\$-			
Video Conferencing System									
All-in-One 4K Conference Cam with 120° FOV Lens	Logitech or equal	960-001101 or equal	Logitech Meetup	\$ -	1	\$ -			
TV Mount for Meetup camera		939-001656 or equal	Wall Mount for meetup						
	Logitech or equal		camera	\$ -	1	\$ -			
Video Sources									
			Unlimited Enterprise -						
Wireless Collaboration Device	Mersive or equal	SP-8100-E5 or equal	5 vear	Ś -	1	s -			
Video Distribution			- /	-		T			
Dual 4K HDMI [®] HDBaseT + USB-C [®] , 3.5mm, and USB-B									
over Cat Extender Dual Gang Wall Plate Transmitter -									
4K 60Hz	C2G or equal	C2G30019 or equal		Ś -	1	s -			
				_ *		T			
HDMI HDBaseT plus 3.5mm, USB-A, and RS232 over Cat									
Audio De-Embedding Extender Box Receiver 4K 60Hz	C2G or equal	C2G30020 or equal		\$ -	1	\$ -			
2-input USB 3.2 Data Matrix Switcher	Crestron or equal	USB-SW-200 or equal			1	<u>,</u>			
Control Components				-		T			
Controller with RS-232 Control - Decorator-Style									
Wallplate	Extron or equal	MLC 62 RS D	Single Gang	s -	1	s -			
Accessories	2.4.1 0.11 0.1 0.4 0.4				-	÷			
Compact surge protector	SurgeX or equal	SA-82 or equal		\$ -	1	\$ -			
HDMI and USB wall plate	Per Contractor	Per Contractor		\$	1	\$ -			
Universal 4K HDMI [®] Dongle Adapter Ring with Color									
Coded Mini DisplayPort [™] and USB-C	Cables2Go or equal	C2G30044 or equal		\$ -	1	\$ -			
Cabling & Accessories	Per Contractor	Per Contractor		\$	1	\$ -			
	1	1	1			1			
				Equi	pment Totals	\$-			
Non-Equipr	nent Costs (project ma	inagement, engineering	g, shipping, onsite installatio	n, commissionin	g, warrantee)	\$-			
				9	System Totals	\$-			

Space Type	CETL Seminar Room										
Description	Single display Conference	Single display Conference space with dual wall mounted PTZ cameras, overhead speakers and microphone arrays, OFE pc, wall mounted									
Supported Use Cases	Presentation, video confe	erencing									
Notable Features	room resources will be sh	narable to both an installed pc and a	guest laptop connection								
External Interfaces	Connection to building fir	re alarm system for muting									
Description	Manufacturer	Model	Notes	Unit Cost	Quantity	Total Cost					
Display System											
98" Flat Panel Display; 16x7 450 nit	NEC or equal	E988 or equal		\$-	1	. \$ -					
Flat Panel Display 5 year extended				_							
warranty	NEC or equal	ADVEXMX-5Y-12 or equal		\$ -	1	\$-					
ADA compliant in wall scissor mount for											
98" display	RPVisuals or equal	RPWM-32MAXBF-XMS-ADA-NB		\$-	1	\$-					
in wall box for ADA scissor mount	RPVisuals or equal	RPWM-32MAXBF-BOX-KIT	to be installed by EC	\$-	1	\$-					
4K60 4:4:4 HDR Network AV Decoder	Crestron or equal	DM-NVX-D30 or equal		\$-	1	\$-					
Video Conferencing System											
4k USB PTZ camera with face tracking /		910-2100-012 or equal	Unite 160 4k								
autoframing	Clearone or equal			\$ -	2	\$-					
Thin Profile wall mount		910-2100-104 or equal	Wall mount for Unite 160 4k	_							
	Clearone or equal		camera	\$-	1	\$-					
			In wall mount for Unite 160								
In Wall camera enclosure	Vaddio or equal	999-2225-020 or equal	4k camera	\$-	1	\$-					
Camera Extension system	SCT or equal	RCU2S-B10 or equal		\$-	2	\$-					
Video Sources											
			Includes wireless keyboard								
Room PC	OFE	OFE	and mouse and display	<u>\$</u>	1	.					
			Unlimited Enterprise -								
Wireless Collaboration Device	Mersive or equal	SP-8000-E5 or equal	5 year	\$-	1	\$-					
Video Distribution											
4K60 4:4:4 HDR Network AV Encoder	Crestron or equal	DM-NVX-E30 or equal		\$-	2	\$-					
Audio System											
12 in/8 out audio dsp with USB audio,											
GPIO, and dante audio networking	Clearone or equal	910-3200-101-D or equal	Converge Pro 2 128SRD	\$ -	1	. \$ -					
Ceiling mic array	Clearone or equal	910-3200-208-U or equal	BMA 360 Microphone	\$-	2	\$-					
6.5" Two-way low-profile ceiling speaker,			includes C-ring and rails for	_							
70/100V transformer with 16Ω bypass,			blind mount installation,								
135° conical DMT coverage	QSC or equal	AD-C6T-LP or equal	Ø305 mm cut-out	\$-	6	; \$-					
Assistive Listening System											
LISTENIR IDSP LEVEL II SYSTEM	Listen or equal	LS-91 or equal		\$-	1	. \$ -					
Control Components											
4-Series [®] Room Media Controller	Crestron or equal	RMC4 or equal		\$-	1	. \$ -					
			Color Selection Black/white								
7" Wall Mounted Touch Screen	Crestron or equal	TSW-770-X-S or equal	by Owner/Architect	\$ -	1	. \$ -					
24 port POE+ managed Network Switch	Netgear or equal	XSM4216F-100NAS or equal		\$ -	1	. \$ -					
Equipment Racks											

Reference Series furniture grade rack -			Color Selection by			
20ru	Middle Atlantic or equal	RFR-2028XX or equal	Owner/Architect	\$-	1	\$ -
Dual LED Worklight	Middle Atlantic or equal	LT-CABUTL-DUAL or equal		\$-	1	\$ -
Horizontal Power Distribution Unit w/ inte	Middle Atlantic or equal	PDCOOL-1115R or equal		\$-	1	\$ -
Accessories						
Compact surge protector	SurgeX or equal	SA-82 or equal		\$-	1	\$ -
Universal 4K HDMI [®] Dongle Adapter Ring						
with Color Coded Mini DisplayPort™ and						
USB-C	Cables2Go or equal	C2G30044 or equal		\$-	1	\$ -
Cabling & Accessories	Per Contractor	Per Contractor		\$ -	1	\$ -
				-		
				Equipn	nent Totals	\$ -
	Non-Equipment Cos	ts (project management, engineering	, shipping, onsite installation, c	commissioning,	warrantee)	\$ -
				Sys	tem Totals	\$ -

Space Туре	1st Floor Lobby	t Floor Lobby							
Description	Lobby display run	ning owner standard signage platform on OFE pc							
Supported Use Cases	Digital Signage								
Notable Features	OFE PC to be confi	gured to run owner standard signage platform. TCNJ to co	nfigure						
External Interfaces	None	ne							
	·								
Description	Manufacturer	Model Notes	Unit Cost	Quantity	Total Cost				
Display System									
65" Flat Panel Display; 16x7	NEC or equal	E658 or equal	\$ -	1	\$-				
Flat Panel Display 5 year extended warranty	NEC or equal	ADVEXMX-5Y-12 or equal	\$-	1	\$-				
Flat Panel Display Articulating Wall Mount	Chief or equal	MWRIWUB or equal	\$-	1	\$-				
Video Sources									
Media Player License	Visix or equal	VX-S-CPO or equal	\$-	1	\$-				
1 Year Maintenance contract	Visix or equal	VX-S-SMX or equal	\$-	1	\$-				
OFE signage PC	OFE	OFE Running OFE Visix signage platform	<u>\$</u>	1	<u>\$</u>				
Accessories									
Compact surge protector	SurgeX or equal	SA-82 or equal	\$-	1	\$-				
Cabling & Accessories	Per Contractor	Per Contractor	\$-	1	\$-				
			Equip	ment Totals	\$-				
Non-Eq	uipment Costs (proje	ect management, engineering, shipping, onsite installation,	commissioning,	warrantee)	\$-				
			Sy	stem Totals	\$-				

Space Type	Seminar										
	Single display Classroom	space with dual wall mounted	PTZ cameras, overhead spe	akers and micr	ophone arra	vs. dual channel wireless					
	microphone system. OFF	pc. wall mounted touchpanel	and connections for guest in	structor lapto	n. System in	cludes a wireless					
	collaboration device. All y	video switched by small forma	t video switch and extended	to display. Inc	ludes local c	ontrol processor and					
	network switch System in	ncludes a LISB sharing switch t	o allow the room dsn and ca	meras to be su	witched betw	veen the OFF nc and a					
Description	guest instructor lanton A	Il equipment will be rack mou	nted at the teachers station								
Supported Use Cases	Presentation, video confe	ntation, video conferencing									
Notable Features	room resources will be sh	resources will be sharable to both an installed no and a guest lanton connection									
External Interfaces	Connection to building fir	e alarm system for muting	und a gaest laptop connecti	011							
Description	Manufacturer	Model	Notes	Unit Cost	Ouantity	Total Cost					
Display System											
75" Flat Panel Display: 16x7	NEC or equal	E758 or equal		Ś -	1	Ś -					
Flat Panel Display 5 year extended warranty	NEC or equal	ADVEXMX-5Y-12 or equal		\$ -	1	\$ -					
Flat Panel Display Articulating Wall Mount	Chief or equal	PWRIWUB or equal		\$ -	1	\$ -					
4K60 4:4:4 HDR Network AV Decoder	Crestron or equal	DM-NVX-D30 or equal		\$ -	1	\$ -					
Video Conferencing System											
4k USB PTZ camera with face tracking / autoframing		910-2100-012 or equal	Unite 160 4k								
	Clearone or equal			\$-	2	\$-					
Thin Profile wall mount		910-2100-104 or equal	Wall mount for Unite 160								
	Clearone or equal		4k camera	\$ -	2	\$ -					
Camera Extension system	SCT or equal	RCU2S-B10 or equal		\$ -	2	\$ -					
Video Sources											
			Includes wireless								
			keyboard and mouse and								
Room PC	OFE	OFE	display	<u>\$</u>	1	<u>ş</u>					
			Unlimited Enterprise - 5								
Wireless Collaboration Device	Mersive or equal	SP-8100-E5 or equal	year	\$-	1	\$-					
Video Distribution	·										
4K60 4:4:4 HDR Network AV Encoder	Crestron or equal	DM-NVX-E30 or equal		\$ -	3	\$-					
2-input USB 3.2 Data Matrix Switcher	Crestron or equal	USB-SW-200 or equal		\$-	1	\$-					
Audio System											
12 in/8 out audio dsp with USB audio, GPIO, and				,							
dante audio networking	Clearone or equal	910-3200-101-D or equal	Converge Pro 2 128SRD	\$-	1	\$-					
Ceiling mic array	Clearone or equal	910-3200-208-U or equal	BMA 360 Microphone	\$-	2	\$-					
			includes C-ring and rails								
6.5" Two-way low-profile ceiling speaker, 70/100V			for blind mount								
transformer with 16 Ω bypass, 135° conical DMT			installation, Ø305 mm cut								
coverage	QSC or equal	AD-C6T-LP or equal	out	\$ -	6	\$-					
Assistive Listening System											
LISTENIR IDSP LEVEL II SYSTEM	Listen or equal	LS-91 or equal		\$-	1	\$-					
Control Components											
4-Series [®] Room Media Controller	Crestron or equal	RMC4 or equal		\$-	1	\$-					

			Color Selection			
			Black/white by			
7" Wall Mounted Touch Screen	Crestron or equal	TSW-770-X-S or equal	Owner/Architect	\$-	1	\$ -
24 port POE+ managed Network Switch	Netgear or equal	XSM4216F-100NAS or equal		\$-	1	\$ -
Equipment Racks						
			Color Selection by			
Reference Series furniture grade rack - 20ru	Middle Atlantic or equal	RFR-2028XX or equal	Owner/Architect	\$-	1	\$ -
Dual LED Worklight	Middle Atlantic or equal	LT-CABUTL-DUAL or equal		\$-	1	\$ -
Horizontal Power Distribution Unit w/ integrated co Middle Atlantic or equal		PDCOOL-1115R or equal		\$-	1	\$ -
Accessories						
Compact surge protector	SurgeX or equal	SA-82 or equal		\$-	1	\$ -
Universal 4K HDMI [®] Dongle Adapter Ring with						
Color Coded Mini DisplayPort™ and USB-C	Cables2Go or equal	C2G30044 or equal		\$-	1	\$ -
Cabling & Accessories	Per Contractor	Per Contractor		\$-	1	\$ -
				Equ	ipment Totals	\$ -
Nor	n-Equipment Costs (project	management, engineering, sh	ipping, onsite installation,	commissionir	ng, warrantee	\$ -
					System Totals	\$ -

Space Туре	Private office	ivate office									
Description	Private office with	wall mounted display and v	vireless collaboration device	2							
Supported Use Cases	Presentation										
Notable Features	None	ne									
External Interfaces	None	ine									
Description	Manufacturer	Model	Notes	Unit Cost	Quantity	Total Cost					
Display System											
43" Flat Panel Display; 16x7	NEC or equal	E438 or equal	OFE (ELF FUNDED)	\$ <u>-</u>	0	<u> </u>					
Flat Panel Display 5 year extended warranty	NEC or equal	ADVEXMX-5Y-12 or equal	OFE (ELF FUNDED)	<u>\$</u>	e e	<u>\$</u>					
Flat Panel Display Articulating Wall Mount	Chief or equal	TS525TU or equal		\$-	1	\$ -					
Video Sources											
			Unlimited Enterprise - 5								
Wireless Collaboration Device -	Mersive or equal	SP-8100-E5 or equal	year OFE (ELF FUNDED)	\$	θ	<u>ş</u>					
Accessories											
Compact surge protector	SurgeX or equal	SA-82 or equal		\$-	1	\$ -					
Cabling & Accessories	Per Contractor	Per Contractor		\$-	1	\$ -					
	1										
				Equip	ment Totals	\$-					
Non-Equipr	nent Costs (project	management, engineering, s	shipping, onsite installation,	, commissioning,	warrantee)	\$ -					
				Sy	stem Totals	\$ -					

Space Type	Small Group Study								
	Group study space w	ith wall mounted displa	ay with a camera/mic/speaker US	3 bar and wirel	ess collabor	ration device. Dis	splay		
Description	switching and volum	e control via wall moun	ted button panel						
Supported Use Cases	wireless collaboratio	n, presentation, soft co	dec conferencing						
Notable Features	None	None							
External Interfaces	None								
Description	Manufacturer	Model	Notes	Unit Cost	Quantity	Total Cost			
Display System									
55" Flat Panel Display; 16x7	NEC or equal	E558 or equal		\$-	1	\$	-		
Flat Panel Display 5 year extended warranty	NEC or equal	ADVEXMX-5Y-12 or ed	ual	\$-	1	\$	-		
Flat Panel Display Articulating Wall Mount	Chief or equal	MWRIWUB or equal		\$-	1	\$	-		
Video Conferencing System									
All-in-One 4K Conference Cam with 120° FOV Lens	Logitech or equal	960-001101 or equal	Logitech Meetup	\$-	1	\$	-		
TV Mount for Meetup camera		939-001498 or equal	Wall Mount for meetup camera						
	Logitech or equal			\$-	1	\$	-		
Video Sources									
Wireless Collaboration Device	Mersive or equal	SP-8100-E5 or equal	Unlimited Enterprise - 5 year	\$-	1	\$	-		
Control Components									
Controller with RS-232 Control - Decorator-Style									
Wallplate	Extron or equal	MLC 62 RS D	Single Gang	\$-	1	\$	-		
Accessories									
Compact surge protector	SurgeX or equal	SA-82 or equal		\$-	1	. \$	-		
HDMI and USB wall plate	Per Contractor	Per Contractor		\$-	1	\$	-		
Universal 4K HDMI [®] Dongle Adapter Ring with Color									
Coded Mini DisplayPort™ and USB-C	Cables2Go or equal	C2G30044 or equal		\$-	1	\$	-		
Cabling & Accessories	Per Contractor	Per Contractor		\$-	1	\$	-		
				Equip	ment Totals	\$	-		
Non-Equ	uipment Costs (project	management, engineer	ing, shipping, onsite installation, o	ommissioning,	, warrantee)	\$	-		
				Sy	stem Totals	\$	-		

Space Type Large Group Study									
	Group study space w	ith wall mounted displa	ay with a camera/mic/speaker US	3 bar and wire	less collabor	ation device. Disp	olay		
Description	switching and volum	e control via wall moun	ted button panel						
Supported Use Cases	wireless collaboratio	n, presentation, soft co	dec conferencing						
Notable Features	None	lone							
External Interfaces	None								
Description	Manufacturer	Model	Notes	Unit Cost	Quantity	Total Cost			
Display System									
65" Flat Panel Display; 16x7	NEC or equal	E658 or equal		\$-	1	\$	-		
Flat Panel Display 5 year extended warranty	NEC or equal	ADVEXMX-5Y-12 or ed	qual	\$-	1	\$	-		
Flat Panel Display Articulating Wall Mount	Chief or equal	MWRIWUB or equal		\$-	1	\$	-		
Video Conferencing System									
All-in-One 4K Conference Cam with 120° FOV Lens	Logitech or equal	960-001101 or equal	Logitech Meetup	\$-	1	\$	-		
TV Mount for Meetup camera		939-001498 or equal	Wall Mount for meetup camera						
	Logitech or equal			\$-	1	\$	-		
Video Sources									
Wireless Collaboration Device	Mersive or equal	SP-8100-E5 or equal	Unlimited Enterprise - 5 year	\$-	1	\$	-		
Control Components									
Controller with RS-232 Control - Decorator-Style Wallplate	Extron or equal	MLC 62 RS D	Single Gang	\$-	1	\$	-		
Accessories									
Compact surge protector	SurgeX or equal	SA-82 or equal		\$-	1	\$	-		
HDMI and USB wall plate	Per Contractor	Per Contractor		\$-	1	\$	-		
Universal 4K HDMI [®] Dongle Adapter Ring with Color Coded									
Mini DisplayPort™ and USB-C	Cables2Go or equal	C2G30044 or equal		\$-	1	\$	-		
Cabling & Accessories	Per Contractor	Per Contractor		\$-	1	\$	-		
				Equi	pment Totals	\$	-		
Non-Equi	pment Costs (project	management, engineer	ing, shipping, onsite installation, o	commissionin	g, warrantee	\$	-		
				9	ystem Totals	\$	-		

Space Type	Typical Classroom - Second Display Alternate						
Description							
Supported Use Cases							
Notable Features							
External Interfaces							
Description	Manufacturer	Model	Notes	Unit Cost	Quantity	Total Cost	
Display System							
98" Flat Panel Display; 16x7 450 nit	NEC or equal	E988 or equal		\$-	1	\$	-
Flat Panel Display 5 year extended							
warranty	NEC or equal	ADVEXMX-5Y-12 or equal		\$ -	1	\$	-
Universal-Pull out Wallmate 32B Kit	RPVisuals or equal	RPWM-32B-XM-UNV or equal		\$ -	1	\$	-
in wall box for ADA scissor mount	RPVisuals or equal	RPWM-32MAXBF-BOX-KIT	to be installed by EC	\$ -	1	\$	-
4K60 4:4:4 HDR Network AV Decoder	Crestron or equal	DM-NVX-D30 or equal		\$ -	1	\$	-
Accessories							
Compact surge protector	SurgeX or equal	SA-82 or equal		\$ -	1	\$	-
Cabling & Accessories	Per Contractor	Per Contractor		\$ -	1	\$	-
		·					
				Equi	pment Totals	\$	-
	Non-Equipment Costs	(project management, engineeri	ng, shipping, onsite installat	ion, commissionin	g, warrantee)	\$	-
				S	ystem Totals	\$	-

Space Type	Seminar Second Di	Seminar Second Display Alternate					
Description							
Supported Use Cases							
Notable Features							
External Interfaces							
Description	Manufacturer	Model	Notes	Unit Cost	Quantity	Total Cost	
Display System							
75" Flat Panel Display; 16x7	NEC or equal	E758 or equal		\$ -	1	\$	-
Flat Panel Display 5 year extended warranty	NEC or equal	ADVEXMX-5Y-12 or equa	al	\$ -	1	\$	-
Flat Panel Display Articulating Wall Mount	Chief or equal	PWRIWUB or equal		\$ -	1	\$	-
4K60 4:4:4 HDR Network AV Decoder	Crestron or equal	DM-NVX-D30 or equal		\$ -	1	\$	-
Accessories							
Compact surge protector	SurgeX or equal	SA-82 or equal		\$ -	1	\$	-
Cabling & Accessories	Per Contractor	Per Contractor		\$ -	1	\$	-
Equipment Totals					\$	-	
Non-Equipment Costs (project management, engineering, shipping, onsite installation, commissioning, warrantee) 💲					\$	-	
System Totals \$				\$	-		

Space Type	CETL Seminar Roor	CETL Seminar Room - Alternate					
Description	Add Alternate to in	clude a second monitor f	or the space				
Supported Use Cases							
Notable Features							
External Interfaces							
Description	Manufacturer	Model	Notes	Unit Cost	Quantity	Total Cost	
Display System							
75" Flat Panel Display; 16x7	NEC or equal	E758 or equal		\$ -	1	\$	-
Flat Panel Display 5 year extended warranty	NEC or equal	ADVEXMX-5Y-12 or equ	al	\$ -	1	\$	-
Flat Panel Display Articulating Wall Mount	Chief or equal	PWRIWUB or equal		\$ -	1	\$	-
4K60 4:4:4 HDR Network AV Decoder	Crestron or equal	DM-NVX-D30 or equal		\$ -	1	\$	-
Accessories							
Compact surge protector	SurgeX or equal	SA-82 or equal		\$ -	1	\$	-
Cabling & Accessories	Per Contractor	Per Contractor		\$ -	1	\$	-
				Equip	ment Totals	\$	-
Non-E	Non-Equipment Costs (project management, engineering, shipping, onsite installation, commissioning, warrantee) 💲					\$	-
System Totals \$					\$	-	



Mandatory Documents

FORM #	TITLE OF FORM
1	MANDATORY EQUAL EMPLOYMENT OPPORTUNITY LANGUAGE
2	OWNERSHIP DISCLOSURE FORM
3	NON-COLLUSION STATEMENT
4	VENDOR QUALIFICATION SHEET
5	NON-INVOLVEMENT IN PROHIBITED ACTIVITIES IN RUSSIA OR BELARUS FORM
6	DISCLOSURE OF INVESTMENT ACTIVITIES IN IRAN FORM
7	FEDERAL NON-DEBARMENT CERTIFICATION



MANDATORY EQUAL EMPLOYMENT OPPORTUNITY LANGUAGE <u>N.J.S.A.</u> 10:5-31 et seq. (P.L.1975, c.127) <u>N.J.A.C.</u> 17:27-1.1 et seq. FORM # 1

The College of New Jersey PO Box 7718 Ewing, NJ 08628-0718

CONSTRUCTION CONTRACTS

During the performance of this contract, the contractor agrees as follows:

The contractor or subcontractor, where applicable, will not discriminate against any employee or applicant for employment because of age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex. Except with respect to affectional or sexual orientation and gender identity or expression, the contractor will ensure that equal employment opportunity is afforded to such applicants in recruitment and employment, and that employees are treated during employment, without regard to their age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex. Such equal employment opportunity shall include, but not be limited to the following: employment, upgrading, demotion, or transfer; recruitment or recruitment advertising; layoff or termination; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided by the Public Agency Compliance Officer setting forth provisions of this nondiscrimination clause.

The contractor or subcontractor, where applicable will, in all solicitations or advertisements for employees placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to age, race, creed, color, national origin, ancestry, marital status, affectional or sexual orientation, gender identity or expression, disability, nationality or sex.

The contractor or subcontractor will send to each labor union, with which it has a collective bargaining agreement, a notice, to be provided by the agency contracting officer, advising the labor union or workers' representative of the contractor's commitments under this act and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

The contractor or subcontractor, where applicable, agrees to comply with any regulations promulgated by the Treasurer, pursuant to <u>N.J.S.A.</u> 10:5-31 et seq., as amended and supplemented from time to time and the Americans with Disabilities Act.

When hiring or scheduling workers in each construction trade, the contractor or subcontractor agrees to make good faith efforts to employ minority and women workers in each construction trade consistent with the targeted employment goal prescribed by <u>N.J.A.C.</u> 17:27-7.2; provided, however, that the Dept. of LWD, Construction EEO Monitoring Program, may, in its discretion, exempt a contractor or subcontractor from compliance with the good faith procedures prescribed by the following provisions, A, B, and C, as long as the Dept. of LWD, Construction EEO Monitoring Program is satisfied that the contractor or subcontractor is employing workers

(*Cont*)

provided by a union which provides evidence, in accordance with standards prescribed by the Dept. of LWD, Construction EEO Monitoring Program, that its percentage of active "card carrying" members who are minority and women workers is equal to or greater than the targeted employment goal established in accordance with <u>N.J.A.C.</u> 17:27-7.2. The contractor or subcontractor agrees that a good faith effort shall include compliance with the following procedures:

(A) If the contractor or subcontractor has a referral agreement or arrangement with a union for a construction trade, the contractor or subcontractor shall, within three business days of the contract award, seek assurances from the union that it will cooperate with the contractor or subcontractor as it fulfills its affirmative action obligations under this contract and in accordance with the rules promulgated by the Treasurer pursuant to N.J.S.A. 10:5-31 et. seq., as supplemented and amended from time to time and the Americans with Disabilities Act. If the contractor or subcontractor is unable to obtain said assurances from the construction trade union at least five business days prior to the commencement of construction work, the contractor or subcontractor agrees to afford equal employment opportunities minority and women workers directly, consistent with this chapter. If the contractor's or subcontractor's prior experience with a construction trade union, regardless of whether the union has provided said assurances, indicates a significant possibility that the trade union will not refer sufficient minority and women workers consistent with affording equal employment opportunities as specified in this chapter, the contractor or subcontractor agrees to be prepared to provide such opportunities to minority and women workers directly, consistent with this chapter, by complying with the hiring or scheduling procedures prescribed under (B) below; and the contractor or subcontractor further agrees to take said action immediately if it determines that the union is not referring minority and women workers consistent with the equal employment opportunity goals set forth in this chapter.

(B) If good faith efforts to meet targeted employment goals have not or cannot be met for each construction trade by adhering to the procedures of (A) above, or if the contractor does not have a referral agreement or arrangement with a union for a construction trade, the contractor or subcontractor agrees to take the following actions:

(1) To notify the public agency compliance officer, the Dept. of LWD, Construction EEO Monitoring Program, and minority and women referral organizations listed by the Division pursuant to <u>N.J.A.C.</u> 17:27-5.3, of its workforce needs, and request referral of minority and women workers;

(2) To notify any minority and women workers who have been listed with it as awaiting available vacancies;

(3) Prior to commencement of work, to request that the local construction trade union refer minority and women workers to fill job openings, provided the contractor or subcontractor has a referral agreement or arrangement with a union for the construction trade;

(4) To leave standing requests for additional referral to minority and women workers with the local construction trade union, provided the contractor or subcontractor has a referral agreement or arrangement with a union for the construction trade, the State Training and Employment Service and other approved referral sources in the area;

(5) If it is necessary to lay off some of the workers in a given trade on the construction site, layoffs shall be conducted in compliance with the equal employment opportunity and nondiscrimination standards set forth in this regulation, as well as with applicable Federal and State court decisions;

(6) To adhere to the following procedure when minority and women workers apply or are referred to the contractor or subcontractor:

(i) The contactor or subcontractor shall interview the referred minority or women worker.

(ii) If said individuals have never previously received any document or certification signifying a level of qualification lower than that required in order to perform the work of the construction trade, the contractor or subcontractor shall in good faith determine the qualifications of such individuals. The contractor or subcontractor shall hire or schedule those individuals who satisfy appropriate qualification standards in conformity with the equal employment opportunity and non-discrimination principles set forth in this chapter. However, a contractor or subcontractor shall determine that the individual at least possesses the requisite skills, and experience recognized by a union, apprentice program or a referral agency, provided the referral agency is acceptable to the Dept. of LWD, Construction EEO Monitoring Program. If necessary, the contractor or subcontractor shall hire or schedule minority and women workers who qualify as trainees pursuant to these rules. All of the requirements, however, are limited by the provisions of (C) below.

(iii) The name of any interested women or minority individual shall be maintained on a waiting list, and shall be considered for employment as described in (i) above, whenever vacancies occur. At the request of the Dept. of LWD, Construction EEO Monitoring Program, the contractor or subcontractor shall provide evidence of its good faith efforts to employ women and minorities from the list to fill vacancies.

(iv) If, for any reason, said contractor or subcontractor determines that a minority individual or a woman is not qualified or if the individual qualifies as an advanced trainee or apprentice, the contractor or subcontractor shall inform the individual in writing of the reasons for the determination, maintain a copy of the determination in its files, and send a copy to the public agency compliance officer and to the Dept. of LWD, Construction EEO Monitoring Program.

(7) To keep a complete and accurate record of all requests made for the referral of workers in any trade covered by the contract, on forms made available by the Dept. of LWD, Construction EEO Monitoring Program and submitted promptly to the Dept. of LWD, Construction EEO Monitoring Program upon request.

(*Cont*)

(C) The contractor or subcontractor agrees that nothing contained in (B) above shall preclude the contractor or subcontractor from complying with the union hiring hall or apprenticeship policies in any applicable collective bargaining agreement or union hiring hall arrangement, and, where required by custom or agreement, it shall send journeymen and trainees to the union for referral, or to the apprenticeship program for admission, pursuant to such agreement or arrangement. However, where the practices of a union or apprenticeship program will result in the exclusion of minorities and women or the failure to refer minorities and women consistent with the targeted county employment goal, the contractor or subcontractor shall consider for employment persons referred pursuant to (B) above without regard to such agreement or arrangement; provided further, however, that the contractor or subcontractor shall not be required to employ women and minority advanced trainees and trainees in numbers which result in the employment of advanced trainees and trainees as a percentage of the total workforce for the construction trade, which percentage significantly exceeds the apprentice to journey worker ratio specified in the applicable collective bargaining agreement, or in the absence of a collective bargaining agreement, exceeds the ratio established by practice in the area for said construction trade. Also, the contractor or subcontractor agrees that, in implementing the procedures of (B) above, it shall, where applicable, employ minority and women workers residing within the geographical jurisdiction of the union.

After notification of award, but prior to signing a construction contract, the contractor shall submit to the public agency compliance officer and the Dept. of LWD, Construction EEO Monitoring Program an initial project workforce report (Form AA-201) electronically provided to the public agency by the Dept. of LWD, Construction EEO Monitoring Program, through its website, for distribution to and completion by the contractor, in accordance with <u>N.J.A.C.</u> 17:27-7. The contractor also agrees to submit a copy of the Monthly Project Workforce Report once a month thereafter for the duration of this contract to the Dept. of LWD, Construction EEO Monitoring Program, and to the public agency compliance officer.

The contractor agrees to cooperate with the public agency in the payment of budgeted funds, as is necessary, for on-the-job and/or off-thejob programs for outreach and training of minorities and women.

(D) The contractor and its subcontractors shall furnish such reports or other documents to the Dept. of LWD, Construction EEO Monitoring Program as may be requested by the Dept. of LWD, Construction EEO Monitoring Program from time to time in order to carry out the purposes of these regulations, and public agencies shall furnish such information as may be requested by the Dept. of LWD, Construction EEO Monitoring Program for conducting a compliance investigation pursuant to <u>N.J.A.C.</u> 17:27-1.1 et seq.

Additional Mandatory Construction Contract Language For State Agencies, Independent Authorities, Colleges and Universities Only

The Executive Order No. 151 (Corzine, August 28, 2009) and P.L. 2009, Chapter 335 include a provision which require all state agencies, independent authorities and colleges and universities to include additional mandatory equal employment and affirmative action language in its construction contracts. It is important to note that this language is in addition to and does not re- place the mandatory contract language and good faith efforts requirements for construction con- tracts required by N.J.A.C. 17:27-3.6, 3.7 and 3.8. The additional mandatory equal employment and affirmative action language is as follows:

It is the policy of The College of New Jersey that its contracts should create a work- force that reflects the diversity of the State of New Jersey. Therefore, contractors engaged by The College of New Jersey to perform under a construction contract shall put forth a good faith effort to engage in recruitment and employment practices that further the goal of fostering equal opportunities to minorities and women.

The contractor must demonstrate to The College of New Jersey's satisfaction that a good faith effort was made to ensure that minorities and women have been afforded equal opportunity to gain employment under The College of New Jersey's contract with the contractor. Payment may be withheld from a contractor's con- tract for failure to comply with these provisions.

Evidence of a "good faith effort" includes, but is not limited to:

1. The Contractor shall recruit prospective employees through the State Job bank website, managed by the Department of Labor and Workforce Development, available online at <u>http://NJ.gov/JobCentralNJ</u>;

2. The Contractor shall keep specific records of its efforts, including records of all individuals interviewed and hired, including the specific numbers of minorities and women;

3. The Contractor shall actively solicit and shall provide The College of New Jersey with proof of solicitations for employment, including but not limited to advertisements in general circulation media, professional service publications and electronic media; and

4. The Contractor shall provide evidence of efforts described at 2 above to The College of New Jersey no less frequently than once every 12 months.

5. The Contractor shall comply with the requirements set forth at N.J.A.C. 17:27-

1.1 et seq.

To ensure successful implementation of the Executive Order and Law, state agencies, independent authorities and colleges and universities must forward an Initial Project Workforce Report (AA 201) for <u>any</u> projects funded with ARRA money to the Dept. of LWD, Construction EEO Monitoring Program immediately upon notification of award but prior to execution of the contract.

IF AWARDED A CONTRACT YOUR COMPANY/FIRM WILL BE REQUIRED TO COMPLY WITH THE AFFIRMATIVE ACTION REQUIREMENTS LISTED ABOVE.

Firm Name:	 	
Signature:	 	
Title:	 	
Date:		



OWNERSHIP DISCLOSURE FORM # 2

The College of New Jersey PO Box 7718 Ewing, NJ 08628-0718

BID SOLICITATION # AND TITLE:

VENDOR NAME:

2.

3

PURSUANT TO N.J.S.A. 52:25-24.2, ALL PARTIES ENTERING INTO A CONTRACT WITH THE STATE ARE REQUIRED TO PROVIDE A STATEMENT OF OWNERSHIP.

- 1. The vendor is a Non-Profit Entity; and therefore, no disclosure is necessary.
 - The vendor is a **Sole Proprietor**; and therefore, no other disclosure is necessary. A Sole Proprietor is a person who owns an unincorporated business by himself or her-self.
 - A limited liability company with a single member is not a Sole Proprietor.

The vendor is a corporation, partnership, or limited liability company; and therefore, disclosure is necessary.

If you answered **YES** to Question 3, you must disclose the following information below: (a) the names and addresses of all stockholders in the corporation who own 10% or more of its stock, of any class; (b) all individual partners in the partnership who own a 10% or greater interest therein; or, (c) all members in the limited liability company who own a 10% or greater interest therein.*

A 7 1 7 7		ADDRESS			
SIAIE	ZIP		STATE	ZIP	
		NAME			
		ADDRESS			
		ADDRESS	75 57 6	~	
STATE	ZIP		STATE	ZIP	
	STATE	STATE ZIP	NAME ADDRESS ADDRESS ADDRESS CITY NAME ADDRESS CITY NAME ADDRESS ADDRESS CITY	NAME ADDRESS ADDRESS ADDRESS CITY STATE ZIP NAME ADDRESS ADDRESS ADDRESS ADDRESS STATE ZIP STATE	NAME ADDRESS ADDRESS ADDRESS CITY STATE ZIP NAME ADDRESS ADDRESS ADDRESS ADDRESS STATE ZIP NAME ADDRESS ADDRESS ADDRESS ADDRESS ADDRESS

4. For each of the corporations, partnerships, or limited liability companies identified in response to Question #3 above, are there any individuals, partners, members, stockholders, corporations, partnerships, or limited liability companies owning a 10% or greater interest of those listed business entities?

If you answered **YES** to Question 4, you must disclose the following information below: (a) the names and addresses of all stockholders in the corporation who own 10% or more of its stock, of any class; (b) all individual partners in the partnership who own a 10% or greater interest therein; or, (c) all members in the limited liability company who own a 10% or greater interest therein. The disclosure(s) shall be continued until the names and addresses of every non-corporate stockholder, individual partner, and/or member a 10% or greater interest has been identified.*

ADDRESS			ADDRESS		
CITY	STATE	ZIP	CITY	STATE	ZIP
NAME					
ADDRESS CITY	STATE	ZIP	ADDRESS	STATE	ZIP

5. As an alternative to completing this form, a Vendor with any direct or indirect parent entity which is publicly traded, may submit the name and address of each publicly traded entity and the name and address of each person that holds a 10% or greater beneficial interest in the publicly traded entity as of the last annual filing with the federal Securities and Exchange Commission or the foreign equivalent, and, if there is any person that holds a 10% or greater beneficial interest, also shall submit links to the websites containing the last annual filings with the federal Securities and Exchange Commission or the foreign equivalent and the relevant page numbers of the filings that contain the information on each person that holds a 10% or greater beneficial interest.*

* Attach additional sheets if necessary



NON-COLLUSION STATEMENT FORM # 3

The College of New Jersey PO Box 7718 Ewing, NJ 08628-0718

Date:

The College of New Jersey
The Office of Finance & Business Services, Purchasing Department
Administrative Services Building, Room 201
P.O. Box 7718
Ewing, New Jersey 08628-0718
To Whom It May Concern:

This is to certify that	the under	rsigned bio	dder			as	5
not, either directly or	indirectly,	entered i	nto any agr	eement,	participa	ated in	
any collusion, or other	wise taken	any actio	n in restrair	nt of free	competi	tive	
bidding in connection	with the	proposal	submitted	to The	College	of New	
Jersey on the	da	y of	, 20).			

Signature:

Cor	pora	ate S	Seal	:
001	pore		Jean	•

Attest by:

Sworn to and subscribed before me this _____day of _____, 20 ____.

My commission Expires:

Notary Public



VENDOR QUALIFICATION SHEET FORM # 4

The College of New Jersey PO Box 7718 Ewing, NJ 08628-0718

Vendors are required to submit evidence of qualifications to meet all requirements as required by the Office of Finance & Business Services at The College of New Jersey by providing the information listed below. Vendors must comply with the College's terms and conditions available on the <u>Purchasing website</u>.

If this information is being requested as part of an RFP or RFQ, vendors may be requested to furnish additional information for clarification purposes. This will in no way change the vendor's original proposal.

All vendors are encouraged to register with the State of New Jersey, Division of Purchase and Property via NJSTART.

TO BE COMPLETED BY VENDOR

1. Please list the types of commodities that your company can provide.

	A
	В
	C
2.	The number of years your firm has been providing these servicesYear(s)
3.	Location of vendor's office and personnel that will be responsible for managing contract/service:
	Name:
	Title:
	Telephone Number:
	Email Address:
	Street Address:
	City/State/Zip:
	Federal Identification Number:
4.	Does your firm have a New Jersey Business Registration Certificate? Yes No No If you would like to register, visit the State website here, the NJ BRC is required prior to award.

VENDOR OUALIFICATIONS- continued

Under NJ Executive Order 34, TCNJ is responsible for soliciting demographic, ethnic, and gender information from its vendors. Your response, however, is **strictly voluntary**. Please be advised that any contracting decisions made by TCNJ will **not** be influenced in any way by your decision to provide the above information. TCNJ is required to seek the following information from each firm under contract with us:



3. What is the ethnicity of the owner of your company: (check applicable according to 51% ownership)



11. Please provide a list of former or present clients. Also, indicate the name of a contact person and telephone number for reference purposes. Any personnel from The College of New Jersey listed as a reference will not be considered a valid reference.

А.	Client Name:
	Contact Name:
	Telephone Number:
	Email Address:
В.	Client Name:
	Contact Name:
	Telephone Number:
	Email Address:
C.	Client Name:
	Contact Name:
	Telephone Number:
	Email Address:

VENDOR OUALIFICATIONS- continued

12. Please answer the questions below related to your prior experience If any of the responses are yes, attach a summary of details on a separate sheet.

Has the bidder:

a.	been found, though either court adjudication, arbitration	, mediation, or other contr	actually stipulated
	alternate dispute resolution mechanism, to have: failed	to provide or perform goo	ods or services; or
	failed to complete the contract in a timely manner; or o	otherwise performed unsat	isfactoril <u>y un</u> der a
	prior contract with the contracting unit?	Yes	No

- b. defaulted on a contract, thereby requiring the local unit to utilize the services of another contractor to provide the goods or perform the services or to correct or complete the contract or requiring the local unit to look to the bidder's surety for completion of the contract or tender of the costs of completion?
- c. been debarred or suspended from contracting with any of the agencies or departments of the executive branch of the State of New Jersey at the time of contract award, whether or not the action was based on experience with the contracting unit. Yes No

Firm Name:
Signature:
Title:
Date:

CERTIFICATION OF NON INVOLVEMENT IN PROHIBITED ACTIVITIES IN RUSSIA OR BELARUS FORM # 5



The College of New Jersey PO Box 7718 Ewing, NJ 08628-0718

Pursuant to N.J.S.A. 52:32-60.1, et seq. (L. 2022, c. 3) any person or entity (hereinafter "Vendori") that seeks to enter into or renew a contract with a State agency for the provision of goods or services, or the purchase of bonds or other obligations, must complete the certification below indicating whether or not the Vendor is identified on the Office of Foreign Assets Control (OFAC) Specially Designated Nationals and Blocked Persons list. available here: https://sanctionssearch.ofac.treas.gov/. If the Department of the Treasury finds that a Vendor has made a certification in violation of the law, it shall take any action as may be appropriate and provided by law, rule or contract, including but not limited to, imposing sanctions, seeking compliance, recovering damages, declaring the party in default and seeking debarment or suspension of the party.

I, the undersigned, certify that I have read the definition of "Vendor" below, and have reviewed the Office of Foreign Assets Control (OFAC) Specially Designated Nationals and Blocked Persons list, and having done so certify:

(Check the Appropriate Box)

A. That the Vendor is not identified on the <u>OFAC Specially Designated Nationals and Blocked Persons list on</u> <u>account of activity related to Russia and/or Belarus</u>.

OR

B. That I am unable to certify as to "A" above, because the Vendor is identified on the <u>OFAC Specially</u> <u>Designated Nationals and Blocked Persons list on account of activity related to Russia and/or Belarus</u>.

OR

C. That I am unable to certify as to "A" above, because the Vendor is identified on the <u>OFAC Specially</u> <u>Designated Nationals and Blocked Persons list</u>. However, the Vendor is engaged in activity related to Russia and/or Belarus consistent with federal law, regulation, license or exemption. A detailed description of how the Vendor's activity related to Russia and/or Belarus is consistent with federal law is set forth below.

(Attach Additional Sheets If Necessary.)

Signature of Vendor's Authorized Representative	Date	
Print Name and Title of Vendor's Authorized Representative	Vendor's FEIN	
Vendor's Name	Vendor's Phone Number	
Vendor's Address (Street Address)	Vendor's Fax Number	
Vendor's Address (City/State/Zip Code)	Vendor's Email Address	

ⁱ Vendor means: (1) A natural person, corporation, company, limited partnership, limited liability partnership, limited liability company, business association, sole proprietorship, joint venture, partnership, society, trust, or any other nongovernmental entity, organization, or group; (2) Any governmental entity or instrumentality of a government, including a multilateral development institution, as defined in Section 1701(c)(3) of the International Financial Institutions Act, 22 U.S.C. 262r(c)(3); or (3) Any parent, successor, subunit, direct or indirect subsidiary, or any entity under common ownership or control with, any entity described in paragraph (1) or (2).



DISCLOSURE OF INVESTMENT ACTIVITIES IN IRAN FORM # 6

The College of New Jersey PO Box 7718 Ewing, NJ 08628-0718

BID SOLICITATION # AND TITLE:

VENDOR NAME:

Pursuant to N.J.S.A. 52:32-57, et seq. (P.L. 2012, c.25 and P.L. 2021, c.4) any person or entity that submits a bid or proposal or otherwise proposes to enter into or renew a contract must certify that neither the person nor entity, nor any of its parents, subsidiaries, or affiliates, is identified on the New Jersey Department of the Treasury's Chapter 25 List as a person or entity engaged in investment activities in Iran. The Chapter 25 list is found on the Division's website at https://www.state.nj.us/treasury/purchase/pdf/Chapter25List.pdf. Vendors/Bidders must review this list prior to completing the below certification. If the Director of the Division of Purchase and Property finds a person or entity to be in violation of the law, s/he shall take action as may be appropriate and provided by law, rule or contract, including but not limited to, imposing sanctions, seeking compliance, recovering damages, declaring the party in default and seeking debarment or suspension of the party.

CHECK THE APPROPRIATE BOX

I certify, pursuant to N.J.S.A. 52:32-57, et seq. (P.L. 2012, c.25 and P.L. 2021, c.4), that neither the Vendor/Bidder listed above nor any of its parents, subsidiaries, or affiliates is listed on the New Jersey Department of the Treasury's Chapter 25 List of entities determined to be engaged in prohibited activities in Iran.

OR

I am unable to certify as above because the Vendor/Bidder and/or one or more of its parents, subsidiaries, or affiliates is listed on the New Jersey Department of the Treasury's Chapter 25 List. I will provide a detailed, accurate and precise description of the activities of the Vendor/Bidder, or one of its parents, subsidiaries or affiliates, has engaged in regarding investment activities in Iran by completing the information requested below.

Entity Engaged in Investment Activities Relationship to Vendor/ Bidder	
Description of Activities	
Duration of Engagement	
Anticipated Cessation Date	
*Attach Additional Sheets If Necessary.	

CERTIFICATION

I, the undersigned, certify that I am authorized to execute this certification on behalf of the Vendor, that the foregoing information and any attachments hereto, to the best of my knowledge are true and complete. I acknowledge that the State of New Jersey is relying on the information contained herein, and that the Vendor is under a continuing obligation from the date of this certification through the completion of any contract(s) with the State to notify the State in writing of any changes to the information contained herein; that I am aware that it is a criminal offense to make a false statement or misrepresentation in this certification. If I do so, I may be subject to criminal prosecution under the law, and it will constitute a material breach of my contract(s) with the State to declare any contract(s) resulting from this certification void and unenforceable.

Signature

Date

Print Name and Title



FEDERAL NON-DEBARMENT CERTIFICATION N.J.S.A. 52:32-44.1 (P.L. 2019, c.406) FORM # 7

The College of New Jersey PO Box 7718 Ewing, NJ 08628-0718

Summary of the Certification Requirements under N.J.S.A. 52:32-44.1

Pursuant to state law any natural person, company, firm, association, corporation, or other entity prohibited, or "debarred," from contracting with the federal government agencies, shall also be prohibited from contracting for public work in the state of New Jersey. This prohibition also extends to any affiliate organization(s) held by or subject to the control of an entity of that prohibited person or entity.

Prior to awarding a contract for public work a local unit must obtain written certification from the contracting person or entity through the form below, attesting to their non-debarment from contracting with federal government agencies. Contracting units are reminded that they must fill-in the boilerplate information in the certification sections of Parts II through IV regarding their name and type of contracting unit before using the form.

<u>CERTIFICATION OF NON-DEBARMENT</u> FOR FEDERAL GOVERNMENT CONTRACTS

<u>N.J.S.A</u>. 52:32-44.1 (P.L. 2019, c.406)

This certification shall be completed, certified to, and submitted to the contracting unit prior to contract award, except for emergency contracts where submission is required prior to payment.

PART I: VENDOR INFORMATION		
Individual or		
Organization Name		
Physical Address of		
Individual or		
Organization		
Unique Entity ID		
(if applicable)		
CAGE/NCAGE Code		
(if applicable)		
Check the box that represents the type of business organization:		

□Sole Proprietorship (skip Parts III and IV) □Non-Profit Corporation (skip Parts III and IV)

□ For-Profit Corporation (any type) □ Limited Liability Company (LLC) □ Partnership

Limited Partnership

Limited Liability Partnership (LLP)

Other (be specific): _____

PART II – CERTIFICATION OF NON-DEBARMENT: Individual or Organization

I hereby certify that the **individual or organization listed above in Part I** is not debarred by the federal government from contracting with a federal agency. I further acknowledge: that I am authorized to execute this certification on behalf of the above-named organization; that The College of New Jersey is relying on the information contained herein and that I am under a continuing obligation from the date of this certification through the date of contract award by The College of New Jersey to notify The College of New Jersey in writing of any changes to the information contained herein; that I am aware that it is a criminal offense to make a false statement or misrepresentation in this certification, and if I do so, I am subject to criminal prosecution under the law and that it will constitute a material breach of my agreement(s) with The College of New Jersey, permitting The College of New Jersey to declare any contract(s) resulting from this certification void and unenforceable.

Full Name (Print):	Title:	
Signature:	Date:	

PART III – CERTIFICATION OF NON-DEBARMENT: Individual or Entity Owning Greater than 50
Percent of Organization

Section A (Check the Box that applies)			
	Below is the name and address of the stockholder in the corporation who owns more than 50 percent of its voting stock, or of the partner in the partnership who owns more than 50 percent interest therein, or of the member of the limited liability company owning more than 50 percent interest therein, as the case may be.		
Name of Individual or Organization			
Physical Address			
	OR		
	No one stockholder in the corporation owns more than 50 percent of its voting stock, or no partner in the partnership owns more than 50 percent interest therein, or no member in the limited liability company owns more than 50 percent interest therein, as the case may be.		
Section B (Sk	ip if no Business entity is listed in Section A above)		
	Below is the name and address of the stockholder in the corporation who owns more than 50 percent of the voting stock of the organization's parent entity, or of the partner in the partnership who owns more than 50 percent interest in the organization's parent entity, or of the member of the limited liability company owning more than 50 percent interest in organization's parent entity, as the case may be.		
Stockholder/Partner/Member Owning Greater Than 50 Percent of Parent Entity			
Physical Address			
	OR		
	No one stockholder in the parent entity corporation owns more than 50 percent of its voting stock, no partner in the parent entity partnership owns more than 50 percent interest therein, or no member in the parent entity limited liability company owns more than 50 percent interest therein, as the case may be.		
	Section C – Part III Certification		
I hereby certify that no individual or organization that is debarred by the federal government from contracting with a federal agency owns greater than 50 percent of the Organization listed above in Part I or, if applicable, owns greater than 50 percent of a parent entity of			

I further acknowledge: that I am authorized to execute this certification on behalf of the above- named organization; that The College of New Jersey is relying on the information contained				
herein and that I am	under a continuing obligation from the da	ate of this	certification through	
the date of contract	award to notify The C	ollege of	New Jersey in writing of	
any changes to the in	nformation contained herein; that I am aw	are that	it is a criminal offense to	
make a false stateme	ent or misrepresentation in this certification	on, and if	I do so, I am subject to	
criminal prosecution	under the law and that it will constitute a	material	breach of my	
agreement(s) with The College of New Jersey, permitting The College of New Jersey to declare				
any contract(s) resulting from this certification void and unenforceable.				
Full Name (Print): Title:				
Signature:		Date:		

Part IV – CERTIFICATION OF NON-DEBARMENT: Contractor – Controlled Entities				
Section A				
	Below is the name and a	ddress of the corporation(s) in which the		
	Organization listed in Pa	rt I owns more than 50 percent of voting stock, or		
	of the partnership(s) in w	hich the Organization listed in Part I owns more		
	than 50 percent interest	therein, or of the limited liability company or		
	companies in which the	Organization listed above in Part I owns more than		
	50 percent interest there	in, as the case may be.		
Name of	Business Entity	Physical Address		
Add additional she	eets if necessary			
		OR		
	The Organization listed above in Part I does not own greater than 50			
-	percent of the voting sto	ck in any corporation and does not own greater		
than 50 percent interest in any partnership or any limited liability comp				
Sectio	on B (skip if no business er	ntities are listed in Section A of Part IV)		
	Below are the names and	addresses of any entities in which an entity listed		
	in Part III A owns greater	than 50 percent of the voting stock (corporation) or		
owns greater than 50 percent interest (partnership or limited liability		rcent interest (partnership or limited liability		
	company).			
Name of Business Entity Controlled by Entity		Physical Address		
Listed in Section A of Part IV				

Add additional She	**Add additional Sheets if necessary				
		OR			
	No entity listed in Part III	A owns greater than !	50 percent of the voting stock		
	in any corporation or ow	ns greater than 50 per	cent interest in any		
	partnership or limited lia	bility company.			
	Section C – I	Part IV Certification			
I hereby certify that	t the Organization listed at	pove in Part I does not	own greater than 50 percent		
of any entity that th	nat is debarred by the fede	ral government from c	ontracting with a federal		
agency and, if appli	cable, does not own greate	er than 50 percent of a	ny entity that in turns owns		
greater than 50 per	cent of any entity debarred	d by the federal goverr	ment from contracting with a		
federal agency. I fu	urther acknowledge: that I	am authorized to exec	ute this certification on behalf		
of the above-name	d organization; that The Co	ollege of New Jersey is	relying on the information		
contained herein ar	nd that I am under a contin	uing obligation from t	ne date of this certification		
through the date of	f contract award by The Co	llege of New Jersey to	notify The College of New		
Jersey in writing of	any changes to the informa	ation contained herein	; that I am aware that it is a		
criminal offense to	criminal offense to make a false statement or misrepresentation in this certification, and if I do so,				
I am subject to criminal prosecution under the law and that it will constitute a material breach of					
my agreement(s) with The College of New Jersey, permitting The College of New Jersey to declare					
any contract(s) resulting from this certification void and unenforceable.					
Full Name (Print):		Title:			
Signature:		Date:			



CONTRACT FOR CONSTRUCTION

This AGREEMENT i	s entered into as of the	lay of	_,, between
The College:	The College of New Jersey ("TCNJ" or the "College") PO Box 7718 2000 Pennington Road Ewing, New Jersey 08628-0718		
and			
the Contractor:		(the "Contractor")	
in connection with			
the Project:	[<u>] (th</u>	e "Project")
The Architect:			

<u>ARTICLE 1</u> EMPLOYMENT OF THE CONTRACTOR/THE PROJECT DESCRIPTION

1.1 The College employs the Contractor and the Contractor agrees to perform the construction for the Project identified above. The Project is described in more detail in the College's Plans and Specifications prepared by the Architect.

ARTICLE 2 THE CONTRACT DOCUMENTS

2.1 The Contract Documents consist of this Contract for Construction and the Exhibits attached hereto ("Contract for Construction"), the General Conditions of the Contract for Construction (the "General Conditions") (and any other General, Supplementary and other Conditions), the Plans and Specifications, and also the following documents:

- (a) The Contractor's Bid excluding limitations and qualifications unless such limitation or qualification is specifically accepted in writing by the College;
- (c) Addenda and Clarifications issued before the bid due date;
- (d) The Project Bidding Schedule; and
- (e) Modifications issued after execution of this Contract for Construction.

These documents all form the "Contract," and are as fully a part of this Contract as if attached hereto or repeated herein. This Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral.

ARTICLE 3 SCOPE OF WORK

3.1 The Contractor shall fully perform the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others. The Contractor shall assume full responsibility for constructing and completing the Project and all the Work, including providing all labor, Subcontractors, materials, equipment, and services reasonably inferable from the Contract Documents and all applicable laws, codes and professional standards, and providing all supervision, management, and scheduling required in the General Conditions and as noted throughout the Contract Documents.

ARTICLE 4 CONTRACT TIMES

4.1 TIME OF THE ESSENCE. All dates and durations specified in this Contract, including the Construction Start Date(s), any Milestones Dates, any Substantial Completion Date(s) and any Final Completion Date(s) (collectively, "Contract Times") are agreed to be of the essence.

4.2 CONSTRUCTION START. The Work shall start no later than ten (10) calendar days after the College issues a Notice to Proceed to the Contractor ("Construction Start Date"). If the Work is to be performed in phases, the College may issue a separate Notice to Proceed with respect to each phase (e.g., Phase 1 Notice to Proceed, Phase 2 Notice to Proceed, etc.) thereby establishing different Construction Start Dates for each phase (e.g., Phase 1 Construction Start Date, Phase 2 Construction Start Date, etc.). The College may, in its sole discretion and at no cost to the College, choose to delay the issuance of a Notice to Proceed and the Construction Start Date for any phase until after the Contractor has achieved Substantial or Final Completion of any other phase.

4.3 MILESTONES. The construction tasks or activities shall be completed within the number of calendar days after the Construction Start Date as set forth in the Notice to Proceed ("Milestone Dates"). If the Work is to be performed in phases, each phase may have

separate Milestone Dates (e.g., Phase 1 Milestone Dates, Phase 2 Milestone Dates, etc.), which dates shall be set forth in the Notice to Proceed for that phase.

4.4 SUBSTANTIAL COMPLETION. The Contractor shall diligently prosecute the Work and shall achieve Substantial Completion of the entire Work as set forth in the Notice to Proceed ("Substantial Completion Date"). If the Work is to be performed in phases, each phase may have a separate Substantial Completion Date (e.g., Phase 1 Substantial Completion Date, Phase 2 Substantial Completion Date, etc.), which date shall be set forth in the Notice to Proceed for that phase. The definition and requirements of Substantial Completion are set forth in the General Conditions. The Substantial Completion Date(s) shall only be changed by a written change order.

4.5 FINAL COMPLETION. The Contractor shall achieve Final Completion of the entire Work as set forth in the Notice to Proceed ("Final Completion Date"). If the Work is to be performed in phases, each phase may have a separate Final Completion Date (e.g., Phase 1 Final Completion Date, Phase 2 Final Completion Date, etc.), which date shall be set forth in the Notice to Proceed for that phase. The requirements for Final Completion are defined in the General Conditions as well as the Specifications of the Project. The Final Completion Date(s) shall only be changed by written change order.

4.6 LIQUIDATED DAMAGES FOR DELAY. If the Contractor fails to achieve Substantial Completion of a phase of the Work or of the entire Work by the Substantial Completion Date(s) set forth in the applicable Notice to Proceed (as extended by Change Order, if applicable), and the delay is not excused by the College, then the Contractor shall pay the College the following amounts as liquidated damages for delay ("Liquidated Damages") for each calendar day that the phase of the Work or the entire Work is not substantially completed beyond the applicable Substantial Completion Date:

[\$ 1/20th of 1% of the total contract price per calendar day]

The College and the Contractor agree that the actual loss to the College from construction delays and the inability to use the Project or any phase of the Project in a substantially completed state are for the most part difficult to quantify, and that the foregoing Liquidated Damages formula results in damages amounts that are a reasonable estimate of the damage to the College for not being able to use the Project in a substantially completed state and are not penalties and are not intended to be penalties. The College may deduct Liquidated Damages from payments due under this Contract, but its failure to withhold Liquidated Damages or to assert a claim for Liquidated Damages shall not be deemed a waiver of the College's right to withhold or to assert a claim for damages for any delay that occurs at any time on the Project.
ARTICLE 5 CONTRACT PRICE

5.1 CONTRACT PRICE. The Contractor shall be paid **§**_______ for the complete performance of this Contract, which was proposed by the Contractor in its bid and accepted by the College (the "Contract Price"). The Contractor shall be entitled to additional compensation for authorized changes which include the cost of the changes and mark-ups included in change orders approved in writing by the College in accordance with the change order provision set forth in the General Conditions.

5.2 ALTERNATES. The Contract Price is based upon and includes the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the College:

[_____]

5.3 UNIT PRICES. The Contract Price is based upon and includes the following unit prices, if any, which are described in the Contract Documents:

[_____]

5.4 ALLOWANCES. The Contract Price is based upon and includes the following allowances, if any, which are described in the Contract Documents:

[_____]

ARTICLE 6 PAYMENTS TO THE CONTRACTOR

6.1 PAYMENT. The Contractor will be paid by the College in accordance with this Article and the payment provision in the General Conditions.

6.2 MONTHLY PROGRESS PAYMENTS. The College will make progress payments as the Work proceeds based on written invoices submitted monthly by the Contractor and approved by the Architect and the College. No payments will be made until the Contractor submits a unit schedule break down showing the portions of the total Contract Price for each principal category of Work and value loaded CPM schedule allocating the Contract Price among the schedule activities. Monthly progress payment amounts shall be based on the percentages of the Work completed as of the end of the pay period (less earlier payments). All payment requests or invoices and all payments shall be governed by the payment provision of the General Conditions as well as any special requirements of this Contract, including the requirement that progress payments shall be based on a unit schedule breakdown and a value loaded CPM schedule.

6.3 RETAINAGE. The College will retain 2% of the amount due on each progress payment pending Final Completion of the Work. The holding and release of retainage shall be governed by the payment provision of the General Conditions.

6.4 CHANGE ORDERS. The Contractor shall invoice for change order work in the monthly progress payment invoices as the change order work is performed, but only after a written change order and TCNJ issued Purchase Order has been signed by the College. Changes in the Work shall be governed by the change order provision of the General Conditions.

6.5 FINAL PAYMENT. Upon final completion of all Work included in the Contract Documents including all change orders, acceptance of the Work by the Architect and the College, the satisfactory completion of all of the requirements in the General Conditions for final completion, and the issuance of the Certificate of Final Completion, the Contractor will be paid the fully adjusted Contract Price including any retainage withheld (less earlier payments). The invoice for final payment and final payment shall also be subject to the payment provision of the General Conditions and any special requirements of this Contract.

6.6 PAYMENT TERMS. All invoices and payments shall also be subject to the General Conditions, including the provisions regarding payments, to the right of the College to withhold payments or to make deductions from payments, and to the Prevailing Wage Act requirements set forth in the General Conditions. The College will pay proper final invoices within thirty (30) days of their submission to the College with the approval of the Architect.

6.7 SUBMISSION OF INVOICES. Prior to the submission of the invoice, the Contractor will submit to the College and the Architect, in draft form, a "pencil copy" of the monthly invoice for review and approval setting forth each line item for which the Contractor intends to request payment in that invoice based on the claimed percent completed for that line item. Upon receipt of said "pencil copy", the College and the Architect shall observe the Work in place and, on the basis of such observations, will either approve the amounts requested or modify the Contractor's request, based on the College's independent assessment of the Work in place. The College will then return the pencil copy invoice to the Contractor for the Contractor to then adjust and submit the final invoice with the agreed to percentages completed per line item to the College for payment. No invoice shall be submitted for payment until all amounts and completion percentages have been determined in this manner.

6.8 PROMPT PAYMENT ACT. For the purposes of the State's Prompt Payment Act, <u>N.J.S.A.</u> 2A:30A-1, <u>et seq.</u>:

(a) An invoice will be deemed to have been received when it is received by the College at the address designated in the pre-construction conference for receipt of the invoices.

(b) The "billing date" as that term is used in <u>N.J.S.A.</u> 2A:30A-2 shall be the earlier of the date upon which an invoice for payment is approved for payment or 20 days after the invoice is received, unless within such 20 day period the invoice is found to be incomplete or

otherwise unacceptable and returned to the Contractor, with a written explanation of deficiencies, the amount withheld and the reasons for withholding payment.

(c) In the event that an invoice is found to be deficient and returned to the Contractor, the "billing date" shall be calculated from the date that a corrected invoice is received.

(d) Payment shall be considered to have been made on the date on which a check for such payment is dated.

(e) Payment terms (e.g., "net 20") offered by the Contractor shall not govern the College's obligation to make payment.

(f) The following periods of time will not be included in the calculation of the due date of the Contractor's invoice:

(i) Any time elapsed between receipt of an improper invoice and its return to the Contractor, not to exceed 20 calendar days; or

(ii) Any time elapsed between the College's return of an improper invoice to the Contractor and the College's receipt of a corrected invoice.

If the State's Prompt Payment Act is amended, or the language stated herein is inconsistent with the language contained in the State's Prompt Payment Act, the language of the State's Prompt Payment Act shall control.

6.9 LIMITATIONS ON APPLICABILITY. The provisions of this Article shall not govern the College's payment obligations nor shall they supersede or modify any other contractual provision allowing the withholding of monies from the Contractor to the extent that the Contractor has not performed in accordance with the provisions of the Contract Documents. This Article also shall not govern the College's payment obligations nor supersede or modify any other contractual provision governing the Contractor claims for additional compensation beyond the base Contract Price and approved change orders.

6.10 INTEREST. Interest shall be payable on amounts due the Contractor if not paid within thirty (30) calendar days after the billing date specified above, as provided under the State's Prompt Payment Act, <u>N.J.S.A.</u> 2A:30A-1, <u>et seq.</u> Interest on amounts due shall be payable to the Contractor for the period beginning on the day after the required payment date and ending on the date on which the check for payment is drawn. Interest may be paid by separate payment to the Contractor, but shall be paid within 30 days of payment of the principal amount of the approved invoice. Nothing in this Article shall be construed as entitling the Contractor to payment of interest on any sum withheld by the College for any reason permitted under the Contract Documents or applicable law, or on any claim for additional compensation, over and above sums due under the base Contract Price or approved change orders.

ARTICLE 7 DISPUTE RESOLUTION

7.1 If a dispute or claim arises out of or relates to this Contract, or the breach thereof, and if the dispute cannot be settled through negotiation, the method for resolution of such dispute or claim shall be as provided in the dispute resolution provision of the General Conditions.

ARTICLE 8 TERMINATION OR SUSPENSION

8.1 This Contract may be terminated by the College as provided in the termination and suspension provision in the General Conditions.

8.2 The Work may be suspended by the College or the Contractor as provided in termination and suspension provision in the General Conditions.

ARTICLE 9 INSURANCE AND BONDS

9.1 CONTRACTOR'S INSURANCE. The Contractor shall purchase and maintain insurance as set forth in the insurance and bonds provision of the General Conditions. To the extent the Contractor shall be required to purchase and maintain additional insurance or insurance that differs from that set forth in the General Conditions, such requirements are set forth below:

[_____]

9.2 SUBCONTRACTOR'S INSURANCE. The Contractor shall ensure that its Subcontractors purchase and maintain insurance as set forth in the insurance and bond provision of the General Conditions.

9.3 PAYMENT AND PERFORMANCE BOND. The Contractor shall furnish the College with a payment bond and a performance bond as set forth in the insurance and bond provision of the General Conditions.

ARTICLE 10 OTHER PROVISIONS

10.1 CONTRACTOR REPRESENTATIONS. The Contractor represents to the College that it has:

(a) **Examination of the Contract Documents.** Examined and carefully studied the Contract Documents and the other documents in the bid documents, and that they are sufficient for performing the Work at the Contract Price.

TCNJCC

(b) **Examination of Site.** Visited the site and become familiar with and is satisfied as to the general, local and site conditions that may affect the cost, progress, and performance of the Work.

(c) **Familiarity with Law.** Familiarized itself with all federal, state, and local laws and regulations that may affect the cost, progress, and performance of the Work.

(d) **Familiarity with Other Information and Other Documents.** Carefully studied all reports of investigations and tests of the site and subsurface conditions at or contiguous to the site and all drawings of physical conditions at the site including surface or subsurface composition, water, structures and utilities at or near to the site.

(e) Additional Information Not Required for Bidding or Contract Performance. Does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the performance of the Work at the Contract Price.

10.2 ASSIGNMENT OF CONTRACT. The Contractor may not assign this Contract or any rights under or interests in this Contract including its right to payments under this Contract.

10.3 CONTRACTOR PERSONNEL ASSIGNED. The Contractor's team for this Project shall consist of the following personnel, who shall not be reassigned without the College's prior written consent:

Name	<u>Position</u>
	Project Executive
	Project Manager
	Project Superintendent
	Project Scheduler

The College reserves the right to request and have any member of the Contractor's or Subcontractor's staff replaced on the Project for any non-discriminatory reason.

10.4 NOTIFICATIONS/AUTHORIZED REPRESENTATIVE. All Notices required under this Contract shall be in writing, signed by the party giving same, and shall be deemed properly given only if hand delivered, sent by reputable overnight courier, or by registered or certified U.S. mail, return receipt requested, postage pre-paid and addressed as provided below.

Notice to the Contractor/Contractor's Representative. Written notices from the College and/or the Architect to the Contractor should be addressed to the Contractor's Representative:

Attn			

Notice to the College/College's Representative: Written notices from the Contractor to the College should be addressed to the College's Representative:

The College of New Jersey PO Box 7718, Ewing, New Jersey 08628 Attn:

with a copy to the College's General Counsel as follows:

Michael J. Canavan Vice President and General Counsel The College of New Jersey PO Box 7718 Ewing, NJ 08628-0718

The College's Contracting Officer hereby authorizes the College's Representative to receive all Contract related correspondence.

Notice to the Architect: Written notices from the Contractor to the Architect should be addressed to:

Attn:

Neither the College's nor the Contractor's Authorized Representatives shall be changed without 7 days' written notice to the other party.

10.5 CONTRACT TERMS, CHANGES, AND LAW. This Contract constitutes the entire agreement between the College and the Contractor, and it shall be governed by the law of the State of New Jersey. The terms and conditions of this Contract may not be changed except by a writing signed by the Contractor and the College.

10.6 COUNTERPARTS AND SIGNATURES. This Contract may be executed in counterparts. All executed counterparts shall constitute one contract, and each counterpart shall be deemed an original. The parties hereby acknowledge and agree that facsimile signatures or signatures transmitted by electronic mail in so-called "pdf" format shall be legal and binding and shall have the same full force and effect as if an original of this Contract had been delivered. The College and the Contractor (1) intend to be bound by the signatures on any document sent by facsimile or electronic mail, (2) are aware that the other party will rely on such signatures, and (3) hereby waive any defenses to the enforcement of the terms of this Contract based on the foregoing forms of signature.

10.7 NO IMPLIED COVENANTS OR WARRANTIES. The Contractor acknowledges that there are no implied covenants or warranties from the College under this Contract.

10.8 SEVERABILITY. If any term or provision of the Contract Documents are to any extent held invalid or unenforceable, and if the provisions of the Contract Documents that are essential to each party's interests otherwise remain valid and enforceable, then (i) the remaining terms and provisions in the Contract Documents will not be affected thereby, (ii) each term and provision of the Contract Documents will be valid and enforceable to the fullest extent permitted by law, and (iii) the court/arbitrator(s) will give the offending provision the fullest meaning and effect permitted by law.

10.9 HEADINGS. The headings used in this Contract are for convenience and reference only, and are not part of this Contract, and do not in any way control, define, limit or add to the terms and conditions hereof.

10.10 INTERPRETATION/RULES OF CONSTRUCTION. The parties acknowledge that each party, and if it so chooses, its counsel, have reviewed and revised this Contract and that the normal rule of construction to the effect that any ambiguities be resolved in favor of the non-drafting party shall not be employed in the interpretation of this Contract or any amendments or exhibits thereto.

THE COLLEGE OF NEW JERSEY

By_

William Rudeau, Director of Design and Construction By___

Mark Mehler, Associate VP for Finance & Budget Planning

Date_____

Date____

10

TCNJCC

By____

Sharon Blanton, Vice President for Operations

Date_____

By____

Anup Kapur, Executive Director of Procurement

Date_____

By_____

Maggie Greco, Senior Director of Facilities Planning and Construction

Date_____

CONTRACTOR:

By_____ Title_____

Date

GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

Last Revised September 2024

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ARTICLE 1 CONTRACT DOCUMENTS, INTERPRETATION, INFORMATION FOR BIDDERS, CLAIMS BASED ON BID AND CONTRACT DOCUMENTS

1.1 Definitions.

Terms defined in the Contract for Construction shall have the meaning provided therein. Definitions for the purpose of these General Conditions include the following:

<u>Addendum</u>: A document issued to bidders by the College prior to the bid due date which supplements, revises or modifies the bid solicitation documents furnished for bidding purposes, and which must be identified and included in bids for the Contract.

<u>Architect</u>: The Architect (A/E) engaged by the College to design the Project, to prepare the design documents and assist with bid documents, and may administer the Contract and act as the agent of the College as described in the Contract.

<u>Bulletin</u>: A document prepared by the Architect describing proposed changes or additions to the Work in the Contract Documents that is issued after Contract award. If the College decides to implement the change, it will provide the bulletin to the Contractor and ask it to submit a change order proposal or request (in accordance with the change order provisions in the Contract for Construction, these General Conditions and other sections of the bidding documents).

<u>Change Order Proposal or Change Order Request</u>: A written proposal or request submitted by the Contractor in accordance with the change order provision of the Contract for Construction, these General Conditions and other sections of the bidding documents, including proposals submitted in response to Contract Change Directives, which proposes cost, time and other terms under which the Contractor will perform changed work under the Contract. If accepted by the College, a written change order signed by the Vice President for Administration and a TCNJ Purchase Order signed by the Contract or in writing, it will become part of the Contract as a change order.

<u>The College's Representative:</u> The College's Representative is a person or persons designated by the College to act on its behalf in administering the Contract for the College. The College's Representative may include the Director of Campus Construction, the Project Manager or an independent construction manager working for the Office of Campus Construction.

<u>College Site Superintendent</u>: The College Site Superintendent is a person or persons designated by the College to witness, observe, record and report on activities in and around the construction site. The Site Superintendent does not have the authority to stop or change the scope of the Work of the Contract Documents.

<u>Contract</u>: The Contract Documents all form the Contract. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. The Contract may be amended or modified only by a Modification. The Contract Documents shall not be construed to create a contractual

relationship of any kind (1) between the Contractor and the Architect or the Architect's consultants, (2) between the College and a Subcontractor or a Sub-subcontractor, (3) between the College and the Architect or the Architect's consultants or (4) between any persons or entities other than the College and the Contractor. The Architect shall, however, be entitled to performance and enforcement of obligations under the Contract intended to facilitate performance of the Architect's Contractor's duties.

<u>Contract Amendment:</u> The Contract can only be amended by (1) a written amendment identified as such that is signed by the College and the Contractor, (2) a change order signed in accordance with the Contract Documents, (3) a written Contract Change Directive (CCD) issued by the College that should result in a change order unless issued to address some fault of the Contractor, (4) a written approval or acceptance by the College or the Architect of a change requested by the Contractor in writing, provided the request for a change is specifically identified in a submittal.

<u>Contract Change Directive (CCD)</u>: A Contract Change Directive (CCD) is a written directive issued by the College which orders an addition, deletion, clarification of a disputed item or revision in the Work, or a response to an emergency. A CCD does not by itself change the Contract, but it should result in a change order which does change the Contract Price or Contract Times if warranted. A CCD should specify the terms of the change order (if deemed warranted by the College) which will result, and/or specify a deadline for the submission by the Contractor of a proper change order request, and/or contain other similar terms.

<u>Contract Documents:</u> The Contract Documents are enumerated in Article 2 of the Contract for Construction.

<u>Contract Limit Lines:</u> The lines shown on the Plans that limit the boundaries of the Project site, and beyond which no construction work or activities shall be performed by the Contractor unless otherwise specified in the Contract Documents, including the Plans and Specifications and supplemental General Conditions.

<u>Contracting Officer</u>: The Associate Treasurer of the College shall be the Contracting Officer in connection with the Contract and the Project. The Contracting Officer and other designee shall have authority to act on behalf of the College under the Contract.

<u>Field Order (FO)</u>: A written order issued by the Architect or the College which requires minor changes in the Work that do not result in a change in the Contract Price or the Contract Times. If the Contractor believes that a field order warrants the issuance of a change order that changes the Contract Times or Contract Price, it must notify the College and the Architect in writing within 48 hours, and its notice must specify the terms of the change order that it believes are warranted, including specific time and price change requests.

<u>Plans:</u> The Plans are the graphic and pictorial portions of the Contract Documents showing the design, location and dimensions of the Work, generally including plans, elevations, sections, details, and diagrams.

<u>Project:</u> The Project is the total construction of the Work performed under the Contract Documents and may include construction by the College and by separate contractors that the College has specifically identified.

<u>Specifications</u>: The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, systems, standards and workmanship for the Work, and performance of related services prepared by the Architect or the College.

<u>Supplemental General Conditions:</u> The part of the Contract Documents which amends or supplements these General Conditions for the Project.

<u>Work:</u> The construction and services required by the Contract Documents, whether completed or partially completed, and includes all other labor, materials, equipment and services provided or to be provided by the Contractor to fulfill the Contractor's obligations. The Work may constitute the whole or a part of the Project.

1.2 Intent Of Contract Documents.

The intent of the Contract Documents is to describe a functionally complete and aesthetically acceptable Project to be constructed and completed by the Contractor in every detail in accordance with the Contract Documents. Any Work, services, materials, equipment or documentation that may be reasonably inferred from the Contract Documents or from prevailing custom or trade usage as being required to produce a complete Project shall be supplied by the Contractor whether or not specifically identified at no additional cost to the College. Where the Contract Documents describe portions of the Work in general terms but not in complete detail, only the best construction practices and only materials and workmanship of the first quality are to be used. Only where the Contract Documents specifically describe a portion of the Project as being performed by others is the Work to be considered to include less than the entire Project.

1.3 Interpretation Of Contract Documents.

When two or more interpretations of a Specification for the Work are possible, the most stringent or the highest cost interpretation shall apply as determined by the Architect. The Architect (or in the absence of the Architect, the College) shall be the sole interpreter of the Plans and Specifications and the Contractor's performance therewith. It is the intent of these Plans and Specifications to provide materials of a quality consistent with the highest standards provided under similar circumstances in the same general geographical area and that will result in long- term use and efficient operation.

1.4 Law And Referenced Standards.

The Contractor is required to comply with all federal, state and local laws and regulations that apply to the Project, the Work and the Contract. Where the Contract Documents refer to any publication, including but not limited to any standard, which affects any portion of the Work or the Project, it shall be considered to mean the edition or revision in effect on the bid due date unless otherwise specified in the Contract Documents. No provision in any publication including

any standard shall create an obligation on the part of the College or the Architect to supervise or direct the Contractor's Work.

1.5 Plans And Specifications.

The Plans will include general plans and such details as deemed necessary to give a comprehensive representation of the construction required. The Contractor shall keep one set of Plans available at the Project site, which shall be available for inspection by the College and the Architect at all times. All alterations affecting the requirements in the Plans must be authorized by the College and the Architect in writing, and shall be promptly noted on the Contractor's record set of Plans, which are maintained at the site for inspection by the College and the Architect.

1.6 Order Of Precedence Of Contract Documents.

Each of the Contract Documents is an essential part of the Contract, and a requirement specified in one part of the documents is binding as if specified in all. The Contract Documents are intended to be complementary and to describe and provide for a complete Project. The obligations of the Contractor under the various Contract Documents shall be cumulative and to the extent that one of the Contract Documents imposes a stricter or more costly requirement or higher standard upon the Contractor than does another Contract Document, the more stringent or more costly requirement or higher standard, as determined by the Architect, shall apply. Otherwise, if there is any conflict among the Contract Documents, the signed Contract for Construction and all approved change orders shall control. As to the other Contract Documents, the order of precedence shall be as follows:

- (a) Contract for Construction
- (b) Addenda
- (c) Supplemental General Conditions
- (d) General Conditions
- (e) Specifications
- (f) Plans
 - i. Notes
 - ii. Large Scale Details
 - iii. Sections
 - iv. Elevations
- (g) Scope of Work Description

1.7 Organization Of Plans And Specifications.

The arrangement of the Plans and the organization of the Specifications into divisions, sections or articles shall not be construed by the Contractor as being intended to divide or allocate the Work among Subcontractors or trades or to establish the scope of the Work to be performed by particular Subcontractors or trades. The College is not liable for the Contractor dividing and separating the Contract Documents into individual packages to Subcontractors. Items that the Contractor fails to include or provide for shall be at the Contractor's sole risk and

cost. The Contract Documents work together as a whole and, therefore, the Contractor is required to coordinate the entire package with all its Subcontractors.

1.8 Required Approvals.

In all cases where approvals or decisions under the Contract Documents are required from the College, the Work shall not proceed without the required approvals and decisions in writing.

1.9 Conformity Of Work To Contract Documents.

All Work performed shall conform to the lines, grades, cross-sections, dimensions, material requirements, tolerances, details and other information in the Contract Documents. The purpose of tolerances is to accommodate occasional minor variations from the middle portion of the tolerance range that are unavoidable despite reasonable construction practices. When a maximum or minimum tolerance value is specified, the material and the Work shall be controlled so that they shall not be preponderantly of borderline quality or dimension.

1.10 Work Involving Existing Structures.

On projects involving alterations, remodeling, repairs, installations or other work in preexisting structures or systems, the Contractor shall by personal inspection of the existing structures and systems satisfy itself as to the accuracy of any information provided that may affect the quantity, size and/or quality of materials required for a satisfactorily completed Project, including information that is not identified or included in the Plans and Specifications. The Contractor shall provide all material and labor required to complete the Work based on conditions that can be reasonably observed by a competent and diligent contractor before bidding.

1.11 Verification Of Dimensions.

The Contractor shall verify all dimensions at the job site and shall take any and all measurements necessary to verify the information in the Plans. The Contractor shall properly and accurately layout and survey the Work. Any errors or discrepancies affecting the layout of the Work shall be reported to the Architect and the College immediately in writing. No Work affected by any error or discrepancy shall proceed until such discrepancy is resolved by a written decision of the Architect with the consent of the College.

1.12 Manufacturer Literature.

Manufactured articles, materials and equipment shall be installed, applied, connected, erected, used, cleaned and conditioned in accordance with the manufacturer's written instructions unless otherwise specified in the Contract Documents. If there is any conflict between manufacturer literature and the Contract Documents, it shall be reported by the Contractor to the Architect and the College in writing, and the Contractor shall not proceed without a written decision by the Architect with the consent of the College.

1.13 Quality -- General Requirement.

Where no explicit quality or standard are specified for Work, materials or equipment, they shall be new, of good quality, free of defects, suitable for their intended use, in conformity with the Contract Documents, and consistent with the highest quality of the surrounding Work and of the construction of the Project generally.

1.14 Examination Of Contract Documents Before Bidding/Errors.

The Contractor represents and warrants that before bidding it examined and carefully studied the Contract Documents and other documents included or referred to in the bid documents. The Contractor also represents and warrants that the documents are sufficient for bidding and performing the Work at the Contract Price. Should it appear that any of the Work or materials are not sufficiently or properly detailed or explained in the Contract Documents, the Contractor shall notify the College in writing before the bid deadline for submitting questions.

Errors, omissions, conflicts, discrepancies, inconsistencies or other defects in the Contract Documents or between the Contract Documents and any codes, standards or other applicable documents which are capable of being discovered by a diligent and competent contractor before bidding shall be reported to the College in writing before the bid deadline for submitting questions. If errors, omissions, inconsistencies or other defects in the Contract Documents are not discovered until after the bid due date, the Contractor shall promptly notify the College and the Architect of them in writing, provide written recommendations regarding changes or corrections to resolve any such errors, omissions, inconsistencies or defects, and obtain the Architect's written interpretation and approval with the consent of the College before proceeding with the Work affected.

1.15 Site Information.

Soil borings, test pits or other subsurface or site information regarding the physical site and subsurface conditions on or near the site may have been obtained from independent contractors for the purpose of preparing the design documents for the Project rather than for the purpose of contractor estimating or bidding. Such information may be identified or included in the Contract Documents so that it can be reviewed by bidders during the bidding phase, but because of the limited nature and purpose of the information, it shall not be considered to be part of the Contract Documents, and the Contractor must assume responsibility for interpreting and relying upon the information.

1.16 Sufficiency Of Documents Provided For Bidding.

The Contractor represents and warrants that before bidding it carefully studied all reports, surveys and documents included or identified in the bid documents regarding observations, inspections, investigations and tests of the site and subsurface conditions at or near the site, and all information provided to bidders regarding physical conditions at or near the site, including surface and subsurface composition, water, structures and utilities, and that it determined that no further examinations, investigations, tests, studies or data were necessary for bidding or the performance of the Work at the Contract Price. If the Contractor concluded that additional

information is required, it must notify the College in writing before the bid deadline for submitting questions.

1.17 Examination Of Site Before Bidding.

The Contractor represents and warrants that before bidding it familiarized itself with the site and was satisfied as to the general, local and site conditions which may affect the cost, progress and performance of the Work and the Contract, and that its bid and bid price take into account all such conditions. No additional costs will be borne by the College for conditions that existed and were reasonably observable or described at the time of bidding.

1.18 Hazardous Materials On Site.

The Contractor will not be responsible for hazardous environmental conditions uncovered or discovered on the site that were not disclosed in the Contract Documents and that were not caused by the Contractor or anyone working through or under the Contractor. If such conditions are discovered, the Contractor shall stop work and notify the College in writing immediately. The College may issue a written directive to the Contractor requiring it to stop work until the hazardous environmental condition is remedied, and the Contractor will be entitled to an extension of the Contract Times if an extension is warranted under the provisions of the Contract for Construction and these General Conditions regarding extensions. The College may also make changes in the Contract in response to the contract for Construction and these General Conditions, and the Contract will be changed in accordance with the change order provisions in the Contract for Construction and these General Conditions.

1.19 Limitation On Claims Based On Contract Documents And Information Provided For Bidding.

The Contractor may not assert claims for extra compensation beyond the bid and Contract Price for constructing the completed Project by reason of any errors, omissions, inconsistencies, or defects in the Contract Documents that are discoverable by a diligent and competent contractor, because of (i) its obligation to review and study the bid documents before submitting its bid, (ii) its representation in the Contract Documents that it did so, and (iii) its obligation to notify the College in writing of any such errors, omissions, inconsistencies, or defects before submitting its bid,. In addition, the Contractor may not assert claims for extra compensation beyond the bid and Contract Price for constructing the completed Project by reason of any lack of information affecting the construction of the Project at the time of bidding, or errors in the information included or referenced in the bid documents except to the extent explicitly permitted by the Contract for Construction or these General Conditions. The Contractor shall notify the College in writing before submitting its bid of any errors or omissions in the information provided or be precluded from seeking extra compensation or asserting a claim. This limitation on claims may be modified and further restricted in the signed Contract for Construction when the Contract Documents explicitly require the Contractor to participate in any aspect of the design phase.

The Contractor may assert claims for extensions and additional compensation in accordance with the provisions of the Contract for Construction and these General Conditions if

information regarding the site that is identified in the bid or Contract Documents is factually inaccurate, and the inaccuracy is one that a reasonably competent and diligent contractor would not discover in preparing a bid. The Contractor may not assert a claim for an extension or extra compensation when it claims, not that the information is factually inaccurate, but rather that conclusions, inferences or judgments made in reliance on accurate information prove to be incorrect.

ARTICLE 2 THE COLLEGE

2.1 General Rights And Responsibilities Of The College.

The College as the owner of the Project is entitled to have the Contractor perform and complete the Work in accordance with the Contract Documents, including the time of completion, quality and documentation requirements of the Contract. The College for its part undertakes to furnish the site, to notify the Contractor of any restrictions on the site that could affect the Contractor's performance of the Contract, to obtain approvals relating to the site that are needed for the construction to proceed, to pay the Contractor in accordance with the Contract, and to act reasonably in reviewing all documentation, claims and questions properly submitted to it under the Contract. The College also undertakes to provide the information and items that it expressly agrees in the Contract Documents to provide.

The College shall also have such other rights and responsibilities as are specified in the Contract Documents. The College will not supervise the Contractor's Work or be responsible for the Contractor's construction means and methods, or the Contractor's safety practices, or any failure of the Contractor to comply with the Contract Documents or any laws or regulations.

2.2 The College's Representative, Authority To Decide Contract Questions.

The Contracting Officer delegates its authority to the College's Representative who is authorized to act and make decisions on behalf of the College regarding matters specified in the Contract Documents. However, the College's Representative is not authorized to make or agree to material changes to the Contract Documents or changes involving the Contract Times or Contract Price.

All changes to the Contract Documents including change orders that modify Contract Price, Contract Times or other material change to the Contract Documents must be reviewed and approved by the Contracting Officer or his/her designee. The Contracting Officer designates that the Vice President for Administration is authorized to approve change orders.

The College's Representative, in consultation with the Architect, is authorized to decide on behalf of the College, all questions regarding the quality, acceptability and rate of progress of the Work, all questions regarding the interpretation of the Contract Documents, the acceptability of the performance of the Contract by the Contractor, and the compensation due to the Contractor. Where the College's Representative is authorized to render decisions under the Contract for Construction or these General Conditions regarding disputes or claims, he/she shall consult with the Architect and shall not act arbitrarily so as to unfairly benefit either the College or the Contractor.

2.3 Required Approvals.

In all cases where approvals or decisions are required from the College under the Contract Documents, such approvals or decisions shall be made reasonably, except in cases where a specific standard applies such as, for example, situations where the College is entitled to exercise unqualified discretion in selecting the types of materials, products or construction which it decides to procure.

2.4 Information Required From The College.

Information which the Contract Documents specify the College will provide shall be provided with reasonable promptness.

2.5 Permits.

The College will arrange and pay for permits and permit inspections, including building code permits except to the extent that the Specifications specify otherwise. The Contractor will arrange for and coordinate all inspections and the dates and times for all inspections with local, state and independent agencies and include the College's Representative or the Site Superintendent.

2.6 The College's Inspection Of The Project.

The College shall have the right to be represented at the site by the College's Representative(s), the Site Superintendent and other College employees designated by the College, the Architect, and other consultants designated by the College or the Architect. The College and its representatives shall have the right to visit the site, inspect Work and materials, inspect Project documentation, conduct tests, attend meetings, meet with the Contractor' and the Subcontractors' representatives shall be allowed access to all parts of the Work, and the Contractor shall furnish them with information and assistance when they request it.

The Contractor shall give the College and the Architect timely notice of readiness of Work for observation, inspection and testing, and shall cooperate with these efforts. The Contractor shall also comply with any inspection and testing procedures specified in the Contract Documents.

The Contracting Officer, the Architect and the College's Representative shall have the right to direct the Contractor to remove or uncover unfinished Work if deemed necessary to inspect Work or materials in place.

If Work is covered before it is inspected because the College, the Architect or any consultant were not afforded reasonable notice and an opportunity to inspect, or where the

Contract Documents or any law require an inspection, the Contractor shall uncover and replace Work at its own expense if required to do so by the College.

If any other portion of the Work not specifically required to be inspected is covered, and the College or the Architect did not ask to observe or inspect the Work before it was covered, the College may nonetheless ask to inspect the Work. If the College makes such a request, the Contractor shall uncover the Work for inspection. If the Work uncovered is found to be in accordance with the Contract Documents, the cost of uncovering and replacement shall be paid by the College by a change order. If the Work uncovered is found not be to in compliance with the Contract Documents, the Contractor shall pay all costs of uncovering and replacement, and also remedy the defect or deficiency at its own cost.

The College at all times retains the right to stop all or part of the Work by a written direction because of defective Work until the defect is eliminated. This right shall not give rise to any duty on the part of the College to exercise the right for the benefit of the Contractor or those performing its Contract.

The College at all times retains the right to stop all or part of the Work due to concerns with the effectiveness of the Contractor's safety program required under Article 5.2. The College may require the Contractor to provide a written plan to correct safety deficiencies, an on-site safety supervisor, or other administrative or engineering controls to ensure the safety of personnel impacted or potentially impacted by Contractor operations. The Contractor shall indemnify, defend and hold the College harmless from fines issued by Federal, State or Local OSHA enforcement.

2.7 The College's Inspectors, Duties And Limitations

If the College designates inspectors to inspect Work and materials and Project documentation, they will not be authorized to alter or waive any requirements or provisions in the Contract Documents. The College's inspectors will not be authorized to issue instructions contrary to the Contract Documents or to act as foremen or employees of the Contractor. The College's inspectors have the authority to reject unsuitable Work or materials, subject to written confirmation by the College's Representative. If the Contractor believes that any action of a College inspector is contrary to the Contract Documents, it shall notify the College's Representative and the Architect in writing within 48 hours. The College does not undertake to have inspectors sufficient in number to inspect every item of Work or material as it is provided, or to have inspectors with the expertise needed to judge every aspect of the Work.

The Contractor shall remain responsible for defective Work or materials irrespective of any inspections or lack of inspections during the Work. If the Contractor seeks a binding determination of the acceptability of Work or materials during the performance of the Contract, it shall do so by making a written request for such a determination to the College's Representative with a copy to the Architect.

2.8 The College's Rejection Of Defective Work.

The College shall have the right to reject defective Work, materials, or equipment at any time, and to require the Contractor to remove and replace it at the Contractor's expense. The Contractor shall also be responsible for repairing damage to other work caused by defects or deficiencies in its Work. The College's Representative, upon consultation with the Architect, may elect to accept Work or materials that do not conform to the Contract Documents and to credit or reduce the Contract Price, but the College shall have no contractual obligation to elect this remedy. Changes to the Contract Documents in these circumstances shall be recorded as a change order under the change order provision of the Contract for Construction and these General Conditions.

ARTICLE 3 THE ARCHITECT

3.1 The Architect's General Role.

The Architect is, by contract with the College, responsible for the design of the Project. During construction, the Architect is responsible for reviewing the Contractor's submittals to determine if they conform to the Contract Documents and good industry practice, to provide some level of inspection to determine if Work and materials provided by the Contractor conform to the Contract Documents and good industry practice, and to review the Contractor's payment applications. During the performance of the Work, the Architect may investigate any defects and deficiencies in the Work or materials provided and make recommendations to the College regarding the defects or deficiencies. The Architect will conduct inspections to determine if the Contractor has achieved proper Substantial and Final Completion and submitted all documents required at Substantial and Final Completion. The Contractor shall cooperate with and render assistance to the Architect in the performance of these duties.

3.2 The Architect's Access And Facilities.

The Contractor shall allow the Architect and its consultants access to the Project at all times and shall facilitate their access to inspect Work and materials and Project documentation. The Architect and its consultants shall be permitted to attend job meetings, scheduling meetings and other meetings at the site and the Contractor shall facilitate their ability to do so. The Contractor shall provide an office at the site for the Architect if the Specifications require it to do so.

3.3 Limitation Of The Architect's Responsibilities.

The Architect will not be responsible for or have control of construction means and methods or safety precautions and programs in connection with the Work. The Architect will not be responsible for or have control of acts or omissions of the Contractor, its Subcontractors, or any of their agents or employees, or any other person performing any of the Contract Work.

3.4 The Architect's Rejection Of Work.

The Architect may recommend rejection of Work or materials that it believes does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, it may recommend to the College special inspections or testing of Work or materials, including completed Work and materials.

3.5 The Architect's Review Of The Contractor's Submittals.

The Architect will review, approve or take other appropriate action regarding the Contractor's submittals, such as shop drawings, product data and samples, to assure that they conform with the design requirements and Contract Documents. The approval of a specific item shall not be deemed to constitute approval of an assembly of which the item is a component.

3.6 The Architect's Review Of The Contractor's As-Built Plans.

The Architect will periodically review the Contractor's as-built plans maintained at the site to ensure that they are up-to-date, and shall review the completed as-built plans at Project completion to ensure that they are complete and are provided to the College.

3.7 The Architect's Determination Of Substantial and Final Completion.

The Architect will conduct inspections to determine the dates of Substantial and Final Completion and to determine if the Contractor has properly Substantially and Finally completed the Project. The Architect will obtain from the Contractor all written warranties and all other documents that the Contractor is required to provide at Substantial and Final Completion of the Project.

ARTICLE 4 THE CONTRACTOR

4.1 The Contractor's Responsibility For Performance Of The Contract And Work.

The Contractor is the person or entity identified as such in the Contract. The Contractor shall be lawfully licensed in the jurisdiction where the Project is located.

The Contractor shall perform all of the duties in the Contract Documents, shall furnish the labor, materials and equipment to complete the construction of the Project in accordance with the Contract Documents, and furnish all services, labor, materials and equipment necessary or appropriate to construct the Project. The Contractor shall manage, supervise, schedule, direct, and inspect the Work as competently, skillfully, and efficiently as possible, and shall be solely responsible for all construction means, methods, techniques, safety, security, sequences, procedures, and coordination.

The Contractor shall comply with all applicable laws, and shall establish and maintain reasonable quality assurance and safety programs in connection with its Work. The Contractor shall complete the Work in compliance with the Contract Documents and by Milestone, Substantial Completion and Final Completion Dates in the Contract for Construction or any authorized extensions thereof. The Contractor shall maintain good order and discipline at the site at all times.

4.2 The Contractor's Key Personnel.

The Contractor shall assign to the Project a Project executive, Project manager, superintendent, and scheduler, and such other key personnel as are specified in the Contract for Construction or as required to carry out the requirements of the Project. The Contractor shall not remove or replace such key personnel without the College's written approval. The College has the authority to reject key personnel assigned to the Project and have replaced any staff member of the Contractor or any of the Subcontractors for any non-discriminatory reason, including, but not limited to, safety violations, poor past performances, drug use, or inappropriate behavior.

4.3 The Contractor's Supervision Of Contract Work/The Superintendent.

The Contractor shall supervise and be responsible for the acts and omissions of the Contractor's employees, agents, Subcontractors, sub-subcontractors, suppliers and other persons performing portions of the Work and the Contract. The Contractor's designated Project superintendent shall be at the Project site at all times when Work is in progress. The Contractor may designate in writing an alternate superintendent who must be approved in writing by the College. The superintendent (or alternate) shall have full authority to represent and act for the Contractor at the site and shall have full authority to execute orders and directives of the College without delay.

Communications from the College or the Architect to the superintendent shall be deemed to have been given to the Contractor. The superintendent shall be capable of and authorized to respond to all hazardous and unsafe conditions at the Project site and to implement prompt corrective measures to eliminate all unsanitary, hazardous or dangerous conditions at the site. The College may suspend all or part of the Work at the Project site if the superintendent (or alternate) is not present at the Project site. Such a suspension shall not be the basis of a claim against the College, including without limitation any claim for additional time or extra cost.

The superintendent shall attend all meetings at the Project site including job meetings, scheduling meetings, and meetings with the College and/or the Architect. The superintendent shall have a written plan that must be approved in writing by the College for responding to emergencies when the Work is not in progress. The Contractor shall also utilize qualified competent craftsmen on the Project.

4.4 Cooperation With The College And Other Contractors.

The College reserves the right to contract for and perform other or additional work on or adjacent to the Project site. When separate contracts are let within the limits of the Project site, or in areas adjacent to the site, the Contractor shall perform its Work so as not to interfere with or

hinder the progress or completion of the work being performed by other contractors. The Contractor shall also affirmatively cooperate with such other contractors and coordinate its activities with theirs, and include coordination measures in the Project Schedule. The Contractor shall arrange its Work and shall place and dispose of materials being used so as not to interfere with the operation of other contractors within the limits of the Project site. The Contractor shall join its Work with that of the other contractors in an acceptable manner and shall perform its Work in proper sequence with that of other contractors.

If there is a disagreement as to the respective rights of the Contractor and others doing work within the limits of or adjacent to the Project site, the College shall determine the respective rights of the contractors involved to secure the satisfactory completion of all affected work. The Contractor shall not be entitled to additional compensation beyond its Contract Price that may arise because of inconvenience, delay, or loss experienced by it as a result of the presence and operations of other contractors working within the limits of or adjacent to the Project site.

The College reserves the right to occupy any portion of the Project that is ready for occupancy prior to Final Completion and acceptance of the Project, after Local and State Construction Enforcing Agency approval.

The occupancy of any portion of the Project does not constitute an acceptance of any Work nor does it waive the College's right to liquidated damages or constitute an acceptance of any Work, as the Project will be accepted as a whole and not in units. Prior to such occupancy, however, the Architect, a representative of the College, and the Contractor shall fully inspect the portions of the Project to be occupied, preparing a complete list of omissions of materials, faulty workmanship, or any items to be repaired, torn out or replaced. The College will assume responsibility for damage to premises so occupied of any items not on this list when such damage is due to greater than normal wear and tear, but does not assume responsibility for improper or defective workmanship or materials.

4.5 **Performance Of The College Directives.**

When the College issues a written directive to the Contractor under the authority of any provision in the Contract for Construction or these General Conditions, the Contractor shall perform as directed in a diligent manner and without delay. Compliance with written directives shall not adversely affect the rights of the Contractor under the Contract for Construction, these General Conditions or law, but if the Contractor objects to a directive of the College, or claims that a directive infringes upon its rights or entitles it to a change order, it shall notify the College in writing within 2 business days of any directive and describe any objection it has to the directive and the reasons for its objection. Objection to a written directive does not relieve the Contractor of the obligation to comply with the directive and proceed in a diligent manner to implement the directive without delay.

ARTICLE 5 PERFORMANCE OF WORK

5.1 **Protection Of Work/Materials.**

The Contractor, shall at its own expense, protect all finished Work and materials from damage and keep them protected until the Project is accepted as Substantially Completed, and shall repair or replace any Work or material damaged before acceptance. After the Project is accepted as Substantially Complete, the Contractor will remain responsible up through Final Completion for damage to Work and materials caused by it or its Subcontractors or others participating in the performance of its obligations under the Contract Documents. The Contractor shall also secure and protect its own tools, equipment, materials and supplies, and the College shall have no liability for damage, theft or injury to the Contractor's property.

5.2 Safety And Safety Programs.

The Contractor shall have full responsibility for safety at the Project site at all times up to Final Completion and acceptance of the Project and the Contract. The Contractor shall provide for the safety of all individuals on the Project site, and take measures to ensure that individuals on or near the Project site are not injured by the performance of the Contract. The Contractor shall establish and maintain a Project safety program in accordance with all applicable laws including OSHA, good industry practice, and any additional requirements in the Contract Documents. If the College or the Architect become aware of an unsafe situation, the Contractor will immediately respond to remedy the safety concern and shall take all other actions necessary to comply with Article 2.6.

5.3 Emergencies Affecting Safety.

If there is an emergency affecting the safety of persons or property, the Contractor shall take immediate action to prevent damage, injury or loss. The Contractor shall notify the College in writing of the situation and all actions being taken immediately or as soon as possible. If, in the opinion of the Contractor, immediate action is not required, the Contractor shall notify the College in writing of the emergency situation and proceed in accordance with the College's instructions. However, if loss, damage, injury or death occurs that could have been prevented by the Contractor's prompt and immediate action, the Contractor shall be liable for all costs, damages, claims, actions, suits, attorney's fees and other expenses that result.

Any additional compensation or extension of time claims by the Contractor on account of emergency Work shall be determined in accordance with the change provisions of the Contract for Construction and these General Conditions. The Contractor shall be responsible for emergencies and costs and delays resulting therefrom that could have been foreseen or prevented with normal diligence, planning, and supervision of the Work, or that are caused by the Contractor's failure to properly perform the Contract.

The Contractor shall provide the College with a list of the names and telephone numbers of its employees and employees of each Subcontractor designated to be contacted in case of an emergency during non-working hours. A copy of this list shall be displayed prominently at the Project site so that it is visible when the Project site is secured and shall be provided to the College's campus police department.

5.4 Working Hours.

Except as required for the safety or protection of persons or property, or as specified in the Contract Documents, all Work at the site shall be performed during regular working hours, and not on Saturdays, Sundays, legal holidays, the College's commencement days, resident move-in and move-out days or other days specifically noted in the Contract Documents without the prior written consent of the College, which will not be unreasonably withheld.

5.5 Site Security.

The Contractor shall provide, maintain and oversee security at the site if required in the Specifications. The Project site shall be fenced as specified in the Specifications, and the Contractor shall control access when gates are unlocked or open. The fence shall provide a physical barrier to the site and protection from visible nuisance. At a minimum, the fence shall be firmly secured with buried posts or weighted feet, top rails, metal fabric, and locking gates. Contractor shall immediately notify the College in the event of unauthorized entry to the site.

5.6 Site Use.

The Contractor shall confine construction equipment, storage and Work to the Project site absent written approval from the College. Any request by the Contractor to use areas outside the Project site must be described in written form and included with the Contractor's bid.

5.7 Building Access.

The Contractor shall be responsible for the sign out, distribution, safe use and return of all building keys and/or access cards, and shall be responsible for all costs associated with failure to return these items (e.g., the cost to re-key/re-implement the system).

5.8 Minimize Interruption.

The Contractor acknowledges that the College is an existing educational facility and that classes may be in session during construction. The Contractor agrees to conduct its Work with as little disruption as reasonably possible to the College's students, faculty, employees and guests, and will maintain a safe environment for the College's students, faculty, employees and guests, in addition to the Contractor's employees and workers of all tiers. The Contractor and its Subcontractors and employees of all tiers must display courtesy and consideration with and shall refrain from discriminating against or harassing the College's students, faculty, employees, visitors and guests at all times. The Contractor will not allow smoking, vaping, alcohol, drugs, any firearms, or other weapons on the College's property at any time. The Contractor shall abide by all campus traffic regulations.

5.9 Submittals (Shop Drawings, Product Data, Samples).

Prior to the beginning of Work on the Project, the Contractor shall furnish to the Architect and the College for their review and approval, a schedule setting forth all the submittals, including shop drawings, product data and samples required by the Contract Documents, that the Contractor intends to submit to the Architect for review and approval, the date upon which the Contractor shall make each such submittal and the date upon which the Architect shall complete its review of each such submittal, which in no event shall be less than ten (10) days from receipt ("Submittal Schedule"). The Architect and the College shall identify all submittals that will require more than ten (10) days to review and notify the Contractor of the required review period. The Contractor shall adjust the Submittal Schedule to accommodate the extended review period. The Architect shall endeavor to conduct its review and approval of all submittals in accordance with the Submittal Schedule. In the event that a submittal is made that is not set forth on the Submittal Schedule, the Architect shall review and return such submittal within ten (10) working days from receipt.

Submittals shall be complete as to quantities, details, dimensions and design criteria. The Architect will approve and the College will review submittals if they conform to the Contract Documents, the design concept and good industry practice. The Contractor shall note its approval of all submittals and the date for any submittals prepared by any Subcontractor or supplier, and it shall be responsible for determining and verifying all materials, field dimensions, field construction criteria, and coordination requirements pertaining to the submittal.

The Contractor will not be relieved of responsibility of deviations in submittals from the requirements in the Contract Documents by reason of approvals of the submittals unless the Contractor specifically identifies the deviation in the submittal and the Architect and the College expressly approve the deviation in writing. The Contractor shall be responsible for errors or omission in its submittals. No Work or materials included in a submittal shall begin until the submittal is approved by the Architect and the College.

5.10 Layout And Dimensional Control.

The Contractor shall be responsible for locating and laying out the Project components and all of the Project parts on the Project site in strict accordance with the Plans, and shall accurately establish and maintain dimensional control. The Contractor shall employ a competent and licensed New Jersey engineer or land surveyor as appropriate to perform all layout Work and to fix the level and location of excavations, footing base plates, columns, walls, floors and roof lines. The Contractor shall furnish to the College and the Architect certifications that each such level is as required by the Plans as the Work progresses.

The plumb lines of vertical surfaces shall be tested and certified by the Contractor's engineer or surveyor as the Work proceeds. The engineer or surveyor shall establish all points, lines, elevations, grades and bench marks for the proper control and execution of the Work. The engineer or surveyor shall establish a single permanent benchmark to be approved by the Architect, to which all three coordinates of dimensional control can and shall be based. The engineer or surveyor shall verify all topographical and utility survey data, and all points, lines, elevations, grades and benchmarks furnished by the College.

Should any discrepancies be found between information in the Plans and the actual site or field conditions, the Contractor shall notify the Architect and the College in writing, and shall not proceed with any Work affected until it receives written instructions from the College.

The Contractor is required to provide a final "as built" survey from a New Jersey licensed/certified surveyor of the Project site showing all structures, elevations, grades and required information on the Project site and submit to the College in CADD format.

5.11 Construction Access, Roads, Walks, And Parking.

The Contractor shall keep all roadways, drives, walkways and parking areas within or near the site free and clear of debris, gravel, mud or any other site materials, including, for example, the cleaning of muddy wheels and undercarriages on vehicles before they exit the site. The Contractor shall be responsible for any citations, fines, or penalties imposed on it or the College for failing to comply with applicable local rules or laws regarding its use of roads and the like.

The Contractor shall obtain permission in writing from the College before using for construction purposes any existing driveways, parking areas, walkways or areas not specifically designated for such use in the Contract Documents. The Contractor shall maintain such driveways and areas in good and clean condition during construction and not damage them. At Final Completion, the Contractor shall leave them in the same condition as they were at the start of the Work. Conditions of such facilities before use shall be photographed and otherwise documented by the Contractor. The Contractor shall not commence construction of permanent driveways, parking areas or walks on the Project site without the written approval of the College.

Any existing walkways, driveways, aprons, or curbs damaged by the Work of the Contract Documents shall be replaced in kind, at the Contractor's expense, immediately upon Project completion, or as required to maintain campus safety and campus aesthetics.

5.12 Construction Site Condition, Storage, Dust Control.

The Contractor shall provide reasonable, safe and orderly storage for its equipment, tools and materials, and shall not unreasonably encumber the site. The Contractor shall keep the site and the Project free from the accumulation of refuse, debris and scrap materials caused by its operations so that the site has a neat, orderly and workman-like appearance. Loading, cartage, hauling and dumping will be at the Contractor's expense. The Contractor shall provide, at its expense, temporary dust-proof partitions around areas of work in existing buildings, and where reasonably required, in new building areas.

5.13 Photographs.

The Contractor shall provide, at its expense, monthly progress photographs of the Project. The photographs shall be 8 inches by 10 inches and shall be submitted to the College in duplicate monthly. Unless otherwise specified in the supplemental general requirements, four photographs shall be submitted each month which provide views of the Project taken from the same four points each, which points shall be selected by the Architect.

5.14 Project Sign.

The Contractor shall, at its expense, provide, erect and maintain two Project signs at the site, which shall be described in the Contract Documents. The College will specify the location of the signs. The signs shall be painted by a professional sign painter or prepared by a professional graphic artist. No other signage will be permitted at the site. The signs shall include the name and cell phone number of a Contractor-designated project lead that is available for 24-hour contact in case of emergency. The Contractor shall remove the signs when the Project is finally accepted unless the College requests that they be removed earlier.

5.15 Soil Conservation.

The Contractor shall employ reasonable measures to conserve the soil at the site, and determine and comply with all soil conservation measures required by the Mercer County Soil Conservation District.

The Contractor shall coordinate and schedule all soil conservation inspections, shall provide the College with written notice of all such inspections so that the College may attend the inspections if it chooses in its sole discretion to do so, and shall provide the College with all site inspection notes, approvals or notices.

5.16 Temporary Facilities, Services, Electric, Heat And Enclosures.

The Contractor shall provide storage areas, temporary drives and sidewalks, employee parking areas, staging areas, excavation borrow/spoil areas, commercial canteen areas, field offices including a meeting room, telephones, toilet facilities, and other temporary facilities that are necessary to perform the Work or that may be required by the Project Specifications. The Contractor shall locate these facilities on the Project site, and the location shall be subject to the approval of the College.

The Contractor shall provide adequate and clean temporary toilet facilities on the Project site in locations to be approved by the College, and they shall be serviced at least twice a week by a firm qualified and experienced in such functions. The Contractor shall provide such temporary electricity, water, and other utilities that are necessary to perform the Work, or that may be required by the Project Specifications. The Contractor shall also supply such temporary enclosures and heat that are necessary to perform the Work or that may be required by the Project Specifications. The Contractor shall also supply such temporary enclosures and heat that are necessary to perform the Work or that may be required by the Project Specifications. The Contractor shall not enter or use any College facilities not required by the Work of the Contract.

Temporary electric and heat shall be furnished by the Contractor for the benefit of other contractors working on the Project if specified in the Project Specifications.

The Contractor shall not anticipate using the permanent heating or air conditioning system in a building for temporary heat or air conditioning prior to the acceptance of the Project as Substantially Complete unless specified otherwise.

Any natural gas, combustible material, or hazardous material containers utilized by the Contractor must be stored in a safe, ventilated location approved by the College. The Contractor must also submit for approval a reasonable safety plan for the operation of temporary heat equipment. The Contractor shall be solely responsible for any natural gas, combustible material or hazardous materials containers utilized by the Contractor or any of its Subcontractors and shall indemnify, defend and hold harmless the College from any fines, costs, expenses, liabilities, damages, etc. resulting from the Contractor's or any of its Subcontractors' use of such materials.

5.17 Substitutions.

To the extent that the Contractor includes in its bid substitute materials or equipment or construction methods in lieu of those specified in the Contract Documents, it does so at its own risk. Any substitution must be equal in type, function and quality to the item required in the Contract. The Contractor must submit all information required within 20 days of the Contract award to determine if the proposed substitute is equal to the requirements of the Contract Documents, and any substitution must be approved in writing by the Architect and the College.

No substitution shall result in any increase in the Contract Price or Contract Times. The Contractor in its application for the substitution must certify in writing that the substitution is equal to what is specified in the Contract Documents in all material respects and will not increase the Contract Times or Contract Price of the Work. The College shall have sole discretion to determine whether a proposed substitution is equal to what is specified in the Contract Documents.

Should the substitution be rejected, the Contractor will then be required to provide the specified product, material or method at no additional cost to the College and no change in the Project Schedule.

5.18 License Fees.

The Contractor shall be responsible for obtaining the right to use any equipment, design, device or material required to perform the Contract, and shall include in its Contract Price any license fee or royalty required.

ARTICLE 6 SUBCONTRACTORS

6.1 The Contractor's Responsibility For Subcontracted Work.

The Contractor shall be fully responsible to the College for the proper performance of the Contract irrespective of whether the Work is performed by the Contractor's own forces or by Subcontractors employed by the Contractor. The Contractor shall be responsible for the acts and

omissions of its Subcontractors and suppliers on the Project and shall take appropriate measures if they are not properly supervising or performing their Work.

6.2 Subcontractor Identification And Approval.

The Contractor shall have included with its bid for the Contract, the names, addresses and license numbers of all Subcontractors that it proposes to utilize on the Project for plumbing and gas fitting work, HVAC work, electrical work, structural steel and ornamental iron work. No Subcontractor may perform Work on the Project until it has been approved in writing by the College.

Within 20 days after issuance of the Notice to Proceed, the Contractor shall furnish to the Architect and the College in writing for review by the Architect and the College a list of the names of all Subcontractors, sub-subcontractors, fabricators, manufacturers, sources of supply, articles, devices, fixtures, pieces of equipment, materials and processes proposed for each item of Work using AIA Document G705-2001, List of Subcontractors. The Architect and the College will notify the Contractor in writing if either the College or the Architect, after due investigation, has reasonable objection to any names on such list.

In submitting the names of Subcontractors, the Contractor shall (1) list the name and address of the Subcontractor, (2) provide the name and address of all sub-subcontractors for each significant subdivision of the trade or work, and (3) reference in the form of a list at least 3 jobs similar in size and quality to the Project performed by the subcontractor in the last 5 years, with name and location of work, dollar value and names of the College and the Architect.

In submitting sources of supply, articles, devices, fixtures, piece of equipment and materials, including those under subcontracts and sub-subcontracts, the Contractor shall list (1) the name and address of the source of supply, and (2) the name of the manufacturer of the items.

If the College disapproves of a proposed Subcontractor, it will provide the reason for its decision in writing. The College will not be liable for any extra cost or delays caused by the reasonable disapproval of proposed Subcontractors. The approval of Subcontractors by the College shall not relieve the Contractor of the responsibility for complying with all of the provisions of the Contract Documents including those performed by the Subcontractors. Subcontractors approved by the College may not be changed without prior notice to and written approval by the College.

Payment to the Contractor shall not be made until the list of Subcontractors (as required above) has been provided to the Architect and College.

6.3 Subcontractor Qualifications.

The College may disapprove of a proposed Subcontractor if (i) it has a reasonable objection to the Subcontractor, (ii) there is evidence of poor performance on other Projects or financial problems, (iii) the Subcontractor has been suspended or debarred by any public agency within the State of New Jersey, (iv) the Subcontractor is not properly licensed and registered to do business in New Jersey or with the New Jersey Department of Labor regarding prevailing wages, or (v) the Subcontractor has been charged with or convicted of violating any laws, including but not limited to, the New Jersey Prevailing Wage Act, criminal laws, public procurement laws, anti-trust laws, election laws, laws against employment discrimination, environmental laws, tax laws, professional licensing laws, or laws regarding attempts to improperly influence the College or other public officials.

Subcontractors shall utilize qualified, competent craftsmen on the Project.

6.4 Subcontractor Compliance With Contract/Subcontractor Supervisors.

The Contractor shall require its Subcontractors on the Project to comply with all pertinent terms of the Contract Documents, and shall include all appropriate terms and provisions in written subcontracts on the Project to achieve proper Contract performance. Each Subcontractor shall have competent superintendents and foremen supervising their work, and the Contractor shall take appropriate measures if they fail to do so.

6.5 No Contractual Relationship Between The College And Subcontractors.

The Contractor shall enter into written subcontracts with each and every Subcontractor and supplier solely in its own name. No approval by the College of any Subcontractor or supplier and nothing in the Contract Documents shall create any contractual relationship or duties between the Contractor's Subcontractors and the College. Nothing in the Contract Documents shall cause any of the Contractor's Subcontractors or suppliers to be deemed a third- party beneficiary of the Contract between the College and the Contractor, and nothing herein shall give any of the Contractor's Subcontractors or suppliers any rights or claims directly against the College.

6.6 Contingent Assignment of Subcontracts.

Each subcontract agreement for a portion of the Work and any purchase order for materials or equipment may, in the College's sole discretion, be assigned by the Contractor to the College, provided that

- (a) assignment is effective only after termination of the Contract by the College for cause or for convenience and only for those subcontract agreements that the College accepts by notifying the Subcontractor and the Contractor in writing and only on such terms and conditions acceptable to the College;
- (b) assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract;
- (c) if the College elects to take an assignment of any subcontract or purchase order, the Contractor shall execute all papers necessary to effectuate the assignment; and
- (d) the assignment shall not relieve the Contractor of its existing obligations to any Subcontractor or Supplier, nor shall it cause the College to assume
any of the Contractor's obligations to any Subcontractor or Supplier that arose prior to the termination.

When the College accepts the assignment of a subcontract agreement or purchase order, the College assumes the Contractor's rights and obligations under the subcontract going forward. Upon such assignment to the College, the College may further assign the subcontract to a successor contractor or other entity.

ARTICLE 7 TIME, LIQUIDATED DAMAGES, DELAY CLAIMS AGAINST THE COLLEGE.

7.1 Contract Times.

The Contractor shall begin the Work within 10 days after the issuance of a Notice to Proceed by the College, and shall perform the Work in the Contract Documents by the dates specified in the Notice to Proceed, including Construction Start, Milestone, Substantial Completion and Final Completion Dates (collectively, "Contract Times"). As specified in the Contract for Construction, if the Work is to be performed in phases, the College may issue separate Notices to Proceed for each phase, which shall specify the Construction Start, Milestone, Substantial Completion and Final Completion Dates for that phase. The College may, in its sole discretion and at no cost to the College, choose to delay the issuance of a Notice to Proceed and the Construction Start Date for any phase until after the Contractor has achieved Substantial or Final Completion of any other phase.

7.2 Liquidated Damages For Delay.

If the Contractor fails to Substantially Complete any phase of the Work or the entire Work by the Substantial Completion Date(s) set forth in the applicable Notice to Proceed (as extended by Change Order, if applicable), and the delay is not excused by the College, then the Contractor shall pay the College the amounts specified in the Contract for Construction as liquidated damages for delay for each calendar day that the phase of the Work or the entire Work is not Substantially Completed beyond the applicable Substantial Completion Date

7.3 Delay Claims By The Contractor Against The College --Limitations.

The Contractor may not assert claims against the College for extra compensation by reason of any delays in its Work resulting from acts or omissions of any third parties irrespective of extensions granted under the Contract, including but not limited to delays caused by third parties such as the Architect, other contractors, utilities and governmental authorities.

The College shall only be required to pay additional compensation for delays caused by the College itself and

shall not be liable for any period of delay when there is a concurrent delay for which the College is not responsible.

When the Contractor is entitled to extra compensation for delay under the Contract for Construction and these General Conditions, it can only assert claims for extra costs at the job site, and may not assert claims for extra costs for home office expenses, home office overhead, lost profit or revenue, or consequential losses as that term is defined by New Jersey law. Any additional compensation under this Article shall also be subject to the provisions in the Contract for Construction and these General Conditions regarding claims, and the provisions in the Contract for Construction and these General Conditions regarding the maintenance and availability of cost records.

ARTICLE 8 PROJECT SCHEDULE

8.1 General Project Schedule Requirements.

The Contractor shall schedule the construction Work and determine the most feasible means and order for the Work to complete the Project within the times required by the Contract. The Contractor shall prepare a Project Schedule and monthly schedule updates, which must be approved in writing by the College and the Architect. The Contractor shall perform the Contract and the Work in accordance with the Project Schedule. The Project Schedule should include a schedule of submittals for approval as required herein. The Project Schedule must be submitted before any Work (other than mobilization to site and general layout and site preparatory work) on the Project can begin under the Notice to Proceed. When the Contractor's Project Schedule is approved in writing by the College, it shall become an additional Contract Document and the Contractor shall be used in determining the amount of the monthly progress payments to the Contractor. The College may also use the Project Schedule and updates to determine if the Contractor is adequately planning and performing the Work in accordance with the Contract Documents.

8.2 Form And Content Of Project Schedule.

The Contractor shall prepare the Project Schedule using Critical Path Method (CPM) scheduling techniques. The Contractor shall utilize the latest revision of Primavera P3 or Microsoft Scheduling software. The Contractor shall prepare a detailed schedule which shows how it will plan, organize, execute and complete the Work. The Project Schedule shall be in the form of an activity oriented network diagram (CPM). The principles and definitions used in this Article shall be as set forth in the Associated General Contractors of America (AGC) publication "Construction Planning and Scheduling", copyright 1994.

The detailed network diagram shall provide sufficient detail and clarity of form and technique so that the Contractor can plan, schedule and control the Work properly, and the College and the Architect can readily monitor and follow the progress of all portions of the

Work. The network diagram shall comply with the limitations imposed by the scope of the Work and contractually specified Milestone, Substantial Completion, and Final Completion Dates. The Project Schedule shall include the arrow or network diagram and the computer produced schedule with dates. The Project Schedule shall include and reflect the following factors:

- (a) Project phasing, contract Milestone, Substantial and Final Completion Dates.
- (b) The structural breakdown of the Project.
- (c) The types of Work to be performed and the labor trades involved.
- (d) Reasonable logic and activity durations.
- (e) Reasonable coordination of all activities.
- (f) Purchase, manufacture and delivery activities for all major materials and equipment.
- (g) Deliveries of equipment furnished by the College.
- (h) Allowances for work by separate contractors identified in writing by the College at the time of Contract award.
- (i) Submittals and approvals of shop drawings, material samples, and other required submittals.
- (j) Subcontract Work.
- (k) Crew flows and sizes (manpower).
- (l) Assignment of responsibility for performing all activities.
- (m) Access and availability to Work areas.
- (n) Identification of interfaces and dependencies with preceding, concurrent and follow-on contractors, and sequences and interdependence of activities.
- (o) Testing and inspections.
- (p) Phased or total inspection, acceptance, and takeover by the College.
- (q) Utilization of the Project Schedule to determine amounts of monthly progress payments.
- (r) Activities required of the College and the Architect such as approvals, including reasonable durations for the activities.

Activities should be set forth in working days and have a maximum duration of 60 days, except for non-construction activities such as the procurement and delivery of materials and equipment. All durations shall be the result of definitive manpower and resource planning by the Contractor. The level of detail in the Project Schedule shall be subject to the approval of the College. The Project Schedule shall include a reasonable approach to achieve Milestone, Substantial Completion and Final Completion Dates in the Contract. Any failure of the Contractor from completing that Work and all of the Work needed to complete the Project by the Milestone, Substantial Completion and Final Completion Dates in the Contract.

The network diagram is to be prepared by a computer plotter. The logic diagram will be pure logic and shall not be drawn to time scale. The logic diagram shall be drawn on 30" x 42" size sheets and prepared on a tracing/mylar or similar material suitable for reproducing high quality prints.

8.3 Computerization Of Project Schedule.

The mathematical analysis of the detailed network diagram shall be made by computer, and the tabulation for each activity shall include the following:

- (a) Activity numbers.
- (b) Activity descriptions.
- (c) Durations in work days for each activity.
- (d) Earliest start date (by calendar date).
- (e) Earliest finish date (by calendar date).
- (f) Latest start date (by calendar date).
- (g) Latest finish date (by calendar date).
- (h) Slack or total float in work days.

The following computer documents shall be prepared as part of the initial Project Schedule submission and each update:

- (a) Activity file sort, including sorts listing activities required of the College and the Architect, such as approvals.
- (b) Eight week "lookahead" detailed bar chart.
- (c) Eight week summary bar chart.
- (d) Additional computer sorts requested by the College.
- (e) High density CDs or thumb drives of all computer files.

8.4 Weather Inclusion In Project Schedule.

Seasonal weather conditions shall be included in the Project Schedule, including average precipitation, temperature and other weather conditions typical in the geographic area over a 5 year period by month.

8.5 **Project Schedule Updates.**

The Contractor shall prepare Project Schedule updates monthly until the Project is completed. The first update shall be issued 30 calendar days after the Construction Start Date specified in the Notice to Proceed. Updates shall include the following information:

- (a) Actual start and completion dates for activities.
- (b) Activity percent completion.
- (c) Remaining durations for activities in progress.

Each Project Schedule update shall also include a narrative report that includes the following information:

- (a) Summary of Work completed during update period.
- (b) Comparison of actual progress and status to activities and dates in original Project Schedule.

- (c) Analysis of critical path including effect of activity progress on the Project critical path.
- (d) Analysis of secondary critical paths, meaning float within 10 days of the Project critical path.
- (e) Analysis of time lost or gained during the update period.
- (f) Identification of problem areas.
- (g) Identification of change orders and delays impacting or delaying the Project under the Project Schedule.
- (h) Solutions or proposed solutions to current problems and delays.
- (i) Extensions requested by the Contractor, including activities affected and the amounts, and the reasons for the requests.
- (j) Extensions granted by the College for delays and changes, including the activities affected and the amounts, and any effect on the critical path and Contract Milestone, Substantial Completion and Final Completion Dates.
- (k) Delays in activities required of the College and the Architect, and activities that they are required to complete in the update period following the issuance of the update.

All Project Schedule updates must be submitted to the College and the Architect for written approval. Project Schedule updates, including the reports which are approved by the College, shall be deemed to be official records of the progress and status of the Project under the Project Schedule and the Contract, and may be utilized by the College in determining if the Contractor is adequately planning and performing the Work under the Contract Documents.

8.6 Meetings/Eight Week Bar Charts.

The Contractor's Project Manager and Scheduler shall arrange for and attend monthly progress and scheduling meetings with the College and the Architect. Monthly progress meetings shall be scheduled 3 to 7 days after monthly Project Schedule updates and reports are issued and provided to the College and the Architect. The purpose of these meetings will be to review past progress, current status, problem areas, delays, measures to reduce delays, future progress, and the Contractor's most recent Project Schedule update and report. At the monthly progress meetings, the Contractor shall provide a look ahead summary and detailed bar charts showing the Work and activities to be performed and/or completed during the 8-week period following the Project Schedule update.

8.7 **Project Schedule Documentation For Contract Payments.**

The Contractor will not be entitled to payments under the Contract until a Project Schedule has been submitted to and approved in writing by the College. No payment will be made under the Contract if, when the payment is due, a Project Schedule update and narrative report is due under this Article but has not been submitted to and approved in writing by the College. The original Project Schedule shall include a breakdown allocating the total Contract Price among the network activities in the Project Schedule, which must be approved by the College.

8.8 **Progress and Recovery Project Schedules.**

The Contractor shall perform its Work in accordance with the Project Schedule. If the Contractor's Work falls behind the requirements of the Project Schedule, it shall, at its own cost, institute measures to improve its progress and bring its Work in compliance with the Project Schedule, including but not limited to increasing manpower, increasing work hours per shift, increasing shifts, increasing working days per week, and rescheduling Work activities to perform them concurrently where feasible.

If monthly Project Schedule updates show that the Contractor's progress has fallen behind the Project Schedule so as to jeopardize the achievement of Milestone, Substantial Completion or Final Completion Dates by more than 10 work days, the Contractor shall, if requested by the College in writing, prepare a recovery schedule with acceleration measures to regain the lost time, and shall proceed in accordance with the recovery schedule in addition to the Project Schedule at its own cost.

8.9 The Contractor's Failure to Provide Project Schedule Updates.

If the Contractor fails to provide monthly Project Schedule updates and reports when required, the College can elect in its sole discretion to employ any of the following remedies: (i) not make progress payments; (ii) on 10 days written notice to the Contractor, retain its own consultant to provide Project Schedule updates and reports and deduct the cost from the Contract Price; (iii) terminate the Contract for default in accordance with the termination provisions in the Contract for Construction and these General Conditions and/or (iv) make a claim on the performance bond.

8.10 Scheduler Qualifications.

The Contractor must utilize a Project Scheduler that satisfies the qualification requirements for the Project. If at any time during the Project it appears that the Contractor's Project Scheduler is not competent to provide the scheduling services required in this Article, the Contractor shall, within 10 days after a written notice and demand from the College, retain a replacement scheduler that is competent to provide the services required. The College may also utilize any of the remedies provided in the Contract for Construction or these General Conditions for the Contractor's failure to provide proper Project Schedule updates and reports.

<u>ARTICLE 9</u> EXTENSIONS, COMPENSATION FOR CERTAIN EXTENSIONS.

9.1 Delays Warranting Extensions Of Contract Times.

If the Contractor is unavoidably prevented from completing any part of the Work within the Milestone, Substantial Completion or Final Completion Dates by causes beyond the control and without the fault of the Contractor or its Subcontractors, those Contract Times will be extended by amounts equal to the time lost due to such delays, provided the Contractor requests extensions in accordance with this Article. Delays warranting extensions of the Contract Times include unforeseeable and unavoidable delays caused by the College, the Architect, other contractors employed by the College, utility owners or other third parties, acts of God, acts of governmental authorities, wars, abnormally severe weather conditions of unusual duration (specifically excluding weather conditions of the type and duration that have been encountered in the area in which the Project is located) that prevent timely delivery of materials or equipment necessary to the completion of portions of the Work or hamper access to the Work by workmen or Subcontractors, fires, floods, earthquakes, epidemics, plagues, and other unavoidable casualties.

Except for the conditions described in Article 7.3, apart from an extension of time, no payment or allowance of any kind shall be made to the Contractor as compensation for damages on account of hindrance or delay from any cause in the progress of the Work, whether such delay be avoidable or unavoidable. The Contractor agrees that it will make no claim for compensation, damages for any such delays, and will accept in full satisfaction for such delays said extension of time.

9.2 Weather Delays.

The Project Schedule shall take into account normally anticipatable adverse weather plus an additional five (5) days of severe and unusual weather conditions that will materially interfere with the timely prosecution of the Work. No time extensions will be granted for time lost due to weather conditions that do not meet the criteria set forth in Article 9.1, and then only to the extent more than five (5) days of delay result from such severe and unusual weather conditions. Owner shall not be required to keep a record of days of precipitation or low temperatures and the burden of proof with respect to weather delays shall be upon Contractor. No time extensions will be considered for any weather conditions that do not affect Work on the critical path or Contract Times.

9.3 Float Time Use.

Float time in the Project Schedule is not for the exclusive use of either the Contractor or the College. Float time is available for use by both parties to facilitate the effective use of available resources and to minimize the impact of problems and delays that may arise during construction. No time extension will be granted as a result of any problem, change order or delay which only results in the loss of available positive float on the Project Schedule. Float time shown on the Project Schedule shall not be used by the Contractor in a manner that is detrimental to the interests of the College or the Project.

9.4 Calculation Of Extensions.

Extensions will be calculated based on the effect of delays on the Project Schedule and the activities in the Project Schedule. If the Contractor is entitled to an extension for a delay based on the nature of the delay under this Article, the activities in the Project Schedule affected by the delay will be extended by the amount they are affected. If extensions of activities in the Project Schedule affect the critical path and delay the Contract Milestone, Substantial Completion or Final Completion Dates, they too will be extended to the extent affected. The critical path and Contract Times will only be extended to the extent that they are actually

affected under the Project Schedule by a delay for which the Contractor is entitled to an extension.

If, for any scheduled activity or period, there are concurrent delays that include delays for which the Contractor is entitled to an extension and delays for which the Contractor is not entitled to an extension, the Contractor will be given an extension for the delays for which it is entitled to extension so that it will not be liable to pay liquidated damages for delay, unless the College eliminates or reduces that delay. A concurrent delay will not justify an extension to the Contractor if it has minimal effect on the completion of the Project, and/or if it would likely have been avoided if it had become apparent that it was having an effect on the progress of the Project and the Final Completion Date.

9.5 Elimination of Delays and Extensions (Acceleration).

If the effect of a delay for which the Contractor is entitled to an extension can be reduced or eliminated by changes in the Project Schedule or other measures which have no material adverse impact on the Contractor in terms of cost or otherwise, the Contractor shall employ those measures so that no extension is required or so that a shorter extension is required. If the Contractor is entitled to extensions for delays, and if the College (in its sole discretion) notifies the Contractor in writing that it prefers to eliminate the lost time to avoid or reduce the extension required, by changes or additional efforts such as acceleration efforts, the Contractor shall perform those measures as a change to the Contract to be compensated under the change order provisions in the Contract for Construction and these General Conditions.

9.6 Requests For Extensions Required.

The Contractor must provide the College with a written notice of delay and request for an extension within 24 hours of the beginning of a delay. The written notice of delay and request for extension must include the nature and cause of the delay, the known extent of the delay, the Work activities on the Project Schedule affected by the delay, and the extent of the effect to each, and suggestions or proposals to reduce or eliminate the delay. This limited time frame is to provide the College the opportunity to immediately address the issue and limit the amount of time in the potential delay and its potential impact on the Project Schedule.

9.7 SECTION WAS DELETED

ARTICLE 10 PAYMENTS TO THE CONTRACTOR.

10.1 Contract Price.

The College will pay the Contractor as full compensation for performing the Work the Contract Price as adjusted by approved change orders that increase or decrease the Contract Price. The College will do so in accordance with this Article, any supplemental General Conditions regarding payment, and the payment terms in the Contract for Construction. Payment provisions in the supplemental General Conditions that add to or modify this Article shall take precedence over this Article. Payment provisions in the Contract for Construction that add to or modify payment terms shall take precedence over the supplemental General Conditions and this Article.

10.2 Monthly Progress Payments.

The College will pay the Contractor monthly progress payments as the Work proceeds and will pay for the Work completed, less retainage. The Contractor shall submit monthly invoices using the College's invoice form for the Work completed in each calendar month, and the monthly invoice shall be submitted in accordance with the Contract. The Contractor shall be entitled to monthly progress payments based on the percentage of the Work completed (less earlier payments), and that amount shall be based on the Unit Schedule Breakdown and the update of the Project Schedule for the billing period showing schedule activities completed and progress on incomplete activities, in conjunction with the values assigned to those activities. If there is a discrepancy between the amount due based on the Unit Schedule Breakdown and the amount due based on the Project Schedule update, the Contractor shall only be entitled to the lesser amount unless the College's Representative, in his/her sole discretion, decides otherwise. Payments made by the College shall be used by the Contractor solely for purposes of this Project and for paying Subcontractors, suppliers, and for labor and materials, and shall not be used to pay debts owed by the Contractor outside of the Project.

10.3 Unit Schedule Breakdown/CPM Activity Price Breakdown.

Before the Contract for Construction is signed, the Contractor shall submit to the College and the Architect a Unit Schedule Breakdown (schedule of values) utilizing the College's form (AIA Documents G702/G703) which reasonably allocates the Contract Price among the principal categories of Work and materials in the Contract. The Unit Schedule Breakdown must be signed by the Contractor and is subject to written approval by the Architect and the College for use in calculating monthly progress payments under the Contract. The Contractor shall not "front end load" the Unit Schedule Breakdown. The Unit Schedule Breakdown may include line items for mobilization, bonds and insurance.

The Contractor's proposed Project Schedule shall reasonably allocate the Contract Price among the activities in the schedule so that monthly Project Schedule updates can be utilized in connection with the Unit Schedule Breakdown in determining the amount of monthly progress payments. The Contractor's Unit Schedule Breakdown and Project Schedule activity price breakdown must be approved in writing by the Architect and the College before any payments are made under the Contract.

10.4 Invoices For Monthly Progress Payments: Form and Content.

The Contractor must utilize the College's invoice form and the invoice forms (AIA Documents G702/G703 and waiver attachments) must be completed before they are submitted for payment. Each invoice must be signed by the Contractor, and shall certify that the Work and materials represented as having been provided have been provided, and that all Subcontractors and suppliers on the Project have been paid all amounts legitimately due for Work and materials billed to the College in earlier invoices that were paid by the College. The Contractor's submission of an invoice constitutes an affirmative representation and warranty by the Contractor that it performed the Work in compliance with the Contract Documents and applicable laws, codes and regulations.

Invoices for monthly Project payments must include the status of the Work in the Unit Schedule Breakdown and the Project Schedule update for the billing period that shows the activities completed or started and the value of them based on the Project Schedule. Invoices must also include certified payrolls for the Contractor and all Subcontractors for the billing period, affirmative action monthly manning reports, a certification of Subcontractor/supplier payments, the College's acknowledgment of progress payment and release of liens and claims form duly executed by the Contractor, the College's acknowledgment of progress payment and release of liens and claims form duly executed by each Subcontractor and supplier who has furnished labor or materials that are the subject of the current invoice, a list of all materials stored to date including descriptions, values, quantities and location, and any other documents required in the Contract Documents.

The Contractor will be entitled to have an invoice paid if the Architect and the College approve in writing the invoice including the percentage of Work completed, and if the quality of the Work and materials conform to the Contract Documents. The approval of invoices shall not waive claims for defects or deficiencies in the Work or materials provided, or the right to subsequently inspect the Project as a complete and functioning whole.

10.5 Payment For Materials And Equipment Procured But Not Installed.

The Contractor may seek payment in monthly invoices for materials and equipment delivered to the Project site but not yet incorporated into the Work. The Contractor shall include with its monthly invoices a list of the stored equipment, the amount and type of stored materials, and the place where they are stored. Each invoice that seeks payment for materials and equipment delivered to the Project site but not installed or incorporated into the Work shall include a signed bill of sale to the College and an invoice from the supplier. All risk of loss or damage for materials and equipment delivered to the Project site shall remain with the Contractor.

The College will only rarely pay for material or equipment stored offsite, and only when it determines, in its sole discretion, that there is good cause. The College will consider no request to pay for materials or equipment stored off site unless the Contractor includes a written request for such payment with its bid for the Project. If the College does agree to pay for material or equipment stored offsite during the performance of the Contract, it will do so when the Contract for Construction is signed.

If the College does agree to pay for materials and equipment stored offsite, such payments shall be subject to any conditions in the signed Contract, and in all cases, a bill of sale to the College, a paid invoice, insurance and proof the storage facility is bonded will have to be provided to the College when each payment is sought. The location will have to be specified in writing and the material or equipment will have to be inspected by the College. The Contractor and its performance bond surety must agree in writing that they retain all risk of loss or damage, and each payment application must contain a consent to payments for materials stored offsite signed by the Contractor's bonding company.

Payments on account of materials or equipment not incorporated into the Work but delivered and suitably stored at the site, or at some other location agreed upon in writing, may be made by the College subject to the following conditions:

- (a) Such materials or equipment shall have been fabricated or assembled specifically for the Project and delivered to storage no earlier than needed for the orderly progress of the Work as demonstrated by the Project Schedule.
- (b) Title to such materials or equipment shall pass to the College pursuant to the Contractor's bill of sale, which shall contain guarantee of replacement thereof in the event of damage thereto or disappearance thereof due to any cause. The Contractor shall also affirm that it will pay for such materials or equipment immediately upon receipt of payment therefore from the College.

In the case of offsite storage, the Contractor shall also provide Consent of Surety to such payment and insurance of such materials or equipment against the perils set forth in these General Conditions both while storage and during transportation to the site. Raw materials or other materials or equipment readily duplicated or usable on other projects will be paid for only after the materials are incorporated into the construction.

10.6 Retainage.

The College will retain 2% of the amount due on each partial payment pending Final Completion of the Contract.

Retainage amounts being withheld by the College shall be released and paid in full to the Contractor within 45 days of the Final Completion Date agreed upon by the Contractor and the College, without further withholding of any amounts for any purpose whatsoever, provided that the Work has been Finally Completed as indicated.

10.7 Payment For Change Order Work.

The Contractor shall invoice for change order work in the monthly progress payment invoices as the change order work is performed, but may only do so after a written change order has been signed by the appropriate College personnel and a TCNJ Purchase Order is issued by the College.

10.8 Final Payment.

Upon Final Completion of all the Work including all change orders, upon final acceptance of the Work by the Architect and the College, and upon the issuance of the Certificate of Final Completion, the Contractor will be paid the fully adjusted Contract Price including any retainage. The Contractor shall submit an invoice for the final payment. The final invoice must be accompanied by the College's acceptance of final payment and release of liens and claims form duly executed by the Contractor, the College's acceptance of final payment and release of liens and claims form duly executed by each Subcontractor and supplier who has furnished labor or materials that are the subject of the final invoice, all warranties, guarantees, manufacturer literature, approved as-built drawings, shop drawings required, and any other documents that the Contractor is required by the Contract Documents to provide to the College at the time of Final Completion. The final invoice must also include a written signed consent to the final payment signed by the Contractor's bonding company.

10.9 Payment Terms.

All invoices and payments shall be subject to the terms of the Contract for Construction and these General Conditions, including the provisions regarding payments, and to the right of the College to withhold payments or to make deductions from payments for damages, defective work, liquidated damages, third-party claims, failure to complete Work, failure to comply with requirements of the Contract Documents, failure to comply with Prevailing Wage Act requirements set forth in the Contract for Construction and these General Conditions, failure to comply with Project Schedule obligations, or other causes authorized by the Contract Documents.

10.10 Payment Based On Partial Acceptance (Limitation).

The College will not accept portions of the Project as Substantially or Finally Complete unless specified elsewhere in the Contract Documents. If the Specifications authorize partial acceptances, they will also specify the terms and conditions of such acceptances.

10.11 Failure To Pay Amounts In Dispute Not To Affect Performance.

The failure of the College to pay any amount requested by the Contractor in an invoice based on a determination that the invoice is improper or some other dispute shall not entitle the Contractor to stop or slow down the performance of the Work.

10.12 Reasons For Withholding Payment.

In addition to the reasons set forth elsewhere in the Contract for Construction and these General Conditions, the Architect or the College may also withhold payments to the Contractor, or, because of subsequently discovered evidence, may nullify the whole or a part of a payments previously issued to the Contractor, to such extent as may be necessary in the Architect's or the College's opinion to protect the College from loss for which the Contractor is responsible because of

- (a) defective Work not remedied;
- (b) third party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to the College is provided by the Contractor;
- (c) failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;
- (d) reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Price;
- (e) damage to the College or a separate contractor;
- (f) failure to comply with requirements for monthly progress payments pursuant to Article 10.4; or
- (g) failure to carry out the Work in accordance with the Contract Documents.

When the above reasons for withholding payment are removed, payment will be made for amounts previously withheld.

If the College withholds or the Architect recommends that the College should withhold payment from the Contractor under subsection (c) above, the College may, after providing the Contractor with written notice and an opportunity to cure, issue joint checks to the Contractor and to any Subcontractor or material or equipment suppliers to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. However, by doing so, the College is not undertaking any payment obligation on the part of the Contractor, nor does any Subcontractor have any claims against the College or any right to future joint check payments.

10.13 Set-Off For State Tax Indebtedness.

Pursuant to <u>N.J.S.A.</u> 54:49-19, and notwithstanding any other provision of law to the contrary, if the Contractor or any of its Subcontractors or suppliers are indebted to the State of New Jersey for any State tax, the College may withhold and/or set off any payments due to the Contractor as may be necessary to satisfy such indebtedness and/or pending resolution of the indebtedness.

10.14 Maintenance Of Cost And Accounting Records.

The Contractor shall maintain and retain weekly payroll, material, Subcontractor, supplier, overhead and other cost and accounting records for the Project, and for additional services or extras required by the College, including all costs that the Contractor is entitled to be paid under the Contract. The Contractor shall require its Subcontractors on the Project to do likewise. The Contractor shall also maintain all estimates and takeoffs used in preparing and calculating its bid price for the Contract and change orders. The Contractor shall also maintain all documentation related to products, transactions or services under the Contract. The records shall be maintained and shall be made available to the College or its representatives when requested. These records shall be maintained in accordance with generally accepted accounting principles and practices for a period of 5 years after final payment is received by the Contractor, or the duration of any dispute or lawsuit arising out of the Project, whichever is later, and shall be made available to the College or its representatives and the New Jersey Office of the State Comptroller when requested.

Any failure to maintain or produce the records required by this Article may limit the Contractor from being paid on any claims that are based on costs and expenses or losses incurred by the Contractor or its Subcontractors including extra costs that are or that should be reflected in the records required by this Article or good business practices. This record keeping requirement applies to records related to the basic Contract Price as well as extra compensation for change orders and claims of all kinds.

No claim by the Contractor against the College for payment, whether for Contract Work, extras, changes or claims that is based to any degree on costs that should be recorded in cost records required by this Article or good business practices may be asserted against the College to the extent the cost records do not exist or are not provided to the College upon demand.

The College reserves the right to audit the records of the Contractor and its Subcontractors at any time and for up to 3 years after the Final Completion of the Project. If an audit reveals overpayment by the College, the Contractor shall refund the cost of the audit and the overpayment to the College, or the College may deduct the cost of the audit and the overpayment from future payments under the Contract, or the College may assert claims against the Contractor and/or its surety for the cost of the audit and such overpayments.

10.15 Written Evidence of Payment to Subcontractors.

The College has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and material and equipment suppliers' amounts paid by the College to the Contractor for subcontracted Work. Such evidence shall include acknowledgment of progress payment and release of liens and claims forms duly executed by each Subcontractor and supplier for payments previously made to the Contractor. If the Contractor fails to furnish the College with the written evidence that it has properly paid Subcontractors and material and equipment suppliers, the College shall have the right to contact Subcontractors to ascertain whether they have been properly paid. Neither the College nor Architect shall have an obligation to pay or to see to the payment of money to a Subcontractor, except as may otherwise be required by law. The College may, in its sole discretion, issue checks made payable jointly to the Contractor and a Subcontractor; however, by doing so, the College is not undertaking any obligation on the part of the Contractor, nor does the Subcontractor have any claims against the College nor any right to future joint check payments.

ARTICLE 11 CHANGES.

11.1 Changes Authorized.

The College may at any time authorize and direct changes in the Work or accelerations of the Work that change the scope of the Work and that increase or decrease the Contract Price. All changes including changes in the Contract Price shall be governed by this Article. All changes must be in a written change order signed by the Vice President for Administration, the College's Representative, the Architect and the Contractor. A TCNJ Purchase Order will then be issued by the College and signed by the Contracting Officer, after which time, the Contractor can then bill for the completed change order Work. Any extensions in the Contract Times and increases in the Contract Price because of extensions resulting from changes shall be governed by Article 9of these General Conditions regarding extensions, but the authorization for the extra compensation itself resulting from an extension must be contained in a change order that complies with this Article as well. The College may elect to have changed Work on the Project that is within the scope of the Contract Documents performed by another contractor. Changes in the Work shall not affect the surety bond protection or insurance coverage required by the Contract Documents.

11.2 Change Request Or Directive.

The College may request a change in the Work or materials to be provided under the Contract Documents by a written Contract Change Directive ("CCD") signed by the College's Representative. If the College is of the opinion that no change in the Contract Price or Contract Times is required because of the change request, it shall so state in the CCD. A CCD may include provisions regarding the scope of the changed Work or materials, and may also include conditions including time parameters. A CCD may provide that specified Work shall stop until further notice, but the Contractor shall not stop or delay any Work because of a CCD unless the CCD provides that Work should stop because of the change. A CCD may provide that the performance of changes shall not commence until a change order is issued and a subsequent

TCNJ Purchase Order is issued and signed by the Contracting Officer, or that changed Work should proceed before a change order and TCNJ Purchase Order are issued by the College to maintain the progress of the Project.

11.3 Change Orders Which Are Protested.

If the Contractor protests the terms of a change order, it shall notify the College of its protest in writing within 2 business days of the issuance of the Change Order. It shall describe the terms that it objects to and the reasons for its protest. It shall include supporting documentation if appropriate, including detailed justification for any Contractor requested additional compensation based upon unavoidable additional costs. The College may elect to direct the Contractor in writing to perform the change order requirements despite the protest. If it does so, the Contractor's right to pursue further relief based on the protest shall be preserved and the Contractor shall immediately proceed with the change Work

11.4 Changes Affecting Contract Times.

Changes and change orders shall not affect or extend any of the Contract Times unless the change order itself specifies that it changes Contract Times. If a change order issued by the College delays the completion of any activity in the Project Schedule, the time allowed for that activity shall be extended, and if a delay in that activity delays other activities, the critical path or the Completion Dates in the Contract, they too will be extended. The Contractor shall make reasonable efforts in scheduling changed Work so that it does not delay or extend activities in the Project Schedule critical path, including any Milestone Dates, the Substantial Completion Date and the Final Completion Date. The Contractor shall also make alternate proposals for change order Work that include acceleration for the changed Work where feasible to achieve this goal, and shall include the cost of such efforts in its change order requests and proposals.

Change orders must specify whether they result in any delay (or extension) to any critical path activities in the Project Schedule, including an identification of the activities and the amount of delay in each. If no delay or extension is set forth in a change order, it will be deemed an agreement by the College and the Contractor that no delay or extension results from the change order.

11.5 Contractor Initiated Change Order Requests.

If the Contractor contends that any directive or communication from the College or Architect, or any condition, event or circumstance entitles it to a change order changing the scope of the Work, terms of the Contract Documents, Contract Price or Contract Times, it shall submit a written change order request to the College's Representative within 5 days of the event upon which the request is based. The written request shall specify the terms of the change order requested, and include all documentation and information that the Contractor seeks to have considered in support of the request, or that is necessary to a proper consideration of the request.

11.6 Change Order Amounts.

All price changes or amounts in change orders shall be based on (i) lump sum, (ii) actual work time and materials plus mark-ups for overhead and profit, or (iii) unit prices times actual quantities that may or may not include separate mark-ups for overhead and profit. If a change order price is to be based on a lump sum price or a unit price, the College may request the submission of such documentation regarding market price or cost which it reasonably deems necessary to determine a lump sum or unit price. If a change order is based on actual work time and material costs, it will include a not-to-exceed price.

Applications for payment for change order Work shall be included in monthly progress payment invoices as the change order work is performed, but only after a TCNJ Purchase Order has been issued to the Contractor by the College. For change orders based on time and material costs or unit prices times actual quantities, the time spent, material provided, and quantities performed shall be recorded in daily time slips, material invoices, and quantity of work performed tickets that are signed by the College's Representative to certify that the Work and materials were provided, and the quantities. Labor costs and material costs for change orders shall be based on actual costs to the Contractor without any mark-ups except as provided in this Article.

Mark-ups may be added to time and material costs where a change order is authorized to be paid on a time and material basis, and also unit price change orders if the change order price term expressly authorizes mark-ups as a separate additional charge to be added to the unit price. When mark-ups for overhead and profit are authorized, the standard mark-up for overhead and profit shall be 15% of net costs properly invoiced in the change order. The schedule for mark ups is as follows:

- 15% of direct costs for overhead, profit, bond, and insurance for Work performed directly by the Contractor;
- 15% of direct costs for overhead, profit, bond, and insurance for Work performed directly by the Subcontractor and 5% of the direct and indirect costs of the Work performed by the Subcontractor for the Contractor; and
- 15% of direct costs for overhead, profit, bond, and insurance for Work performed directly by the Subcontractor's subcontractor and 5% of the direct and indirect costs of the Work performed by the Subcontractor's subcontractor for the Subcontractor and 5% of the direct and indirect costs of the Work performed by the Subcontractor for the Subcontractor for the Contractor.

There shall be no additional mark-ups for materials or supplies. Bond and insurance costs are included in the noted mark ups above. Refer to Division 1 Specifications also for further delineation of items included in mark-ups.

THE CONTRACTOR MUST USE THE COLLEGE'S CHANGE ORDER FORM INCLUDED IN THE PAYMENT PROCEDURE DOCUMENTS.

11.7 Right To Audit Extra Costs (Before And After Payment).

The College reserves the right to audit all change orders and additional costs claimed and/or paid under the Contract at any time. The obligation of the Contractor, Subcontractors and suppliers to establish, maintain and produce cost records and remedies for failing to do as specified elsewhere in these General Conditions and the Contract for Construction shall govern. If an audit reveals that actual costs invoiced to the College and/or paid by the College in change orders exceed the actual costs incurred, the Contractor shall refund the excess, or the College may deduct the excess from future payments under the Contract, or the College may assert claims against the Contractor and/or its surety for such overpayments.

11.8 Change Orders With Both Price Increases and Decreases.

If a change order reduces the scope of the Work or materials to be provided by the Contractor under the Contract, the change order shall provide for a reduction in the Contract Price in the amount of the actual reduction in cost. If a change order results in both added costs and reduced costs, they shall be combined for a net plus or minus Contract Price adjustment, and when mark-ups are applicable, they shall only be added to a net increase in the Contract Price which results from a combination of additions and deductions in the change order.

11.9 Waiver Of Rights In Connection With Change Orders Issued Without Protest.

The Contractor shall not be entitled to seek any additional compensation or any extension of the Contract Times beyond the amounts and any extensions included in a change order signed by the College or a written change order request submitted by the Contractor to the College for approval, the intent being that the Contractor must disclose all additional costs and delays claimed to result from a change so that the College can take measures in considering the change to effect cost savings and avoid delays. The failure to include extra costs or delays in a change order request will preclude the Contractor from later claiming such costs or delays in connection with the change in any form or fashion.

ARTICLE 12 COMPLETION.

12.1 Substantial Completion.

When the Contractor believes that the Project (or a specific phase of the Work, if the Work is to be performed in phases) is Substantially Complete, meaning all essential requirements of the Work have been sufficiently completed so that the Project (or a specific phase) can be occupied and used for its intended purpose (and as further defined in the College's Division 1 specifications for capital projects), it can make a written request to the Architect and the College to conduct an inspection and to issue a Certificate of Substantial Completion. The Contractor's request shall list all Work and requirements of the Contract Documents that remain to be completed or corrected and an estimate of the value of the incomplete items and the dates by which those items of the Work will be completed, but in no event shall it be more than thirty (30) days from Substantial Completion.

The Architect and the College will conduct an inspection, and if they determine the Contractor has Substantially Completed the Project (or a specific phase of the Work, if the Work is to be performed in phases), the College will issue a Certificate of Substantial Completion. If the Architect and the College determine that the Contractor has not achieved Substantial Completion, the College will notify the Contractor in writing and will list the Work and requirements of the Contract Documents that must be completed for Substantial Completion and provide a punch list. The Architect and the College will also assign a value to the incomplete items to be added to the 2% retainage held after the Certificate of Substantial Completion is issued. The College and the Architect will re-inspect when the Contractor notifies them in writing that those items have been completed.

Any failure of the College or Architect to include incomplete or deficient items in a Certificate of Substantial Completion or a notice regarding a Substantial Completion inspection shall not affect the Contractor's obligation to properly complete all requirements of the Contract.

The College will not issue a Certificate of Substantial Completion unless it can occupy and use the Project (or the phase of the Work) for its intended purpose, and the Contractor agrees that the College's use and occupancy of the Project (or the phase of the Work) shall not affect the Contractor's obligation to complete the Project and requirements of the Contract Documents. The Contractor also agrees that its completion of the Project will not unreasonably interfere with the College's occupancy and use of the Project (or the phase of the Work) and that the College's occupancy will not impede the Contractor's completion of the Work to Final Completion.

Unless otherwise specified in the supplemental General Conditions, a Certificate of Substantial Completion will not be issued unless an unqualified temporary or permanent certificate of occupancy is issued, and the College is able to use and occupy the Project (or the phase of the Work) without interruption.

The issuance of a Certificate of Substantial Completion shall not void or alter any of the other terms of the Contract Documents, including but not limited to terms relating to warranties, or relieve the Contractor of its obligation to complete the Work or remedy defective Work or materials, unless such terms are expressly modified by the Certificate of Substantial Completion.

Guarantee periods for equipment, workmanship and materials shall commence when the Certificate of Substantial Completion is issued or from the completion and acceptance of equipment, workmanship or materials, whichever is later, unless otherwise specified in the supplemental General Conditions or the Certificate of Substantial Completion.

The rights of the Contractor regarding payments upon the issuance of the Certificate of Substantial Completion shall be as provided in the payment provisions of the Contract for Construction and these General Conditions.

12.2 Final Completion.

The Contractor shall notify the Architect and the College in writing when it has completed the entire Project (or a specific phase of the Work, if the Work is to be performed in phases) and has satisfied all of the requirements of the Contract Documents for Final Completion. The Architect and the College will then conduct an inspection, and if they determine that the Contractor has completed the entire Project (or a specific phase of the Work, if the Work is to be performed in phases) and has satisfied all of the requirements of the Contract Documents for Final Completion, the College will then issue a Certificate of Final Completion. If any items remain incomplete or unsatisfactory, the College will notify the Contractor inwriting and list the incomplete or unsatisfactory items. The Contractor shall immediately complete and correct any unfinished items and notify the Architect and the College in writing and request a follow-up inspection for Final Completion.

The Certificate of Final Completion will not be issued until all documents required by the Contract Documents have been provided, including the College's acceptance of final payment and release of liens and claims forms duly executed by the Contractor and any Subcontractors and suppliers who have furnished labor or materials under the Contract, warranties, maintenance and operating instructions, certificates, insurance, shop drawings required, and as-built drawings approved by the Architect. Final Completion must include leaving the entire Project site and the Project (or the phase of the Work) clean, neat and orderly. All distortions, cracks, delaminating and deteriorations of finished surfaces must be remedied. All broken items shall be repaired. All paint spots, stains and plaster must be removed. All unused equipment and excess material shall be removed. The Project and the Project site (or the phase of the Work) shall be clean and finished.

If the Contractor unreasonably delays completing and correcting items needed for the issuance of the Certificate of Final Completion, the College may unilaterally issue a Certificate of Final Completion that lists incomplete and defective items, and that deducts any applicable liquidated damages and the cost of remedying incomplete and defective items from the final amount due to the Contractor under the Contract.

Final payment will not be made until the Certificate of Final Completion is issued, and the final payment shall be subject to the payment provisions in the Contract for Construction and these General Conditions.

ARTICLE 13 SUSPENSION AND TERMINATION OF CONTRACT.

13.1 Suspension By The College.

The College shall have the right to stop or suspend the Work in whole or in part at any time. The Work may only be stopped or suspended by a written directive of the College's Representative, except in an emergency. The College's Representative may stop or suspend the Work in whole or in part on an emergent basis, either verbally or in writing, but any such emergent suspension or stop Work order shall be confirmed by a written directive from the College's Representative within 48 hours. The College may stop or suspend the Work because of any conditions affecting health or safety on or off site, any dangerous condition, any environmental hazard, the convenience of the College, or the public interest. If a directive to

stop or suspend all or part of the Work includes directions to secure the site, the Contractor shall perform the Work required in the directive. The Contractor shall also maintain the safety and security of the Project during the suspension for the protection of the site, Work in place, materials and equipment on site, persons on or near the site, and the College's property.

If all or part of the Work is suspended in response to a problem or condition caused by the Contractor's performance of its Contract, or parties other than the College itself, or conditions over which the College has no control, the Contractor will not be entitled to any additional compensation for the suspension. If the College directs the suspension of Work because of the improper performance of the Contract by the Contractor or those performing its Contract, the Contractor will not be entitled to any extension of any Contract Times or additional compensation by reason of the suspension. If a suspension is directed for reasons other than the fault of the Contractor or others involved in its performance of the Contract, the Contract, the Contractor will be entitled to an extension under and to the extent authorized in Article 9, and additional compensation under and to the extent authorized 11.

13.2 Termination For Convenience.

The College may, by a written directive, terminate the Contract at any time before completion for the College's convenience or where it concludes that it is in the public interest to do so. The Contractor shall complete any items of Work specified in the notice of termination for convenience and any Work necessary to make the site safe for all persons and property at or near the Project site when the College terminates the Contract for convenience under this Article.

Absent the Contractor fault or violation of the Contract, the Contractor shall be paid in full for all properly completed Work, subject to the payment provisions in the Contract for Construction and these General Conditions. The Contractor will not be entitled to payment for costs and mark-ups for Work or materials not provided before the termination, or costs for Work and materials not provided unless the Contractor cannot avoid liability to pay those costs, or profit or overhead on the portion of the Contract that will not be performed because of the termination, or other types of damages. The extra compensation payable to the Contractor in connection with a termination for convenience may include the cost of materials or equipment purchased for the Project before termination but not installed if the Contractor cannot otherwise use or sell them.

The Contractor will also be entitled to reasonable termination costs in reasonable amounts for additional direct costs in connection with the termination, but not administrative, home office or overhead costs, lost profit, or consequential damages. In addition, any claims shall be subject to the provisions in the Contract for Construction and these General Conditions regarding claims and the maintenance of cost records.

The Contractor shall include provisions similar to this Article in subcontracts and supply contracts for the Project. When a termination for convenience is directed by the College, the Contract shall be closed out in accordance with the provisions of the Contract for Construction and these General Conditions regarding payment and Project completion.

13.3 Termination For Cause.

The College may terminate the Contract for cause if the Contractor (i) commits violations of the Contract Documents, (ii) fails to perform the Work in accordance with the Contract Documents including the Project Schedule, (iii) fails to comply with applicable laws, rules or regulations, (iv) fails to pay Subcontractors or suppliers to the extent reasonably required, (v) becomes insolvent or becomes a debtor in a bankruptcy proceeding, (vi) fails to pay its debts, (vii) is found to have made false or misleading statements to the College in writing in obtaining the Contract or payments, (viii) fails to comply with employment discrimination laws, (ix) fails to pay prevailing wages, (x) fails to maintain or renew the required insurance, (xi) fails to maintain proper protection for the safety of persons or property on the site, (xii) fails to comply with reasonable and authorized directives of the College under the Contract, or (xiii) assigns its rights or interests under the Contract or payments under the Contract to any third party.

If the College terminates the Contract for cause, it shall first send a notice of intent to terminate to the Contractor and the Contractor's surety. The notice shall direct the Contractor to remedy or eliminate the deficiency within a specified time if the problem is one that can be eliminated. If the Contractor fails to reasonably comply with the directive and notice, the College may after 10 days issue a notice of termination to the Contractor and its surety which terminates the Contract effective immediately and specifies the reason for the termination.

If the Contract is terminated, the Contractor shall secure the site and take measures to leave the site safe for persons, material, Work in place and equipment before departing the site, and shall remove all tools and equipment within 5 days of the termination effective date. The Contractor shall not remove any materials or equipment stored on site unless directed to do so by the College. When the Contract is terminated, the Contractor shall deliver materials purchased for the Project and paid for by the College, but not stored on site, together with all appropriate warranties and guaranties to any location designated by the College.

If the Contractor's surety does not take over the completion of the Work in accordance with this Article, the College may appropriate any or all materials on the site that may be suitable and acceptable and may enter into an agreement for the completion of the Work with another contractor, or use other methods to complete the Work.

All damages, costs and charges incurred by the College together with the cost of completing the Work, will be deducted from any monies due or which may become due to the Contractor for Work properly completed by it before the termination. If such expenses exceed the sum available from the unpaid Contract Price, the Contractor and its surety shall be liable and shall pay to the College the amount of such excess in addition to other damages.

The rights and remedies of the College in connection with a termination for cause shall be in addition to other rights and remedies which it has under law, the Contract, and the Contractor's bond.

If the College terminates the Contract for cause and it is subsequently determined by a court that the Contractor was not in default, or that the termination was legally unjustified, the termination will be deemed to be a termination for convenience under this Article, and the rights

and remedies of the Contractor and its surety for the termination will be limited to those which exist in connection with a termination for convenience. If the College terminates the Contract for cause, the Contractor may not file a suit to recover on any claims arising out of the Project before the Work is Substantially Complete.

13.4 Surety Takeover Following Termination For Cause.

If the College terminates the Contractor for cause, the Contractor's performance bond surety may elect to takeover and complete the Contractor's Work and obligations under its Contract. If the surety elects to take over the completion of the Contract, it may only do so on the following conditions:

- (a) The surety must notify the College that it will take over completion of the Contract by a written notice of intent signed by a representative authorized to bind the surety within 5 calendar days of the surety's receipt of the College's notice of termination.
- (b) The surety and the College must execute a written takeover agreement within 10 days after the surety sends its notice of intent to takeover. The takeover agreement signed by the surety and the College, must:
 - i. contain an acknowledgement and agreement by the surety to assume the obligation to complete the balance of the Work under the Contract and to perform all of the Contractor's obligations under the Contract at the surety's sole cost and expense, and to utilize only contractors approved by the College to complete the Work, which approval shall not be unreasonably withheld;
 - ii. provide that the surety is entitled to be paid the unpaid balance under the terminated Contractor's Contract in accordance with and subject to the terms of the Contract for Construction and these General Conditions;
 - iii. provide that the surety is not relieved of any of its obligations under its payment and performance bond for the Project, and that the College retains its right to withhold money for Contract payments to compensate for damages or for other reasons where authorized under the Contract for Construction or these General Conditions; and
 - iv. provide that it is without prejudice to and is subject to all of the rights and remedies of the College, the surety, and the defaulted Contractor, and the surety may not require the College to agree to a takeover agreement that seeks to extinguish any such rights.
- (c) The surety must also pay without delay all obligations of the terminated Contractor for Work and materials on the Project, subject to a reasonable allowance of time to investigate and verify claims.

13.5 Suspension By The Contractor For Non-Payment.

If the Contractor is not paid sums due under an approved invoice within thirty (30) days of the billing date, it may suspend performance without penalty for breach of Contract, but only

after providing the College with 7 days written notice of non-payment, and only in the event that the College fails to furnish the Contractor, within that 7-day period, with a written statement of the amount withheld and the reasons for the withholding. Nothing herein shall be construed to excuse the Contractor's nonperformance, or to limit the College's rights and remedies relating to such nonperformance, with regard to any monies withheld from the Contractor upon the proper notice provided under this Article, or with regard to any Contractor claim disputed by the College.

ARTICLE 14 WARRANTY/DEFECTIVE WORK AND MATERIALS

14.1 General Work One Year Warranty; HVAC Systems Two Year Warranty

The Contractor warrants and guarantees for a one year period that all Work, materials and equipment conform to the Contract Documents and will not fail or manifest defects, that the Project and all its components will be fit for their intended functions, and that all material and equipment will be new and of good quality.

The general one year warranty period (or two year warranty period for HVAC work) shall commence when the Certificate of Substantial Completion is issued, and the one year period (or two year period for HVAC work) shall commence on that date for all components of the Project, including any equipment activated and operated before Substantial Completion, such as HVAC systems, electrical systems and elevators.

During the one year warranty period (or two year warranty period for HVAC work), the Contractor shall repair and remedy at its own expense any premature failure, defects or deficiencies in any Work, materials or equipment that are discovered or that develop during the one year period (or two year period for HVAC work), and shall do so within 5 days after receipt of a written warranty claim from the College. The Contractor shall also repair damages caused by any failure or defect covered by this warranty. A failure to provide the warranty service required shall constitute a breach of this warranty obligation as well as other applicable provisions of the Contract. This warranty shall not cover failures caused solely by substantial misuse or abuse by the College.

This general one year warranty (or two year warranty for HVAC work) is intended to provide the College with prompt warranty service for all aspects of the Project for the one year period (or two year period for HVAC work). It is not intended to limit or extinguish any additional warranties required by any of the Contract Documents, or provided by manufacturers of systems, equipment or materials provided under the Contract. It is not intended to eliminate or reduce the College's rights and remedies under the Contract Documents and law for defects and deficiencies in the Work, materials and equipment, or the time period of the Contractor's general responsibility and liability.

14.2 Defective Work, Materials And Equipment.

Apart from the general one-year warranty provided for in this Article, the Contractor shall be responsible for defective Work, materials and equipment and any failure of these items to comply with the Contract Documents. This obligation shall extend beyond Substantial Completion, Final Completion and the general one year warranty (or two year warranty for HVAC work) in this Article.

If defects in the Work, materials or equipment or non-conforming items are discovered during construction and before Final Completion, the Contractor shall promptly correct them at its own expense. If the Contractor fails to correct defective or non-conforming Work, material or equipment in response to a written notice form the College, either during construction or after Final Completion, the College may employ others to provide the remedial work and the Contractor and its surety shall be liable for the cost thereof and damages incurred by the College. The Contractor and its surety shall also be liable for the cost of making good all Work and material destroyed or damaged by defects or the correction of defects.

If any portion of the Contractor's Contract Price remains in the custody of the College, either earned or unearned, the College may deduct money paid to others to remedy defects after notice is sent to the Contractor and damages incurred by the College when the Contractor fails to provide a remedy in response. The Contractor's responsibility for defects and non-conforming Work, material and equipment shall not be limited in time except by applicable law.

The Contractor's responsibility for defective Work shall not be affected by either the performance or the lack of performance of inspections by the College or the Architect. The issuance of payments, a Certificate of Substantial Completion or a Certificate of Final Completion shall not constitute acceptance of Work, material or equipment that is deficient or not in compliance with the Contract, or limit the Contractor's warranty or the other Contract obligations.

ARTICLE 15 INDEMNIFICATION/LIABILITY TO THIRD PARTIES.

15.1 The Contractor's Indemnification Obligation.

To the fullest extent permitted by law, the Contractor shall defend, indemnify, and hold harmless the College, the State of New Jersey, the New Jersey Educational Facilities Authority, Trenton State College Corporation, and any other persons or entities designated by the College, and the officers, directors, principals, attorneys, agents, servants, and employees of any of them (collectively the "Indemnified Parties") from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from: (1) performance of the Work, whether such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property, including loss of use resulting therefrom caused in whole or in part by the negligent or willful acts or omissions of the Contractor, Subcontractor, anyone directly or indirectly employed by them, or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder or (2) any one or more of the items set forth in this Article. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity which would otherwise exist as to a party or person described in this Article.

In claims against any person or entity indemnified under this Article by an employee of the Contractor, a Subcontractor or anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under this Article shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or Subcontractor under workers' compensation acts, disability benefit acts or other employee benefit acts, nor shall the same be limited by the types or limits of insurance carried or to be carried by the Contractor or any Subcontractor pursuant to the Contract Documents or otherwise.

The indemnity, defense, and hold harmless obligation set forth in this Article shall be supplemented by the following:

- (a) any claims or liens of Subcontractors, except to the extent that the nonpayment upon which the claim or lien is predicated resulted solely from the College's wrongful failure to pay the Contractor sums due under the Contract;
- (b) any fines, penalties, liquidated damages, assessments or other executions imposed by any governmental authority having jurisdiction over the Project by reason of the Contractor's failure to comply with any requirement of the Contract;
- (c) any losses, damages, or expenses incurred by reason of the Contractor's failure to obtain and maintain in force or cause to be obtained and maintained, the insurance required by the terms of the Contract;
- (d) any losses, damages, or expenses incurred by reason of any failure (whether or not specifically identified herein) by the Contractor to perform its obligations under the Contract Documents or any breach of the Contract;
- (e) any claims, damages, or expenses incurred by reason of the Contractor's infringement or alleged infringement of any patent, copyright, or other intellectual property or similar rights; and
- (f) any claims, damages, liquidated damages, penalties, or fines assessed against the College, directly or indirectly, solely or partially by reason of the Contractor's failure to comply with any applicable laws, codes, statutes, or regulations.

If any judgment is rendered against the Indemnified Parties for which indemnification is required under this Article, the Contractor shall satisfy and discharge it. The Contractor shall reimburse the College for reasonable attorney fees, costs and expenses incurred by the Indemnified Parties in the defense of such suit or claim.

The College shall give written notice to the Contractor of claims and suits for which indemnification may be claimed pursuant to this Article.

The foregoing obligations shall survive the completion of the Work and final payment to the Contractor (or the sooner termination of the Contract) with respect to all matters accrued during the term of the Contract and such obligations shall not be construed to negate, abridge or reduce any other rights, obligations or indemnity which would otherwise exist as to a party or person indemnified by this Article.

15.2 The Subcontractor's Indemnification Obligation.

The Contractor shall cause the indemnification obligations set forth in this Article to be included in all contracts with its Subcontractors.

ARTICLE 16 INSURANCE AND BONDS.

16.1 The Contractor's Insurance.

The Contractor shall purchase from, and maintain with a company or companies lawfully authorized to do business in the State of New Jersey, insurance for protection from claims under workers' compensation and other employee benefit acts which are applicable, claims for damages because of bodily injury, including death, and claims for damages, including the Work itself, to property which may arise out of or result from the Contractor's operations and completed operations under the Contract, whether such operations be by the Contractor or by a Subcontractor or anyone directly or indirectly employed by any of them, until at least 1 year after the Final Completion and acceptance of the Project. This insurance shall be written for not less than the limits set forth below or as required by law, whichever coverage is greater, and shall include contractual liability insurance applicable to the Contractor's obligations under Article 15 (Indemnification). The Contractor expressly agrees that any insurance protection required by the Contract Documents shall in no way limit the Contractor's obligations under the Contract, and shall not be construed to relieve the Contractor from liability in excess of such coverage. Nor shall it preclude the College from taking such actions as are available to it under any other provisions of the Contract for Construction, these General Conditions or the law.

16.1.1 Types and Minimum Amounts of Insurance:

- (a) Commercial General Liability Insurance (CGL). Commercial General Liability insurance ISO CG 00 01 12 07 or later occurrence form of insurance including contractual liability with limits of at least one million dollars (\$1,000,000) per occurrence, and at least two million dollars (\$2,000,000) in the aggregate. The general aggregate limit shall apply separately to this project/location or the general aggregate limit shall be twice the required occurrence limit. The CGL policy shall also include products/ completed operations with limits of at least one million (\$1,000,000) in the aggregate. This insurance shall be maintained for at least one year after the Final Completion of the Project.
- (b) Automobile Liability Insurance. Comprehensive Automobile Liability insurance covering owned, non-owned, and hired vehicles. The limits of liability shall not be less than <u>one</u> million dollars (<u>\$1,000,000</u>) combined single limit for bodily injury and property damage for each occurrence.

(c) Workers Compensation/ Employer's Liability. Worker's Compensation Insurance applicable to the laws of the State of New Jersey and other State or Federal jurisdictions required to protect the employees of the Contractor and any Subcontractor, sub-subcontractor or supplier who will be engaged in the performance of the Contract. The certificate must so indicate that no proprietor, partner, executive officer or member is excluded. This insurance shall include Employers' Liability Insurance with a limit of liability not less than one million dollars (\$1,000,000) bodily injury, each occurrence, one million dollars (\$1,000,000) disease, each employee, and one million dollars (\$1,000,000) disease, aggregate limit.

All required insurance coverages must be written by insurance companies acceptable to the College. All insurance companies must have a minimum A.M. Best's financial strength rating of A- or better, or an equivalent rating from another respected rating agency, and an A.M. Best's size rating of VII or greater.

16.1.2 Additional Insureds. All insurance required herein, except Worker' Compensation, shall name The College of New Jersey, the State of New Jersey, the New Jersey Educational Facilities Authority, Trenton State College Corporation and any other persons or entities designated by the College as additional insureds.

16.1.3 Cancellation. The certificates of insurance shall provide for 30 days written notice to the College before any cancellation, expiration or non-renewal during the term the insurance is required by the Contract.

16.1.4 Evidence of Insurance. The Contractor shall when the Contract for Construction is signed and before beginning the Work required under the Contract, provide the College with valid certificates of insurance signed by an insurance provider or authorized agent or underwriter to evidence the Contractor's insurance coverage as required in this Article, and also copies of the policies themselves. The certificates of insurance shall specify that the insurance provided is of the types and in the amounts required in this Article, and that the policies cannot be canceled except after 30 days written notice to the College. The Contractor shall also be required to provide the College with valid certificates of renewal when policies expire. The Contractor shall also, when requested, provide the College with additional copies of each policy and all endorsements required under the Contract, which are certified by an agent or underwriter to be true copies of the policies and endorsements issued to the Contractor.

16.1.5 Remedies for Lack of Insurance. If the Contractor fails to renew any of its required insurance policies, or any policy is canceled, terminated or modified, the College may refuse to pay monies due under the Contract. The College, in its sole discretion and for its sole benefit, may use monies retained under this Article to attempt to renew the Contractor's insurance or obtain substitute coverage if possible for the College's sole benefit, and may invoke other applicable remedies under the Contract for Construction and these General Conditions including claims against the Contractor and its surety. During any period when the required insurance is not in effect, the College may also, in its sole discretion, either suspend the Work under the Contract or terminate the Contract.

16.2 The Subcontractor's Insurance.

The Contractor shall ensure that its Subcontractors purchase and maintain insurance on the same terms and with coverages customary for each trade as required by the Contractor under the Contract. The Contractor shall contractually obligate its Subcontractors to indemnify, defend, and hold harmless the College upon the same terms and conditions that the Contractor is required to do so as provided in Article 15 of these General Conditions (Indemnification).

16.3 Payment And Performance Bond.

The Contractor is required to furnish the College with a payment bond and a performance bond from an approved surety as described in this Article and in the bid documents. The bonds shall conform to <u>N.J.S.A.</u> 2A:44-147. The Contract will not become effective until these bonds are provided to and approved in writing by the College. The bonds must also be accompanied by the surety disclosure statement and certification required by <u>N.J.S.A.</u> 18A:64-68.

ARTICLE 17 DISPUTE RESOLUTION.

17.1 Mediation.

If a dispute or claim arises out of or relates to the Contract, or the breach thereof, and if the dispute cannot be settled through negotiation, the dispute or claim may, at the College's sole option, be subject to mediation administered by the American Arbitration Association under its Construction Industry Mediation Rules as a condition precedent to binding dispute resolution. The parties shall share the mediator's fee and any filing fees equally. The mediation shall be held in Mercer County, New Jersey, at the offices of the College's attorneys, unless another location is mutually agreed upon. Agreements reached in mediation shall be enforceable in any court having jurisdiction thereof.

17.2 Method Of Binding Dispute Resolution.

For any dispute or claim, not resolved by mediation pursuant to this Article, the method of binding dispute resolution shall be litigation in the state or district courts of the State of New Jersey, unless the College, in its sole discretion, decides to submit the dispute or claim to arbitration pursuant to this Article.

17.3 Arbitration (If The College Elects To Arbitrate).

If the College decides, in its sole discretion, to submit a dispute or claim to arbitration rather than litigation as provided above, the arbitration shall be administered by the American Arbitration Association in accordance with its Construction Industry Arbitration Rules in effect on the date of the Contract unless the parties mutually agree otherwise. A demand for arbitration shall be made in writing, delivered to the other party to the Contract, and filed with the person or entity administering the arbitration. The arbitrator shall be a New Jersey licensed attorney with at least twenty (20) years' experience practicing in construction law. In the event that the parties mutually agree to use a panel of three arbitrators, then the construction attorney will be the presiding arbitrator, one of the arbitrators will be a registered architect and the other will be a contractor, all of whom shall be neutral and independent. This Article shall not preclude the College or Contractor from instituting legal action to discharge an invalid construction lien. The arbitration hearing shall be held in Mercer County, New Jersey, at the offices of the College's attorneys, unless another location is mutually agreed upon.

A demand for arbitration shall be made no earlier than concurrently with the filing of a request for mediation, but in no event shall it be made after the date when the institution of legal or equitable proceedings based on the claim, dispute or other matter in question would be barred by the applicable statute of limitations. For statute of limitations purposes, receipt of a written demand for arbitration by the person or entity administering the arbitration shall constitute the institution of legal or equitable proceedings based on the claim, dispute or other matter in question.

The foregoing agreement to arbitrate and other agreements to arbitrate with an additional person or entity duly consented to by the parties to the Contract shall be specifically enforceable in accordance with applicable law in any court having jurisdiction thereof.

The award rendered by the arbitrator(s) shall be a reasoned award and shall include a statement of findings of fact and conclusions of law and shall be final, and judgment may be entered upon it in accordance with applicable law in any court having jurisdiction thereof.

17.4 Consolidation Or Joinder.

The College, in its sole discretion, may consolidate an arbitration conducted under the Contract with any other arbitration to which it is a party provided that (i) the arbitration agreement governing the other arbitration permits consolidation, (ii) the arbitrations to be consolidated substantially involve common questions of law or fact, and (iii) the arbitrations employ materially similar procedural rules and methods for selecting arbitrator(s).

The College, in its sole discretion, may include by joinder persons or entities substantially involved in a common question of law or fact whose presence is required if complete relief is to be accorded in arbitration, provided that the party sought to be joined consents in writing to such joinder. Consent to arbitration involving an additional person or entity shall not constitute consent to arbitration of any claim, dispute or other matter in question not described in the written consent.

The College, in its sole discretion, may grant to any person or entity made a party to an arbitration conducted under this Article, whether by joinder or consolidation, the same rights of joinder and consolidation as the College under the Contract.

17.5 Work During Pendency Of Dispute.

Unless otherwise instructed by the College, the Contractor shall carry on its Work during the pendency of any dispute hereunder, and the College shall continue making payments to the Contractor of undisputed amounts.

17.6 Prompt Payment Claims.

Notwithstanding the foregoing, disputes regarding only whether a party has failed to make payments required pursuant to New Jersey's Prompt Payment Act may be submitted to alternative dispute resolution as provided in <u>N.J.S.A.</u> 2A:30A-2(f). In such event, the College and the Contractor shall share equally the fees and expenses of the selected mediator. Provided, however, that nothing herein shall be construed, in whole or in part, as a waiver, release or modification of the provisions of the New Jersey Contractual Liability Act, <u>N.J.S.A.</u> 59:13-1, <u>et seq.</u>, as it governs claims against the College.

17.7 The Contractor's Claims: Procedures And Limitations.

Claims by the Contractor against the College shall be subject to the New Jersey Contractual Liability Act, <u>N.J.S.A</u>. 59:13-1, <u>et seq.</u>, including the notice and time for suit provisions. For the purpose of determining the time within which the Contractor must file suit under the New Jersey Contractual Liability Act, "completion of the contract" shall be deemed to have occurred upon achievement of Substantial Completion as defined in these General Conditions.

The Contractor also agrees that it shall not be entitled to assert claims against the College for any compensation beyond that provided for in the Contract by reason of the acts or omissions of any third parties, including but not limited to the Architect and any other contractor on the Project. The Contractor may not assert claims for extra costs for home offices expenses, home office overhead, lost profits or revenue, or consequential damages as that term is defined in law. All claims shall also be subject to all other pertinent provisions of the Contract for Construction and the Contract Documents including these General Conditions. The Contractor also agrees that it may not assert any claims for extra costs or damages unless it maintains all the records of its estimated and actual costs as required by the Contract for Construction and these General Conditions.

17.8 Dispute Resolution Process In The Contractor's Subcontracts.

The Contractor shall include this dispute resolution process in all of its contracts with any Subcontractors or suppliers on this Project.

<u>ARTICLE 18</u> MISCELLANEOUS.

18.1 Prevailing Wage.

The Contractor and its Subcontractors shall comply with the New Jersey Prevailing Wage Act, <u>N.J.S.A.</u> 34:11-56.25 through 56.57. Workers employed by the Contractor or any Subcontractor or sub-subcontractor in the performance of services directly on the Project must be paid prevailing wages. As required by <u>N.J.S.A.</u> 34:11-56.27 and 56.28, the Contract cannot become effective until the College obtains from the New Jersey Department of Labor a determination of the prevailing wage rates applicable to the Project as of the Contract award date and attaches a copy to the Contract. As required by <u>N.J.S.A.</u> 34:11-56.27, the Contractor or any

Subcontractor may be terminated if any covered worker is not paid prevailing wages on the Project, and the Contractor and its surety shall be liable for any additional costs which result. The Contractor and its Subcontractors must be registered with the New Jersey Department of Labor (N.J.S.A. 34:11-56.51 et seq.), and the prevailing wage rates must be posted at the job site (N.J.S.A. 34:11-56.32). The Contractor and its Subcontractors must prepare accurate certified records of wages paid for each worker on the Project (N.J.S.A. 34:11-56.29), and copies for the period covered by each invoice must be attached to the invoice submitted under the Contract. In accordance with N.J.S.A. 34:11-56.33, the Contractor's final invoice must include a statement of all amounts still then due to workers on the Project. The Contractor is also cautioned that it must use job titles and worker classifications consistent with those approved by the Department of Labor's regulations at N.J.A.C. 12:60-7.1 through 7.4.

If the State's Prevailing Wage Act is amended, or the language stated herein is inconsistent with the language contained in the State's Prevailing Wage Act, the language of the State's Prevailing Wage Act shall control.

18.2 Employment Discrimination.

The Contractor and any Subcontractors employed by it shall comply with <u>N.J.S.A.</u> 10:2-1 through 10:2-4 and <u>N.J.S.A.</u> 10:5-1 <u>et seq.</u>, including <u>N.J.S.A.</u> 10:5-31 through 10:5-35, which prohibit discrimination in employment in public contracts. The statute and the rules and regulations promulgated thereunder shall be considered to be part of the Contract and binding upon the Contractor and its Subcontractors. If the College is notified of any violation of the public contract awarding regulations in accordance with <u>N.J.A.C.</u> 17:27-7.4 concerning the financing of minority and women outreach and training programs, the College reserves the rights to deduct the outreach and training allocation from the Contract. During the performance of the Contract, the Contractor agrees that:

- (a) In the hiring of persons for the performance of Work under the Contract or any subcontract hereunder, or for the procurement, manufacture, assembling or furnishing of any such materials, equipment, supplies or services to be acquired under the Contract, neither the Contractor, its Subcontractors nor any person acting on behalf of the Contractor or any of its Subcontractors, shall, by reason of race, creed, religion, color, national origin, nationality, ancestry, age, sex (including pregnancy), familial status, marital status, domestic partnership or civil union status, affectional or sexual orientation, gender identity or expression, atypical hereditary cellular or blood trait, genetic information, liability for military service, and mental or physical disability, perceived disability, and AIDS and HIV status, discriminate against any person who is qualified and available to perform the Work to which the employment relates;
- (b) Neither the Contractor, its Subcontractors, nor any person acting on behalf of the Contractor or any of its Subcontractors shall, in any manner, discriminate against or intimidate any employee engaged in the performance of Work under the Contract or any subcontract hereunder, or engaged in the procurement, manufacture, assembling or furnishing of any

such materials, equipment, supplies or services to be acquired under such contract, on account of race, creed, religion, color, national origin, nationality, ancestry, age, sex (including pregnancy), familial status, marital status, domestic partnership or civil union status, affectional or sexual orientation, gender identity or expression, atypical hereditary cellular or blood trait, genetic information, liability for military service, and mental or physical disability, perceived disability, and AIDS and HIV status;

- (c) There may be deducted from the amount payable to the Contractor by the College, under the Contract, a penalty of \$50.00 for each person for each calendar day during which such person is discriminated against or intimidated in violation of the provisions of the Contract; and
- (d) The Contract may be canceled or terminated by the College, and all money due or to become due hereunder may be forfeited, for any violation of this Article of the Contract occurring after notice to the Contractor from the College of any prior violation of this Article of the Contract. The Contractor and its Subcontractors shall comply with all laws prohibiting discrimination against employees, and shall comply with the provision in the Contract regarding employment discrimination.

If the State's Law Against Discrimination is amended, or the language stated herein is inconsistent with the language contained in the State's Law Against Discrimination, the language of the State's Law Against Discrimination shall control.

18.3 Patents.

If any design, device, material or process covered by patents or copyright is used in the Work, the Contractor shall provide for such use by a suitable agreement with the patent or copyright owner. The Contractor shall bear all costs arising from the use of patented materials, equipment, or processes and all copyrighted materials used on or incorporated in the Work. The Contractor shall defend, indemnify and hold harmless the College and its representatives from any and all claims for infringement by reason of the use of any such patented or copyrighted items.

18.4 The Contractor's Compliance With Law.

The Contractor shall keep fully informed of all federal, state and local laws, ordinances, regulations and orders of agencies that have jurisdiction or authority that in any manner affect those employed on the Project or the Project. The Contractor shall at all times observe and comply with, and cause its agents and employees to observe and comply with, all such laws, ordinances, regulations, and/or orders. The Contractor shall also protect and indemnify, defend and hold harmless the College and its representatives against any claim or liability arising from the violation of any laws, ordinances, regulations, or orders, whether by the Contractor or its employees, agents, Subcontractors at any tier, suppliers or materialmen.

18.5 Environmental Protection – The Contractor's Duty To Comply With Applicable Law.

The Contractor shall comply with all applicable federal, state and local laws and regulations and all conditions of permits pertaining to the protection of the environment. Necessary precautions shall be taken to prevent pollution of streams, lakes, ponds, rivers, wetlands, groundwater, reservoirs, and property by chemicals, fuels, oils, bitumens, or other harmful or hazardous materials as defined by law. The Contractor also shall not pollute the atmosphere from particulate or gaseous matter in violation of applicable law.

18.6 No Personal Liability Of College Officials.

In carrying out any of the provisions of the Contract, or in exercising any right or authority granted to them by or in connection with the Contract, there shall be no liability upon any trustee, officer or employee of the College, either personally or as officials of the College, it being agreed that in all such functions they act only as agents and representatives of the College.

18.7 Buy American Requirement.

Pursuant to <u>N.J.S.A.</u> 52:32-1 only manufactured and farm products of the United States, whenever available, shall be used in work.

Pursuant to NJ.S.A. 52:33-1 et seq., notwithstanding any inconsistent provision of any law, and unless the head of the department, or other public officer charged with the duty by law, shall determine it to be inconsistent with the public interest, or the cost to be unreasonable, only domestic materials shall be acquired or used for any public work. This Article shall not apply with respect to domestic materials to be used for any public work, if domestic materials of the class or kind to be used are not mined, produced or manufactured, as the case may be, in the United States in commercial quantities and of a satisfactory quality. If the State's "Buy American" laws are amended, or the language stated herein is inconsistent with the language contained in the State's "Buy American" laws, the language of the State's "Buy American" laws shall control.

18.8 Compliance With Grant Requirements. The Contractor acknowledges and agrees that if the College receives any grant monies in connection with the Project, the Contractor and its Subcontractors shall comply with all requirements associated with such grant or set forth in such grant agreement. Any such grant requirements shall be identified in the Request for Proposals.

18.9 Modification Of Contract.

No modification or amendment of the Contract shall be effective unless it is in writing and signed by both the College and the Contractor.

18.10 State Sales Tax Exemption.

Materials, supplies or services for exclusive use in constructing the Project are exempt from the State Sales Tax Act. Rentals of equipment are not exempt from any tax under the State Sales Tax Act.

18.11 Successors and Assigns.

The College and the Contractor respectively bind themselves, their successors and assigns, to the other party hereto and to the successors and assigns of such other party in respect to covenants, agreements and obligations contained in the Contract Documents.

The Contractor shall not assign the Contract, nor shall the Contractor transfer or assign any Contract funds, due or to become due, or claims of any nature it has against the College without the prior written approval of the College. The College in its sole discretion and considering primarily the interests of the College may elect either to grant or to deny such approval. If the Contractor attempts to make such an assignment without the College's prior written approval, the Contractor shall nevertheless remain legally responsible for all obligations under the Contract.

The College shall be entitled to assign its rights hereunder to one or more lenders as collateral for loans which the College may obtain to finance construction of the Project and to a party who presently has or later acquires a legal interest in the premises. The Contractor agrees to execute such certificates, documents and instruments as are reasonably requested by the College, including, without limitation, certificates, documents and instruments that evidence the Contractor's consent to an assignment of the Contract or confirm the absence or existence of a default on the part of the College hereunder.

18.12 Construction Liens.

If any Subcontractor or other person working under the Contractor files a construction lien or claim or notice of intention or right to file a lien for or on account of Work, labor, services, materials, equipment or other items furnished under or in connection with the Contract for which the College has paid the Contractor, the Contractor agrees to discharge or remove such lien, claim or notice at its own expense by bond, payment or otherwise within twenty (20) calendar days from the date of the filing thereof, and upon its failure to do so, the College shall have the right to cause any such lien or claim, notice of intention or stop notice to be removed or discharged by whatever means the College chooses, at the sole cost and expense of the Contractor (such costs and expenses to include legal fees and disbursements). The Contractor agrees to indemnify, defend and hold harmless the College and its representatives from and against any and all such liens, claims or other filings, and actions brought or judgments rendered thereon, and from and against any and all losses, damages, liabilities, costs and expenses, including legal fees and disbursements, which the College may sustain in connection therewith. Further, if any Subcontractor or other person working under the Contractor files a construction lien or claim or notice of intention or right to file a lien for or on account of Work, labor, services, materials, equipment or other items furnished under or in connection with the Contract for which the College has paid the Contractor, the College may, in the College's sole discretion, pay all wages, damages, recoveries, costs and expenses and reasonable counsel fees arising therefrom and deduct the same from any monies due or to become due to the Contractor.

18.13 Independent Contractor Status.

The relationship of the Contractor to the College is that of an independent contractor. The Contractor agrees that it shall conduct itself consistent with such status, and shall not hold itself out as or claim to be a trustee, officer, employee or agent of the College. The Contractor shall not make any claim or demand for any right or privilege applicable to officers or employees of the College, including but not limited to, workers compensation, unemployment insurance benefits, social security coverage, or retirement benefits.

18.14 Third Party Beneficiary Rights Not Intended.

It is specifically agreed between the College and the Contractor that no provisions of the Contract Documents are intended to make the public or any member thereof a third party beneficiary of the Contract, or to authorize anyone not a party to the Contract to maintain a suit for personal injuries, property damage or other claims under the Contract. It is also the intent of the College and the Contractor that no individual or firm that supplies materials, labor, services, or equipment to the Contractor for the performance of the Work shall be a third party beneficiary of the Contract.

18.15 Gifts To College Employees And Agents Prohibited.

The Contractor shall not give any gifts of any nature, nor any gratuity in any form, nor loan any money or anything of value to any College employee or relative thereof, or any agent of the College. The Contractor shall not rent or purchase any equipment or supplies of any kind from any College employee or relative thereof or any agent of the College.

18.16 Compliance With Procurement Statutes.

The Contractor warrants and represents that the Contract has not been solicited or secured, directly or indirectly, in a manner contrary to the law of New Jersey, and in particular the provisions of <u>N.J.S.A.</u> 18A:64-6.1, 6.2 and 6.3, and that the Contractor has not and shall not violate the law of New Jersey relating to the procurement of or the performance of the Contract by any conduct, including the paying of any gratuity of any kind, directly or indirectly, to any College trustee, employee or officer. Any violation of this Article shall be cause for the College to terminate the Contract, to retain all unpaid and/or uncarned monies, and to recover all monies paid. The Contractor shall notify the College in writing of any interest which any trustee, officer,
employee or consultant of the College has in, or association with the Contractor, any other contractor, any Subcontractor, material supplier, consultant, or manufacturer, or other party which has any interest in the Project.

18.17 Conflict Of Interest.

The Contractor shall not pay, offer to pay, or agree to pay, either directly or indirectly, any fee, commission, compensation, gift, gratuity, or other thing of value of any kind to any State officer or employee or special State officer or employee, as defined by <u>N.J.S.A.</u> 52:13D-13b. and e., in the Department of the Treasury or any other agency with which the Contractor transacts or offers or proposes to transact business, or to any member of the immediate family, as defined by <u>N.J.S.A.</u> 52:13D-13i., of any such officer or employee, or any partnership, firm, or corporation with which they are employed or associated, or in which such officer or employee has an interest within the meaning of <u>N.J.S.A.</u> 52:13D-13g.

The solicitation of any fee, commission, compensation, gift, gratuity or other thing of value by any State officer or employee or special State officer or employee from any State vendor shall be reported in writing forthwith by the Contractor to the Attorney General and the Executive Commission on Ethical Standards.

The Contractor may not, directly or indirectly, undertake any private business, commercial or entrepreneurial relationship with, whether or not pursuant to employment, contract or other agreement, express or implied, or sell any interest in the Contractor to, any State officer or employee or special State officer or employee having any duties or responsibilities in connection with the purchase, acquisition or sale of any property or services by or to any State agency or any instrumentality thereof, or with any person, firm or entity with which he is employed or associated or in which he has an interest within the meaning of N.J.S.A.52:13D-13g. Any relationships subject to this Article shall be reported in writing forthwith to the Executive Commission on Ethical Standards, which may grant a waiver of this restriction upon application of the State officer or employee or special State officer or employee upon a finding that the present or proposed relationship does not present the potential, actuality or appearance of a conflict of interest.

The Contractor shall not influence, or attempt to influence or cause to be influenced, any State officer or employee or special State officer or employee in his official capacity in any manner which might tend to impair the objectivity or independence of judgment of said officer or employee.

The Contractor shall not cause or influence, or attempt to cause or influence, any State officer or employee or special State officer or employee to use, or attempt to use, his official position to secure unwarranted privileges or advantages for the Contractor or any other person.

The provisions cited above shall not be construed to prohibit a State officer or employee or special State officer or employee from receiving gifts from or contracting with the Contractor under the same terms and conditions as are offered or made available to members of the general public subject to any guidelines the Executive Commission on Ethical Standards may promulgate.

The Contractor shall require its Subcontractors and suppliers to comply with the requirements of this Article.

18.18 Confidential Information.

The Contractor shall maintain the confidentiality of information specifically designated as confidential by the College, unless withholding such information would violate applicable law. The Contractor shall require its Subcontractors to maintain the confidentiality of information specifically designated as confidential by the College.

18.19 Publicity.

Publicity and/or public announcements pertaining to the Project must be approved in writing by the College prior to release.