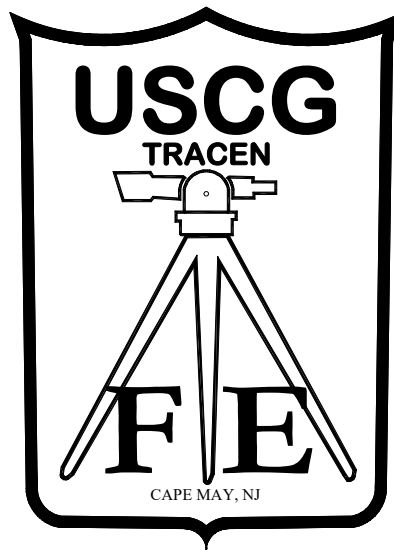


**TRAINING CENTER
CAPE MAY, NJ**

**FACILITIES ENGINEERING
DIVISION**



CMS-1573

Project No.: 11368923

AUGUST 2019

**SPECIFICATION TO REPLACE
UPH CORE ROOF AND HVAC UNITS
BUILDING #254
TRACEN CAPE MAY
CAPE MAY, NEW JERSEY**

AUTHOR: Steve McKaig

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DIVISION 01 – GENERAL REQUIREMENTS

SECTION 01 11 00
SCOPE OF WORK

1. WORK INCLUDED: Work of the Project includes all materials, labor, equipment, services, and all operations necessary to Replace UPH Core Roof and HVAC Units, Buildings #254, at the United States Coast Guard Training Center (TRACEN) in Cape May, New Jersey.:
 - 1.1 Major work items include but are not limited to:
 - A. Replace UPH Core & Passageway roofs;
 - B. Replace two UPH Rooftop HVAC units including ductwork, electric and fire alarm wiring;
 - C. Replace two UPH Exhaust Fans;
 - D. Mobilization, demobilization and clean up;
 - E. Supervision, materials, equipment, transportation, labor and all other incidentals necessary to complete the work.
2. DRAWINGS: Drawings and the accompanying specifications are the property of the Government and comprise legal documentation that pertains exclusively to this project. Drawings will be made available in a format determined by the solicitation method. CEU Cleveland will not provide hard copies of drawings.

2.1 Construction Drawings:

T-7102-AD	Site Plan	SHT 1 of 8
T-7103-AD	Roof Plan	SHT 2 of 8
T-7104-AD	Original Construction Roof Sections	SHT 3 of 8
T-7105-AD	New Roof Sections	SHT 4 of 8
T-7106-AD	Roof Details	SHT 5 of 8
T-7107-MD	Mechanical Plans	SHT 6 of 8
T-7108-MD	Mechanical Equipment Schedules	SHT 7 of 8
T-7109-ED	Electrical Plans	SHT 8 of 8

SECTION 01 11 16
WORK BY OTHERS

1. WORK NOT INCLUDED IN THE CONTRACT: Non-contractor personnel will accomplish the following work items necessary for completion of the project.

However, the contractor must coordinate accomplishment of these work items with the appropriate parties noted below in accordance with Section 01 14 16, "Coordination".

- 1.1 **Work by other Contractors or Service Companies:** The contractor shall allow service contract personnel access to the site for trash removal, snow removal, grounds maintenance or the performance of other related service contracts. The Coast Guard will advise the contractor of the trash removal, grounds maintenance or other recurring maintenance schedules.

SECTION 01 14 00 CONTRACTOR WORK HOURS

1. **WORK HOURS:** The Contractor will be permitted to perform construction work through the hours of 7:00 am and 4:30 PM Mondays through Thursdays. The Coast Guard base hosts recruit graduations on most Fridays year round. The contractor shall expect increased automobile and pedestrian traffic on Fridays. Excessive noise and other disruptive activities shall be limited on Fridays between the hours of 10:00 am and 12:00 during graduation ceremonies unless otherwise approved by the COR. No major deliveries shall be scheduled between 8:00 and 12:00. Note any departures from these work hours on the Daily Reports.
2. **SATURDAY, SUNDAY AND HOLIDAYS:** The contractor shall provide the Contracting Officer's Representative at least forty-eight hours advance notice prior to working on weekends or Federal holidays. The Government may reject any such request without impacting the completion time of the contract.
3. **CONTRACT COMPLETION:** The contractor shall complete work within the time frame indicated upon issuance of the Notice to Proceed for Submittals. Limitations imposed by these work hours will not entitle the Contractor additional time to complete the project. Refer to FAR Clause 52.211-10 "Commencement, Prosecution and Completion of Work".
4. **ACCESS TO BASE:** Prior to commencement of the contract, the Contractor and all sub-contractors are required to register with the USCG TRACEN Cape May Security Office. Background screenings will be performed by TRACEN Security for all employees of the Contractor and sub-contractors working on the Base. The Contractor shall contact USCG TRACEN Cape May Security Office at (609) 898-6915 for detailed requirements.

SECTION 01 14 13 PRE-BID SITE VISITS

1. **GENERAL:** Bidders are responsible for visiting the site to field verify existing conditions and determine actual dimensions and the nature of the work required. Failure to visit the site does not relinquish the bidder from determining the extent and scope of

the work required and estimating the difficulty and cost to complete the project. Requests for equitable adjustments, in either time or money, arising from failing to field verify site conditions may be denied. Provisions regarding the site visit requirements are outlined in FAR Clause 52.236-3 "Site Investigation and Conditions Affecting the Work".

2. SITE VISIT: During the Solicitation Phase of this Project, two Pre-Bid site visits will be scheduled by the Owner. The first Pre-Bid site visit will be held approximately two weeks after the release of the Solicitation. The second Pre-Bid site visit will be held approximately three weeks after the release of the Solicitation. It is the responsibility of the contractor to contact the Project Engineer, Steve McKaig, Facilities Engineering, Design Section, at 609-898-6408 or steven.c.mckaig@uscg.mil to obtain the specific dates, as no other site visits will be scheduled.

SECTION 01 14 14 PRE-CONSTRUCTION SITE CONDITIONS

1. SITE CONDITION VERIFICATION: The Contractor shall verify the conditions of the existing site, equipment and facilities potentially affected by the work under this contract. When designated on the submittal list, the contractor shall photograph and/or videotape the conditions in order to document their pre-construction condition. Copies of the photos and videos shall be submitted to the Contracting Officer prior to starting work.

SECTION 01 14 16 COORDINATION

1. INTERFERENCE WITH COAST GUARD OPERATIONS: Accomplish work in a manner that causes minimal impact on normal operations. The Contractor shall notify the Contracting Officer's Representative at least five working days in advance of any planned outages of water, electrical, telephone, or sanitary facilities. Notify the Contracting Officer's Representative at least one week prior to beginning construction.
2. TRAINING CENTER REGULATIONS:
 - 2.1 The Contractor, his employees, and subcontractors shall become familiar with and obey all Training Center regulations. All personnel employed on the project shall keep within the limits of the work and avenues of ingress and egress, and shall not enter any other areas outside of the site of the work unless required to do so in the performance of their duties. The Contractor's equipment shall be conspicuously marked for identification
 - 2.2 There shall be NO SMOKING in any Coast Guard building.
 - 2.3 Storage Areas: The Contracting Officer's Representative will determine exact

location and boundaries of staging areas. Under no circumstances shall materials be stored in areas that will interfere with aircraft operations.

- 2.4 Storm Protection: If a gale force wind warning or higher is issued, take precautions to minimize any danger to persons and protect the work and nearby Government property. Precautions shall include, but not be limited to, closings, removing loose materials, tools and equipment, from exposed locations. Remove and secure scaffolding and temporary work. Close openings in the work area if storms of lesser intensity are imminent.

SECTION 01 14 19 FIELD ADJUSTMENTS

1. The Contracting Officer's Representative may authorize field adjustments. Field adjustments are those alterations that do not affect time, price, or intent of the contract documents. All field adjustments shall be documented in the Daily Reports and on the As-Built Drawings.

SECTION 01 18 14 BUILDING PERMITS

1. NO BUILDING PERMITS from state or local governments are required for work performed on federal property.

SECTION 01 18 17 ENVIRONMENTAL PERMITS

1. Unless directed by other sections of this specification, the Contractor will not be responsible for obtaining environmental permits.

SECTION 01 26 13 REQUESTS FOR INFORMATION

1. SUMMARY:
 - 1.1 Section Includes: Administrative requirements for requests for information.
2. DEFINITIONS:
 - 2.1 Request for Information: A document submitted by the Contractor requesting clarification of a portion of the contract documents, hereinafter referred to as RFI (Request for Information).
 - 2.2 Proper RFIs: A properly prepared request for information shall include a detailed written statement that indicates the specific Drawings or Specification in need of

clarification and the nature of the clarification requested.

- A. RFIs shall be sequentially numbered.
- B. Drawings shall be identified by drawing number and location on the drawing sheet.
- C. Specifications shall be identified by Section number, page and paragraph.

2.3 Improper RFIs: RFIs that are not properly prepared.

- A. Improperly prepared RFIs will not be processed by the Contracting Officer, but will be returned unprocessed.

2.4 Frivolous RFIs: RFIs that request information that is clearly shown on the Contract Documents.

- A. Frivolous RFIs may be returned unprocessed.

3. CONTRACTOR'S REQUESTS FOR INFORMATION:

3.1 During Bid Phase: Bidders shall submit all questions, in writing, to the Contracting Officer. Requests for Information (RFI) shall be submitted no later than five (5) business days prior to the bid due date. RFIs will be addressed by the USCG three (3) business days prior to the bid due date.

3.2 During Construction Phase: When the Contractor is unable to determine from the Contract Documents, the material, process or system to be installed, the Contracting Officer shall be requested to make a clarification of the indeterminate item.

- A. Wherever possible after contract award, such clarification shall be requested at the next site visit by the Contracting Officer's Representative (COR), with the response entered on the daily reports. When clarification at the COR's site visit is not possible either because of the urgency of the need, or the complexity of the item, Contractor shall prepare and submit an RFI to the Contracting Officer.
- B. Contractor shall endeavor to minimize the number of RFIs. In the event that the process becomes unwieldy, in the opinion of the Contracting Officer because of the number and frequency of the RFIs submitted, the Contracting Officer may require the Contractor to abandon the process and submit future requests as either submittals, substitutions or requests for change.
- C. RFIs shall be submitted on the form provided by the Contracting Officer. Forms completely filled in, and if prepared by hand, shall be fully legible

after photocopying, scanning or fax transmission. Each page of the attachments to RFIs shall bear the RFI number in the upper right corner.

- D. RFIs shall be originated by the Prime Contractor.
 - 1. RFIs from subcontractors or material suppliers shall be submitted through, reviewed by, and signed by the Prime Contractor prior to submitting to the Contracting Officer.
 - 2. The Contracting Officer will neither act on nor respond to RFIs received directly from subcontractors or suppliers.
- E. Contractor shall carefully study the Contract Documents to assure that the requested information is not available therein. RFIs which request information available in the Contract Documents will be deemed either Improper or Frivolous as defined above.
- F. In cases where RFIs are issued to request clarification of coordination issues, for example, pipe and duct routing, clearances, specific locations of work shown diagrammatically, and similar items when feasible, Contractor shall fully lay out a suggested solution using drawings or sketches drawn to scale, and submit with the RFI.
- G. RFIs shall not be used for the following purposes:
 - 1. To request approval of submittals.
 - 2. To request approval of substitutions.
 - 3. To request changes which entail additional cost or credit.
 - 4. To request different methods of performing work than those drawn and specified.
- H. In the event the Contractor believes that a clarification by the Contracting Officer results in additional cost or time, the Contractor shall not proceed with the work indicated by the RFI until a modification is prepared and approved. RFIs do not automatically justify a cost increase in the work or a change in the project schedule.
 - 1. Answered RFIs shall not be construed as approval to perform extra work.
- I. Contractor shall prepare and maintain a log of RFIs, and at any time requested by the Contracting Officer, Contractor shall furnish copies of the log showing outstanding RFIs. Contractor shall note unanswered RFIs in the log.
- J. Contractor shall allow up to 14 days review and response time for RFIs, however, the Contracting Officer will endeavor to respond in a timely fashion to RFIs.
- K. The Government reserves the right to issue a change order to expedite the work per FAR Clause 52.243-4, Changes.

4. CONTRACTING OFFICER'S RESPONSE TO RFIs:

4.1 Contracting Officer will respond to RFIs on one of the following forms:

- A. Proper RFIs:
 - 1. Change Order
 - 2. Request for Proposal
- B. Improper or Frivolous RFIs:
 - 1. Unprocessed RFIs will be returned with a stamp or notation: Not Reviewed.
- C. Answers to properly prepared RFIs may be made directly upon the RFI form with supplementary instructions as necessary.

SECTION 01 31 19
PROJECT MEETINGS

1. LOCATION: Project meetings will be conducted either on-site or with a conference call. The following meetings may be held:

- 1.1 Pre-Construction Conference: After award of a contract, the Coast Guard will arrange a conference with the contractor, and necessary Coast Guard personnel. The purpose of this conference is to orient the Contractor to Government procedures for wage rates, contractual and administrative matters, and to discuss specific issues regarding actual construction.
- 1.2 Progress and Technical Review Meetings: These meetings generally take place at the project site. Either party may request a meeting to review the progress of the project and/or review or clarify the technical requirements of the specifications.

SECTION 01 32 16
CONSTRUCTION SCHEDULE, SCHEDULE OF VALUES,
AND PROGRESS SCHEDULE

1. In accordance with the Notice to Proceed letter, the Contractor shall submit the following:

- 1.1 Construction Schedule-This schedule shall be prepared using a horizontal bar graph with time scale. It shall be in an industry accepted Project Management format and shall accurately display:
 - A. All major categories of work to be performed within the required contract completion date broken out in sufficient detail to track progress throughout the life of the contract. Major work categories should include but are not limited to mobilization, carpentry, plumbing, mechanical, electrical, roofing,

concrete, site work, and demobilization. In addition to construction activities, procurement times for critical items, submittal turnaround time, mobilization, final inspection, punchlist work, and demobilization shall be shown on the schedule.

- B. The duration of each work category.
 - C. Any concurrent work categories.
- 1.2 Schedule of Values-This schedule shall be prepared as a **detailed** cost breakdown of the contract price and be submitted with the Construction Schedule. This schedule shall include but not be limited to costs of materials, equipment, and labor for all major work categories shown on the Construction Schedule. The Contractor shall adhere to the following guidelines when developing the Schedule of Values.
- A. Format - The line items in the Schedule of Values shall be the same as that of the Construction Schedule.
 - B. Bonds - Bonding costs will only be paid in a lump sum if they are broken out separately and included with the schedule of values. The Contractor shall provide evidence that he has furnished full payment to the surety.
 - C. Materials - To request progress payments for materials delivered to the construction or fabrication site, the particular category of work associated with the materials must be broken down into separate material and labor costs.
2. **UPDATES: Each month and /or with each progress payment request, the Contractor shall submit the following:**
- 2.1 Progress Schedule-This schedule shall be an update of the Construction Schedule. It shall show the current schedule of all work.
- A. Modifications - If modifications are made to the contract, the work added shall be tracked separately from the original Construction Schedule and shall maintain its individuality on the Progress Schedule throughout the life of the contract. Progress Payment requests shall not lump modification costs into the original contract price.

SECTION 01 32 26 CONSTRUCTION DAILY REPORTS

1. **GENERAL: The Contractor shall complete a Daily Report for each and every day after mobilization.** The importance of an accurate, fully detailed Daily Report, promptly delivered to the designated On-Site Representative cannot be overemphasized. The report shall provide an accurate cumulative summary of the

history and performance of the work. The Daily Report shall document weather; work hours; work in-place; inspections and tests conducted, and their results; dimensional checks; equipment and material checks; data on workers by classification; the mobilization and demobilization of construction equipment; materials delivered to the site; and any other pertinent noteworthy event; e.g., personnel injury, site visit by Coast Guard personnel, etc.

2. RESPONSIBILITY: The Daily Reports play an important role in settling disputes and claims for both parties. For this reason the On-Site Representative and the Contractor's Superintendent, together, should review the report to ensure its completeness and accuracy. Each day's report shall be submitted to the On-Site Representative no later than 10:00 a.m. the following morning. The maximum allowable retainage will be enforced for late, sporadic or non-submission of Daily Reports. In the absence of an On-Site Representative the Contractor shall mail the Daily Reports directly to the Contracting Officer every Friday. Should the Daily Report indicate an accident, environmental issue, OSHA violation or any crisis the On-Site Representative deems important, the Report should be faxed immediately to the Contracting Officer at (216) 902-6278.
3. DESIGNATED ON-SITE REPRESENTATIVE RESPONSIBILITY: After a Notice to Proceed for site work has been issued the On-Site Representative shall complete a Daily Report for each day until the Contractor mobilizes. After the Contractor is at the site, the On-Site Representative shall ensure that the Contractor completes the Daily Report in accordance with Paragraphs 1 and 2 above. Any items of dispute or other notes the On-Site Representative feels appropriate shall be added to the Daily Report. The On-Site Representative is also responsible for informing the COR when the contractor fails to submit daily reports.

SECTION 01 33 00 SUBMITTAL PROCEDURES

1. GENERAL: The Contractor shall submit to the COR and Contracting Officer, one (1) electronic copy in “.pdf” format of submittals required by this specification and/or itemized on the "List of Submittals" found at the end of this division.
2. REQUEST: A "CONTRACT ITEM ACCEPTANCE REQUEST" shall accompany all submittals. All items shall be individually listed and clearly identified, referencing the applicable Section and Paragraph. A copy of this form is located at the end of this division and may be reproduced as needed. Both sides of Contract Item Acceptance Request sheet shall be submitted. The sheet shall be signed and dated by the Contractor.
 - 2.1 The Contract Item Acceptance Request and the item information shall be consolidated into one .pdf file and one email. Email to the COR and Contracting Officer. Manage email size so as not to exceed the limit allowed by the Coast Guard system. If the email is rejected by the system, reduce the file size and

resubmit.

- 2.2 Up to eleven (11) items may be listed on an individual approval request. Number each Contract Item Acceptance Request consecutively (*Submittals # 1, 2, etc.*) and re-submittals with letters (*Submittal #1A is the first re-submittal of Submittal #1*).
- 2.3 Submittals shall be forwarded to the COR and Contracting Officer. The contractor shall allow 14 calendar days, excluding mailing time, for the review process in the Construction Schedule and all project planning. In instances where submittal review must be expedited, the Contractor may annotate the Contract Item Acceptance Request as "Urgent" to request a prompt return. The Coast Guard will make every effort to accelerate the review of each urgent submittal; however, the Contractor should not anticipate a reduced time schedule and shall plan project progress accordingly.

3. DEVIATIONS

3.1 Deviation from specification:

- A. The COR and Contracting Officer will consider requests for deviations/substitutions only if submitted within fifteen (15) calendar days after award.
- B. Deviations may be considered when a product becomes unavailable through no fault of the Contractor.
- C. The Contractor shall document each request with complete data substantiating compliance of proposed deviation with the Contract documents. *Request for deviation shall not be submitted on a Request for Information (RFI) form.*
- D. A request constitutes a representation that the Contractor:
 1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
 2. Will provide the same warranty for deviation as for specified product.
 3. Will coordinate installation and make changes to other work which may be required for the work to be completed at no additional cost to the Government.
 4. Waives claims for additional costs or time extension which may subsequently become apparent.
 5. Will reimburse the Government for review or redesign services associated with re-approval by the COR and Contracting Officer.
- E. If the deviation has a lesser value than the product originally specified, the Contractor shall provide a credit to the Government.
- F. Deviations will not be considered when they are indicated or implied on Shop Drawings or Product Data submittals, without a separate written

request, or when acceptance will require revisions to the Contract documents.

3.2 Deviation submittal procedures:

- A. The Contractor shall mark the “Deviation” block on the Contract Item Acceptance Request (CIAR) form and provide the information stated in Paragraph 3.1 above.
 - B. The Contractor shall submit shop drawings, product data, and certified test results attesting to proposed product equivalence. Burden of proof is on the Contractor.
 - C. The COR and Contracting Officer will then review the “deviation” request and either accept or reject the deviation. The COR and Contracting Officer’s acceptance of the deviation signifies that the Contractor has provided the information required in Paragraph 3.1. If a credit is due the government, the Contracting Officer will notify the Contract Specialist and the deviation will be processed utilizing the Change Request procedures for a modification to the contract/task order.
 - D. The COR and Contracting Officer will notify the Contractor of acceptance/rejection of the deviation via an accepted or rejected CIAR. The Contracting Officer will notify the Contractor, in writing, if a modification to the contract is required.
 - E. If a request for deviation is received without the documentation stated above, the COR and Contracting Officer will return the submittal to the contractor for the required information.
4. ACCEPTANCE: Submittals will be stamped "Accepted, "Accepted with Comment", or "Resubmit". Accepted, Accepted with Comment or Resubmit for each item will be indicated on the Contract Item Acceptance Request form and one copy returned to the Contractor.
- 4.1 **Prompt re-submittal of items is required.** The Contractor shall furnish a new Contract Item Acceptance Request numbered in accordance with the requirements of paragraph 2.1.
 - 4.2 The actions taken by the Coast Guard are only for general conformity to the contract drawings and specifications and shall not relieve the Contractor from responsibility for error in dimensions and compliance with all terms stipulated by contract.
5. DEFECTIVE WORK: Approval of Submittals does not restrict the Government's right to reject departures from contract requirements, use of damaged or improperly installed items/materials, or latent defects, nor does it prejudice the Government's rights of rejecting any work found defective at Final Inspection and Acceptance.

- 5.1 Work started or completed prior to submittal acceptance is **solely** at Contractor's risk and may jeopardize contract performance.
6. TYPES OF SUBMITTALS: The paragraphs given below provide descriptions for each type of submittal that may be required within the individual sections of this specification. Refer to the Individual Sections themselves and the List of Submittals document for the required submittals.
- 6.1 Product Data: Submit pursuant to this section for review for conformance with contract.
- A. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
 - B. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- 6.2 Shop Drawings: Submit pursuant to this section for review for conformance with contract.
- A. Shop drawing submittals shall be drawings, diagrams, schedules and other data specially prepared for the work of this contract by the contractor or any subcontractor, manufacturer, supplier or distributor to illustrate a portion of work to be installed under this contract.
 - B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
 - C. When required by individual specification sections, provide shop drawings signed and sealed by professional engineer responsible for designing components shown on shop drawings.
 - 1. Include signed and sealed calculations to support design.
 - 2. Submit drawings and calculations in form suitable for submission to and approval by authorities having jurisdiction.
 - 3. Make revisions and provide additional information when required by authorities having jurisdiction.
- 6.3 Samples: Submit pursuant to this section for review for conformance with contract.
- A. Samples For Selection as Specified in Product Sections:
 - 1. Submit to Contracting Officer's Representative for aesthetic, color, or finish selection.
 - 2. Submit samples of finishes from full range of manufacturers' standard colors, textures, and patterns.

- B. Submit samples to illustrate functional and aesthetic characteristics of Products, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
 - C. Include identification on each sample, with full Project information.
 - D. Submit number of samples specified in individual specification sections.
 - E. Reviewed samples which may be used in the Work are indicated in individual specification sections.
 - F. Samples will not be used for testing purposes unless specifically stated in specification section.
- 6.4 Design Data: Submit pursuant to this section for review for conformance with contract.
- A. Submit for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.
- 6.5 Test Reports: Submit pursuant to this section for review for conformance with contract.
- A. Submit test reports for information for limited purpose of assessing conformance with information given and design concept expressed in Contract Documents.
 - B. The testing shall have been performed in a laboratory meeting the requirements specified herein. The tests shall have been performed within three years of submittal of the reports for approval. Test reports shall be accompanied by the certificates from the manufacturer certifying that the material and equipment proposed to be supplied is of the same type, quality, manufacture, and make as tested.
- 6.6 Certifications: Manufacturer's certification furnished by the Contractor on items of materials and equipment incorporated into the work will be accepted only when this method will assure full compliance with the provisions of the contract. Pre-printed certificates will not be acceptable. All certifications shall be in the original. The original of all manufacturers' certifications shall name the appropriate item of equipment or material, specification, standard, or other document specified as controlling the quality of that item and shall have attached thereto certified copies of test data upon which the certifications are based. All certificates shall be signed by the manufacturer's official authorized to sign certificates of conformance or compliance.
- A. When specified in individual specification sections, submit certification.

- B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- 6.7 Laboratory Reports: Reports shall cite the contract requirements, the test or analysis procedures used, the actual test results, and include a statement that the item tested or analyzed conforms or fails to conform to the specification requirements. Each report shall be conspicuously stamped on the cover sheet in large red letters "CONFORMS" or "DOES NOT CONFORM" to the specification requirements as the case may be. All test reports shall be signed by a representative of the testing laboratory authorized to sign certified test reports. The Contractor shall arrange for immediate and direct delivery of the signed original of all reports, certifications, and other documentation.
- 6.8 Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing.
- A. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.
- 6.9 Manufacturer's Field Reports: When specified in the individual specification sections, submit Manufacturer's Field Reports on tests conducted by manufacturers. Reports shall cite the contract requirements, the test or analysis procedures used, the actual test results, and include a statement that the item tested or analyzed conforms or fails to conform to the specification requirements. Each report shall be conspicuously stamped on the cover sheet in large red letters "CONFORMS" or "DOES NOT CONFORM" to the specification requirements as the case may be. All test reports shall be signed by a representative of the testing laboratory authorized to sign certified test reports. The Contractor shall arrange for immediate and direct delivery of the signed original of all reports, certifications, and other documentation.
- 6.10 Manufacturer and Installer Qualifications: When specified in the individual specification sections, submit qualifications of the manufacturers or installers as required. Qualifications shall include a list of projects of similar nature and a list of five references, minimum, with all contact information. Additional references may be required upon request.

- 6.11 Manufacturer's Inspection Reports: When specified in the individual specification section, submit Manufacturer's Inspections Reports prepared by the Manufacturer's Field Representative. Reports shall cite name and contact information of inspector, date of inspection, time on and off the site, weather conditions at time of inspection, contractors on site, number of workmen, equipment, improvements installed, overall quality of work, deficiencies and other concerns, recommended corrective actions and any other information required by the manufacturer.

SECTION 01 35 29
SAFETY PROGRAM

1. GENERAL: The Contractor is wholly responsible for work site safety. The Contractor shall implement a safety program that protects the lives and health of personnel in the construction area, prevents damage to property, and avoids work interruptions. The Contractor shall provide appropriate safety barricades, signs, signal lights, etc. (see Section 01 56 00, "Lights, Signs & Barricades") as well as complying with the requirements of all applicable Federal, State and Local safety laws, rules and regulations.
2. COMPLIANCE: The Contractor is specifically required to comply with the requirements of the U. S. Army Corps of Engineers "Safety and Health Requirements Manual" (EM 385-1-1, latest version available) and the "Accident Prevention" clause (FAR 52.236-13). Once accepted, this safety plan shall become part of the contract requirements. Note: This review/acceptance does not in any way relinquish the Contractor from responsibility for work site safety nor the obligation to comply with the OSHA regulations found in 29 CFR 1910 & 1926 or any other State or Local safety law, rule or regulation applicable to the contract work. The Coast Guard will cooperate fully with the Department of Labor (Occupational Safety and Health Administration) in their enforcement of OSHA regulations.
3. SAFETY PLAN: The Contractor shall submit a written safety plan. At a minimum, this plan shall describe the Contractor's general safety program and identify specific safety provisions for hazards incidental to the contract work; e.g., elevated working surfaces, working over water, working from floating work platforms, overhead crane operations, etc.

SECTION 01 51 00
TEMPORARY UTILITIES

1. GENERAL: All temporary utility connections shall be compatible with existing materials and equipment to provide safe and efficient installation, operation and removal.
2. ELECTRICITY: The Contractor may utilize electrical power from the nearest electrical receptacle or panelboard, subject to availability. OSHA requirements will

govern the use of such utility. All equipment used shall be supplied by the Contractor. US Coast Guard does not make any guarantee against any voltage variation or service interruption.

- 2.1 Utility Outages and Shutdown: Needed power outages shall be arranged only with prior approval from Contracting Officer's Representative (COR), with duration and affected areas held to a minimum.
3. TELEPHONE: Telephone services will not be available for use by the Contractor.
4. WATER HOOKUP: Water will be made available at the nearest hydrant or exterior hose bib. All connections to the water system shall be equipped with back flow protection. Temporary potable water pipes and hoses shall be sterilized before being placed in operation and every time the system is opened to the atmosphere for repair or relocation.
5. SANITARY FACILITIES: It shall be the Contractor's responsibility to furnish and maintain approved portable toilet facilities for all Contractor personnel. The On-Site Representative will designate the physical location for the facility and the Contractor shall maintain the toilet facility to the satisfaction of the Government. Contractor personnel are forbidden to use toilet facilities within existing buildings.

SECTION 01 51 13 EQUIPMENT/UTILITY LOCKOUT AND TAGOUT REQUIREMENTS

1. GENERAL: The Contractor shall comply with OSHA 29 CFR 1910.147, "The Control of Hazardous Energy" (Lockout/Tagout). The Contractor shall provide a Lockout/Tagout Plan to the Contracting Officer prior to starting any work affected by the energy in the equipment/utility system.
2. APPLICATION: The Contractor shall be responsible for locking out and tagging out of service, all equipment/utility systems involved in the work under this contract. After the Contracting Officer's Representative has approved an outage, Government personnel and the Contractor shall independently secure the equipment/utility system and tag the respective system out of service. The Contractor shall provide their own locks and chains that are required to secure the equipment/utility systems; e.g., steam, water, air, and/or electricity.

SECTION 01 51 16 TEMPORARY FIRE PROTECTION

1. TEMPORARY FIRE PROTECTION: Install and maintain temporary fire-protection facilities to protect against predictable and controllable fire loss. Comply with NFPA 10 "Standard for Portable Fire Extinguishers" and NFPA 241 "Standard for Safeguarding Construction, Alterations and Demolition Operations".

1.1 HOT WORK PERMIT

- A. Prior to performing "Hot Work" (welding, burning, lead melting, blowtorches, tar pots, etc.) or operating other flame-producing devices, the contractor shall request a Hot Work permit. This permit will be issued by the Training Center Fire Department through the Contracting Officer's Representative (COR). This permit will be issued only after job site inspection by a member of the Fire Department for a specific task.
 - 1. All Hot Work will be shut down 30 minutes before the end of work and a fire watch shall be kept at the scene of operation during this 30 minutes.
 - 2. Extinguishers and Fire Watch Personnel: The contractor shall furnish, in accordance with all applicable requirements of the NFPA (National Fire Protection Association) Standards, sufficient fire extinguishers and fire watch personnel to protect the area in which his work is being performed. The size and type of fire extinguisher used will be subject to review by the Training Center Fire Department through the COR.

1.2 BURNING

- A. The burning of trash or other waste material shall be prohibited.

1.3 HEATING

- A. All sources of temporary heat shall carry an "Underwriters Laboratory" label and portable heaters shall be located to avoid ignition of combustible materials.
- B. Electrical heaters shall not be connected to extension cords.
- C. Open drumfires are prohibited.

1.4 ELECTRICAL

- A. All portable electric devices (saws, sanders, compressors, lights, extension cords) not required to be left on shall be disconnected at the close of work each day.
- B. All wires plugged into electrical outlets shall be equipped with male plugs. The inserting of the bare ends of wires into outlets is prohibited.

1.5 FLAMMABLES

- A. Oil painting materials (paint, brushes, empty paint cans, rags, paint clothes, drop cloths, etc.) and flammable liquids shall be removed from the building at the close of work each day.

- B. Highly flammable liquids such as paints, thinner, etc. that are to be kept inside buildings shall be held to an absolute minimum except in buildings authorized and designed for such storage.
- C. Storage of gasoline in excess of (5) gallon containers shall be permitted only by specific approval from the Training Center Fire Chief through the Contracting Officer's Representative.
- D. All storage areas containing flammable liquids shall be marked with signs indicating "FLAMMABLES" and "NO SMOKING".

1.6 FIRE HYDRANTS

- A. Fire hydrants shall not be used without approval of the Training Center Fire Department through the Contracting Officer's Representative. Where permission is granted for the use of fire hydrants, the contractor shall be required to furnish a gate valve and backflow preventer to fit the 2 1/2-inch outlets.
- B. The Training Center Fire Department through the Contracting Officer's Representative will have control of the opening and closing of fire hydrants.
- C. A clear space of 15 feet on both sides of fire hydrants shall be maintained at all times.

1.7 EXISTING FIRE DEVICES

- A. Fire hose or extinguishers in existing buildings shall not be removed from their locations, unless specifically indicated to be relocated or removed by the plans and specification for the project. No fire hose or extinguishers shall be used for any purpose other than combating a fire.

1.8 SMOKING:

- A. Smoking is strictly prohibited in all Government buildings. Smoking is only permitted in designated smoking areas. There shall be NO SMOKING or unsupervised open flame permitted inside any structure, temporary or permanent; nor within 25 feet of combustible material or within 50 feet of flammable liquids or compressed gasses.

1.9 FIRE REPORTING

- A. All contractors providing office space or trailers with telephone service shall place or post the fire reporting phone number by the phone. All contractor personnel shall be instructed how to report a fire. Any fire, no matter how small, shall be reported, including those already extinguished, to the Training Center Fire Department immediately. If a Training Center

telephone is used, dial extension 6333. If any other telephone is used, dial 911.

SECTION 01 52 13
FIELD OFFICES

1. OFFICE AND STORAGE SHED: A field office for the COR is not required. The Contractor shall provide his own office and storage shed or trailer, if necessary. No equipment or material storage will be provided by the Coast Guard. Locations of the office and sheds shall be provided by the COR at the Pre-Construction meeting.

SECTION 01 55 00
ACCESS ROADS AND PARKING

1. ACCESS: Access to the site is available from public roads. Any damage to these roads by the Contractor's vehicles shall be repaired without cost to the Government.
2. PARKING: Vehicular operations and parking shall comply with all applicable government orders and regulations. All driveways and entrances serving the Government shall be kept clear and available to emergency vehicles at all times.
3. VEHICLE AND VEHICLE OPERATION: All vehicles, owned by the Contractor or employees of the Contractor, and operators of these vehicles, shall meet all state regulations for safety, noise, loading and minimum liability insurance. All vehicle operators demonstrating reckless or careless operation in the opinion of the Government shall not be allowed to operate vehicles on government property for the duration of the contract.
4. VISITORS: No visiting vehicles will be permitted on government property unless the operator is employed by a subcontractor or supplier.

SECTION 01 55 29
STAGING AREAS AND ACCESS

1. LOCATION: The Contractor shall store materials and operate equipment within the confines of the staging area identified by the Government. Storage of materials outside of the staging area will not be permitted. A lay down and parking area for Contractor's vehicles, trailers and personnel will be designated by the Contracting Officer's Representative at the Pre-construction meeting.
2. COORDINATION: Obey all U.S. Coast Guard Parking Signs and traffic rules. Vehicles shall not travel or park on grass. If travel or parking on grass is necessary, grass shall be restored to original condition after completion of the project at no cost to the Government.

3. ADJACENT AREAS: The Contractor shall ensure that all land and vegetation adjacent to the staging area and access drive remain undisturbed and undamaged; all damages shall be repaired at no cost to the Government.

SECTION 01 56 00
LIGHTS, SIGNS & BARRICADES

1. GENERAL: The contractor shall provide and maintain all warning lights, sign, and barriers to insure the safety of pedestrians or vehicles traveling near or through any hazardous area caused by the execution of the Contract work.

1.1 TRAFFIC REGULATION

A. Traffic Control Signs and Devices:

1. Post Mounted and Wall Mounted Traffic Control and Informational Signs: Shall comply with the Manual on Uniform Traffic Control Devices, latest edition.
2. Traffic Cones and Drums, Flares and Lights: Shall comply with the Manual on Uniform Traffic Control Devices, latest edition.
3. Provide signs at approaches to site and on site, at crossroads, detours, parking areas, and elsewhere as needed to direct construction and affected public traffic.
4. Relocate as Work progresses, to maintain effective traffic control.

B. Removal:

1. Remove equipment and devices when no longer required.
2. Repair damage caused by installation.

- 1.2 BARRICADES: Any stored debris, equipment and all areas dangerous to foot or vehicular traffic shall be barricaded by the Contractor. At night and during other times of poor visibility, barricades shall be illuminated. All barricading, including night illumination shall be maintained by the Contractor. All barricades shall be constructed in accordance with ANSI D6-1.

- 1.3 PEDESTRIAN TRAFFIC: The Contractor shall arrange his equipment and/or progression of work, so as not to interfere with the normal flow of pedestrian traffic. Where interference is unavoidable, the contractor shall provide a marked, safe, and clean route around the obstruction

1.4 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas to protect existing facilities and adjacent properties from damage from construction operations and demolition.
- B. Provide protection for plants designated to remain. Replace damaged plants.

- C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

SECTION 01 65 00
RECOVERED MATERIALS NOTICE

1. GENERAL: It is the intent of Training Center Cape May to comply with the requirements of Section 6002 of the Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act (RCRA or the Act) as amended, 42 U.S.C. 6962 and Executive Order 12873 as they apply to the procurement of the materials designated in paragraph 2.
2. DESIGNATED RECOVERED MATERIALS: It is the purpose of this section to designate items that are or can be made with recovered materials. These designated items can be found at <https://www.epa.gov/smm/comprehensive-procurement-guideline-cpg-program#products>.
3. CONTRACTOR RESPONSIBILITY: The contractor should provide recycled materials to the extent practical, provided the materials meet all other requirements of the applicable specification section.

SECTION 01 66 13
HAZARDOUS WASTE

1. GENERAL: The Contractor shall comply with all federal, state, and local environmental regulations dealing with the generation, management, storage, and disposal of solid, toxic, and hazardous wastes. The Contractor shall ensure that all wastes are properly containerized, labeled and placarded, managed, tested, stored, documented/manifested, transported and disposed of in accordance with all applicable regulations. The manifest for all hazardous waste shall be signed by an authorized Coast Guard representative.
2. RECYCLABLES: Recycling is a mandatory law of the State of New Jersey.
 - A. At the discretion of the COR, certain items of copper (including insulated cable), aluminum and steel shall remain the property of the Training Center. The Contractor shall separate and deliver these materials to a location at the Training Center designated by the COR. The Contractor shall place these materials in their respective bins or dumpsters.
 - B. The contractor shall recycle or reuse all other material designated as recyclable or prohibited from landfilling. Definitions for recyclables and landfill prohibited material can be obtained from the CMCMUA regulations.
3. SUBMITTALS: The Contractor shall provide the Contracting Officer with signed

and fully executed originals of all hazardous waste profiles, test results, hazardous waste manifests and/or other shipping papers, electric lamp disposal documents and all other required documentation. Maximum payment retention shall be withheld until this documentation is received.

SECTION 01 66 16
SAFETY DATA SHEETS AND MATERIAL HANDLING PROCEDURES

1. DATA SHEETS: Submit a Safety Data Sheet (SDS) for all materials containing hazardous substances required for contract execution. Information provided in SDS's shall meet the requirements of 29 CFR 1910.1200. SDS's require Contracting Officer review and acceptance prior to bringing these materials on site.
2. MATERIAL STORAGE: Limit the quantity of these materials stored on site to the amount needed for execution of work. Storage of excess materials will not be permitted. Assure that the storage of these materials comply with all applicable federal, state, and local laws and regulations and provide additional storage facilities (paint lockers, etc.) as required for the storage of such materials. Coordinate the physical location of storage areas with the On-site Representative prior to bringing these materials on site.
3. PROTECTIVE MEASURES: The contractor shall take all protective measures outlined on the SDS's and as required by federal, state, and local regulations to protect all personnel in the vicinity of the work area from exposure to these materials. The Contractor shall include any required protective measures in the Safety Plan (See Section 01 35 29, "Safety Program"). The Contracting Officer's Representative shall review protective measures prior to allowing use of these materials.
4. DISPOSAL OF EXCESS MATERIAL: The Contractor shall dispose of all excess hazardous materials as required by the SDS and all applicable federal, state, and local laws and regulations.

SECTION 01 71 33
PROTECTION FROM WEATHER AND CONSTRUCTION OPERATIONS

1. TEMPORARY ENCLOSURES: Protect existing facilities/equipment and new construction, whether in progress or newly completed, from the adverse effects of the weather and construction operations. Provide temporary enclosures, coverings and barriers as required to afford protection against exposure, weather and wind damage and from construction operations which could degrade, stain, age, or reduce the finished quality of new work or damage existing facilities and equipment.
2. CONTRACTOR'S STAGING AND STOCKPILING: The Contractor is responsible for the protection and use of materials for the project inside or outside the facility, including his dumpster and spot a pot used on site. Should the USCG notify the Contractor of a weather emergency such as an impending Hurricane, the Contractor

will need to tie-down or move these temporary facilities to higher ground. Hurricane season is from June 1 - November 30.

3. REAPPLICATION: All temporary closures or enclosures shall be made ready for immediate re-application in the event of sudden storms or man-made conditions requiring protection of existing facilities or completed construction.
4. CLIMATE CONTROL: Where temporary heat is required during construction to protect work completed or to heat facilities in operation by the Coast Guard, all openings shall be made weather tight to allow the maintenance of 68 degrees F heat minimum with the existing or temporary heating equipment or 78 degrees F. maximum with existing or temporary cooling. NOTE TO OFFEROR: CLIMATE CONTROL SPECIFICALLY REQUIRED BY THIS CONTRACT WILL BE SPECIFIED IN THE STATEMENT OF WORK AND/OR ASSOCIATED DRAWINGS.
5. PIPING: Prevent water-filled pipes or tanks from freezing for both interior and exterior systems installed or in storage.

SECTION 01 74 00
GENERAL CLEANUP & SITE RESTORATION OF WORK AREAS

1. GENERAL: The Contractor shall remove and properly dispose of all trash and debris incidental to the contract work from the limits of government property, as well as all adjacent affected areas. The Contracting Officer shall determine the extent and interval of these cleanups.
2. WORK AREA CLEANUP: At the end of each day the entire work area and all adjacent affected areas shall be thoroughly cleaned by removing all trash, debris, dust, etc. caused by the contract work. Any floor, wall or ceiling surfaces that may have been stained or soiled by the contract work shall be restored to pre-construction condition.
3. SITE RESTORATION: If at any time while performing the contract the Contractor causes damage or destruction to any portion of any Government facility or grounds; e.g., bulkheads, pavement, lawns, shrubbery, etc., it shall be the Contractor's responsibility to replace and/or restore the damage as approved by the Contracting Officer's Representative at no additional cost to the Government.
4. POST CONSTRUCTION CLEANUP: Upon completion of the job, the Contractor shall clean up the job site, returning it to a state of cleanliness equal to or exceeding that in which it was found. The Contractor shall properly dispose of any trash, extra materials, dirt, debris, or other litter that remains. If the job site appearance is not to the satisfaction of the Contracting Officer's Representative, final acceptance will not be approved.

SECTION 01 78 00
AS BUILT DRAWINGS

1. GENERAL: Maintain one full size set of contract drawings to record variations from the original design. **All deviations shall be neatly and clearly marked in RED** on these drawings to show work and/or materials actually provided. As Built drawings shall be **updated** as work progresses and kept at the work site for the duration of the contract. These drawings shall be available for Contracting Officer Representative review upon request.
2. DISCOVERED UTILITIES: Indicate the exact location and depth of any **underground utility lines discovered in the course of the work** on the As-Built drawings.
3. PERMITTED VARIATIONS: As Built drawings shall reflect the actual construction and materials provided when alternative materials or work methods are allowed in the specifications and/or drawings or if the scope is altered by award of bid items, subsequent changes or modifications.
4. STANDARDS: Variations shown on As Built drawings shall be neat, clear and conform with standard drafting practices. Mark-ups shall include supplementary notes, legends, and details necessary to convey the exact representation of construction actually provided. As Built drawings shall be clearly labeled "AS-BUILT" and dated.
5. SUBMITTAL: Submit one ".pdf" digital copy and one ANSI D sized (22"x34") paper copy of the As Built drawings for Contracting Officer and COR acceptance upon completion of the contract. **Final payment will not be until all required As-Built drawings are accepted.** Maximum retention shall be withheld for late or incomplete As Built drawings.

SECTION 01 78 23
OPERATING INSTRUCTIONS AND TRAINING

1. MANUALS: Upon completion of the work, but before the work is accepted by the Government, the Contractor must forward one (1) .pdf file and one (1) complete bound set of instructions, tabbed and identified for reference, for all equipment and/or systems provided under this contract. The instructions shall include component parts, manufacturer's certificates, warranty slips, parts lists, descriptive brochures, and manufacturer's maintenance and operating instructions as indicated below.
 - 1.1 Submit data bound in 8-1/2 x 11 inch (A4) text pages, three D side ring binders with durable plastic covers.
 - 1.2 Prepare binder cover with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project, and subject matter of binder when multiple binders are required.

- 1.3 Internally subdivide binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.
 - 1.4 Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
 - 1.5 Contents: Prepare Table of Contents for each volume, with each product or system description identified, typed on white paper, in three parts as follows:
 - A. Part 1: Directory, listing names, addresses, and telephone numbers of Contracting Officer's Representative, Contractor, Subcontractors, and major equipment suppliers.
 - B. Part 2: Operation and maintenance instructions arranged by process flow and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
 1. Significant design criteria.
 2. List of equipment.
 3. Parts list for each component.
 4. Operating instructions.
 5. Maintenance instructions for equipment and systems.
 6. Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
 - C. Part 3: Project documents and certificates, including the following:
 1. Shop drawings and product data.
 2. Air and water balance reports.
 3. Certificates.
 4. Photocopies of warranties
2. TRAINING: When requested by the COR, the Contractor shall provide up to two hours of training, which shall explain to the Government's personnel all procedures necessary to operate and maintain all equipment and systems on a continuing basis.

SECTION 01 80 00
FACILITY PREVENTATIVE MAINTENANCE PROGRAM (FPMP)

1. GENERAL: The intent of this section is for the Contractor to complete the Equipment Enrollment Form (EEF) spreadsheet for systems that have been installed or demolished under this project and are listed in the USCG Approved Equipment Enrollment Catalog. Both the USCG Approved Equipment Enrollment Catalog and Equipment Enrollment Form (EEF) are provided as Reference Documents in the solicitation.
 - 1.1 At a minimum, the following items require UNIFORMAT II Level 4 designations if

the components are used in the contract.

- A. Plumbing Systems//
 - B. HVAC Systems//
 - C. Electrical Systems//
 - D. Fire Alarm Systems//
 - E. Fire Suppression Systems//
 - F. Water Systems//
 - G. Compressed Air and Piping Systems//
 - H. Carpet Care, Flooring and Cleaning//
 - I. Battery Systems//
 - J. Any machinery or equipment installed as part of this contract//
2. REFERENCES: The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.
- 2.1 ASTM E 1557: Standard Classification for Building Elements and Related Sitework – UNIFORMAT II
3. SUBMITTALS: Submit hard copy prints and electronic MS-Excel files of Equipment Enrollment Form (EEF) for Contracting Officer acceptance upon completion of the contract for each Real Property asset that has equipment to be enrolled as part of the FPMP.
- 3.1 Equipment Enrollment Form (EEF) Requirements:
- A. Form Fields: The following fields are listed on the form and shall be completely filled out except where otherwise noted on the Equipment Enrollment Form. The actual equipment attribute list below may change slightly prior to the actual start of this enrollment task.
 - 1. UNIFORMAT II Level IV Classification
 - 2. Component Type (Assigned from USCG Approved Equipment Enrollment Catalog (column D))
 - 3. Physical Location, broken down by Floor, and Room #.
 - 4. Manufacturer Name
 - 5. Model Number
 - 6. Serial #
 - 7. Installation Date

8. Purchase Price (Cost of equipment, labor, shipping)
 9. Replacement Costs (Cost of equipment only)
 10. Warranty Expiration Date
 11. Equipment Attributes (Name Plate information typically indicating Size, Flow, Volume, Pressure, etc.)
- B. Only equipment from a single building and/or structure is allowed per Equipment Enrollment Form (EEF).
- C. Equipment identified for maintenance by O&M manuals but not listed in the USCG Approved Equipment Enrollment Catalog shall also be cataloged per ASTM E 1557 and listed on the Equipment Enrollment Form. If the equipment is not listed in ASTM E1557, consult the Coast Guard for the proper naming convention

LIST OF SUBMITTALS

SECT.	PAR.	ITEM	STATUS	COMMENTS
01 14 14	1	Pre-Con Site Condition Photographs		
01 32 16	1.1	Construction Schedule		
	1.2	Schedule of Values		
	2.1	Progress Schedule		
01 35 29	3	Safety Plan		
01 51 13	1	Lockout/Tagout Plan		
01 66 16	1	Safety Data Sheet		
	3	Protective Measures		
01 78 00	5	As-Built Drawings		
01 78 23	1	Operating Instructions		
01 80 00	3	Equipment Enrollment Form(s)		
05 52 00	2.1	Tie-Off Point, Product Data		
		Tie-Off Point, Shop Drawing		
		Tie-Off Point, Manufacturer Instructions		
06 10 05	2.1	Rough Lumber, Product Data		
	2.2	Fasteners, Product Data		
07 22 00	2.1	Insulation, Product Data		
		Insulation, Shop Drawings		
	2.2	Cover Board, Product Data		
	2.3	Fasteners, Product Data		
07 53 10	1.5.A	Installer, Qualifications		
	1.5.B	Wind Uplift Resistance, Design Data		
	1.9	Roof System, Warranty		
	2.1.B	EPDM Sheet, Product Data		
		EPDM Sheet, Manufacturer Instructions		
	2.1.C	Accessories, Product Data		
07 60 00	2.1	Flashing & Sheet Metal, Product Data		
		Flashing & Sheet Metal, Shop Drawings		
07 71 23	2.1	Gutters & Downspouts, Product Data		
	2.3	Accessories, Product Data		
07 92 00	2.1	Sealant, Product Data		
		Sealant, Manufacturer Instructions		
	2.2	Accessories, Product Data		
23 05 29	1.4	Product Data		
23 07 00	1.3	Product Data		
		Manufacturer Instructions		
		Manufacturer Certificate		
	1.7	Warranty		

Status Abbreviation Guide: AC-Accepted; AC w/CMT-Accepted with Comment; R-Resubmit; NA-Not Applicable

LIST OF SUBMITTALS, CONTINUED

SECT.	PAR.	ITEM	STATUS	COMMENTS
23 30 00	1.2	Shop Drawings		
		Product Data		
		O & M Manuals		
		Manufacturer Instructions		
23 62 13	1.5	Product Data		
		Shop Drawings		
		O & M Manuals		
		Manufacturer Instructions		
	1.7	Warranty		
26 05 19	2.1	Building Wire, Product Data		
26 05 29	2.1	Conduit Supports, Product Data		
	2.2	Firestopping, Product Data		
26 05 33	2.1	Electrical Metallic Tubing, Product Data		
	2.2	Liquidtight Flexible Metal Conduit, Product Data		
26 05 53	2.1	Fire Alarm Raceway Marking, Product Data		
26 24 16	2.1	Circuit Breakers, Product Data		
32 92 27	2.1	Grass Seed, Product Data		
	2.2	Top Soil, Product Data		

Status Abbreviation Guide: AC-Accepted; AC w/CMT-Accepted with Comment; R-Resubmit; NA-Not Applicable

DHS-USCG TRAINING CENTER CAPE MAY, NJ		CONTRACT ITEM ACCEPTANCE REQUEST		
Contract Number		Submittal Number	Submittal New Re-submittal	Date
Project Number			CONTRACTOR MARK IF DEVIATION FROM SPECIFICATIONS	FOR GOVERNMENT USE ONLY
Item No.	Specification Sect. & Para.	DESCRIPTION OF MATERIAL (Include Type, Model No., Catalog No., Mfg., etc.)	Deviation	Status
Contractor		By: (Signature and Date)		
Request as indicated above was received in this office on _____				
Recommend Acceptance or Resubmit as indicated above and subject to any applicable comments.				
Name and Grade		Signature		Date
Acceptance or Resubmit as indicated above and subject to any applicable comments.				
Name and Grade		Signature		Date

Status Abbreviation Guide: AC-Accepted; AC w/CMT-Accepted with Comment; R-Resubmit

DIVISION 05 – METALS
SECTION 05 52 00
FALL PROTECTION SYSTEM

PART 1 GENERAL

1.1 SUMMARY

- A. This section includes metal fall arrest tie-off points.
- B. Related Sections:
 - 1. Section 06 10 05 – Rough Carpentry for EPDM Roofing

1.2 REFERENCES

- A. ANZI
 - 1. ANZI Z359.1 – Safety Requirements for Personal Fall Arrest Systems, Subsystems, and Components.
- B. ASTM International
 - 1. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
 - 2. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- C. OSHA
 - 1. OSHA 1926.502 – Safety and Health Regulations for Construction – Fall Protection.

1.3 SUBMITTALS

- A. Refer to Section 01 33 00 - Submittal Procedures for overall submittal procedures and specific requirements associated with each type of submittal listed below.
- B. Types of submittals required for this Section:
 - 1. Product Data
 - 2. Shop Drawing
 - 3. Manufacturer’s Installation Instructions
- C. Refer to the List of Submittals document at the end of Division I for a detailed list of every submittal required for the products and workmanship covered under this Section.

1.4 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 TIE-OFF(ANCHOR) POINTS:

- A. Product Description: Single location, fall arrest, tie-off point with base plate and round post
 - 1. Base Plate: 12"x12"x0.5" (minimum) steel.
 - 2. Post: 2.5" Schedule 80 steel pipe welded to base plate.
 - a. Height: 18"
 - 3. Loop: 0.625" diameter steel tie-off loop on top of post.
 - 4. Finish: Galvanized, hot dipped.
- B. Performance Requirement: Design fall protection system in accordance with ANZI Z359.1 and OSHA 1926.502.
 - 1. Tie-Off (Anchor) Points: Designed for use by a single person with a combined weight (body plus tools) of 310 pounds, minimum.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Anchor base plate to structural roof in accordance with the manufacturer's recommendations using galvanized steel hardware.
- B. Install components plumb and level, accurately fitted, free from distortion or defects.
- C. Coordinate exact location of tie-off (anchor) points with the Contracting Officer's Representative.

END OF SECTION

DIVISION 06 – WOOD, PLASTIC AND COMPOSITES

SECTION 06 10 05 ROUGH CARPENTRY FOR EPDM ROOFING

PART 2 GENERAL

2.1 SUMMARY

- A. Section includes blocking and nailers, hardware, and anchors.
- B. Related Sections:
 - 1. Section 07 22 00 – Roof and Deck Insulation
 - 2. Section 07 53 10 – Ethylene-Propylene-Diene-Monomer Roofing
 - 3. Section 07 60 00 – Flashing and Sheet Metal

2.2 REFERENCES

- A. American Wood-Preservers' Association:
 - 1. AWPA U1 - All Timber Products - Preservative Treatment by Pressure Process.
- B. ASTM International:
 - 1. ASTM A653-Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- C. National Fire Protection Association:
 - 1. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.
- D. Northeastern Lumber Manufacturers Association:
 - 1. NELMA - Standard Grading Rules for Northeastern Lumber.
- E. Southern Pine Inspection Bureau:
 - 1. SPIB - Standard Grading Rules for Southern Pine Lumber.

2.3 SUBMITTALS

- A. Refer to Section 01 33 00 - Submittal Procedures for overall submittal procedures and specific requirements associated with each type of submittal listed below.
- B. Types of submittals required for this Section:
 - 1. Product Data

- C. Refer to the List of Submittals document at the end of Division I for a detailed list of every submittal required for the products and workmanship covered under this Section.

2.4 QUALITY ASSURANCE

- A. Perform Work in accordance with the following:
 - 1. Lumber Grading: Certified by DOC PS 20.
- B. Apply label to identify each preservative treated material.
- C. Perform Work in accordance with the International Building Code, 2006.

PART 3 PRODUCTS

3.1 LUMBER MATERIALS

- A. Lumber Grading Rules: SPIB.
- B. Non-Structural Light Framing: Kiln-dried (Southern Pine or Douglas Fir), Structural Grade No. 2 or better, 19 percent maximum moisture content, Chromated Copper Arsenate (CCA) pressure treated.
- C. Minimum size of lumber shall be 2"x4" nominal and shall exceed the width of any metal flange attached to it by a minimum of ½".

3.2 ACCESSORIES

- A. Fasteners and Anchors:
 - 1. Fasteners: Hot dipped galvanized steel for high humidity and treated wood locations.
 - 2. Nails: ASTM A653, Class G185.
 - 3. Anchors: Toggle bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry or concrete. Bolt or ballistic fastener for anchorages to steel.
 - 4. Screws: Self tapping, sheet metal screws. Hot dipped galvanized ASME B18.52.1, ASME B18.6.2, and ASME B18.6.3.
 - 5. Washers: Provide plain washers to conform to ASME B18.22M ASME B18.22.1. Provide beveled washers for American Standard beams and channels, square or rectangular, tapered in thickness, and smooth. Provide lock washers to conform to ASME B18.21.2M & ASME B18.21.1.
- B. Any fastener required by the roofing manufacturer for use in the roofing system.

PART 4 EXECUTION

4.1 FRAMING AND NAILERS

- A. Nailers shall be attached to resist a force of 200 lbs./lineal foot minimum.
- B. Set level and plumb, in correct position.
- C. Fasten framing and nailers in accordance with applicable code.
- D. Total wood nailer height must match the total thickness of insulation being used and should be installed with a 1/8" (3.2 mm) gap between each length and each change of direction. When more than one nailer thickness is used end joints should be staggered a minimum of 12" from the prior layer in straight runs.
- E. Wood nailers must be firmly fastened to the deck or building. Mechanically fasten wood nailers to resist a minimum force of 200 lb/f (890 N) in any direction. Defer to attachment requirements of the roofing system if greater than 200 lbf (890 N).
- F. The wood nailer must be tapered (if applicable) so that it will always be flush at the point of contact with the insulation.
- G. Uncoated metal and painted metal flashings, except for 300-series stainless steel must not make direct contact with treated wood nailers.
- H. Curb roof openings except where prefabricated curbs are provided. Form corners by alternating lapping side members.

END OF SECTION

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

SECTION 07 22 00 ROOF AND DECK INSULATION

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes rigid insulation and cover board.
- B. Related Sections:
 - 1. Section 06 10 05 – Rough Carpentry for EPDM Roofing
 - 2. Section 07 53 10 – Ethylene-Propylene-Diene-Monomer Roofing
 - 3. Section 07 60 00 – Flashing and Sheet Metal
 - 4. Section 07 92 00 – Sealants and Caulking

1.2 REFERENCES

- A. ASTM INTERNATIONAL
 - 1. ASTM C1289-Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation.
- B. FM Global
 - 1. FM AS4470-Approval Standards for Class 1 Roof Covers.

1.3 SUBMITTALS

- A. Refer to Section 01 33 00 - Submittal Procedures for overall submittal procedures and specific requirements associated with each type of submittal listed below.
- B. Types of submittals required for this Section:
 - 1. Product Data
 - 2. Shop Drawings, Tapered Insulation Layout
- C. Refer to the List of Submittals document at the end of Division I for a detailed list of every submittal required for the products and workmanship covered under this Section.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Delivery
 - 1. Deliver materials to site in manufacturer's unopened and undamaged standard commercial containers.
 - 2. Deliver materials in sufficient quantity to allow continuity of the work.

- B. Storage and Handling
 - 1. Store and handle materials in a manner to protect from damage, exposure to open flame or other ignition sources, and from wetting, condensation or moisture absorption. Store in a trailer that provides a dry, ventilated environment. Replace damaged material with new material.

1.5 ENVIRONMENTAL CONDITIONS

- A. Do not install roof insulation during inclement weather or when air temperature is below 40 degrees F and interior humidity is 45 percent or greater, or when there is visible ice, frost, or moisture on the roof deck.

PART 2 PRODUCTS

2.1 INSULATION

- A. General: Provide flat and tapered rigid insulation as called for on the contract drawings. Tapered insulation shall be designed to provide 1/8 inch per foot minimum slope towards roof drains.
- B. Insulation Type: Polyisocyanurate Board; ASTM C1289, Type II, Class I rigid insulation board with a fiberglass reinforced facer mat on both sides.
 - 1. Compressive Strength: 20 psi
 - 2. Density: 2 pcf
 - 3. Water Absorption: <1% by Volume
 - 4. UL 1256
 - 5. FM Class I approved
- C. Insulation Thickness:
 - 1. Building #254, Core Area, North & South Wings: Minimum of 2 inches with a Long Term Thermal Resistance (15-year time-weighted average) value of 11.4 or more.
 - 2. Building #254, Passageways: Minimum of 1 inch with a Long Term Thermal Resistance (15-year time-weighted average) value of 5.7 or more.
 - 3. Building #255: Minimum of 2 inches with a Long Term Thermal Resistance (15-year time-weighted average) value of 11.4 or more.
 - 4. Average insulation thickness will be much greater than the specified minimum due to requirement to provide tapered insulation to create slope.
- D. Recycled Content: Total recycled content of insulation shall be approximately 39%.
- E. Manufacturing Facility
 - 1. ISO 9001 registered facility.

2.2 COVER BOARD

- A. General: For use as a thermal barrier underlayment, fire barrier overlayment, or protection board for adhesively-applied roofing membrane over roof insulation.
- B. Description: High density gypsum board core with a fiberglass reinforced facer mat on both sides meeting ASTM C 1177:
 - 1. Flexural Strength: ≥ 80 lbf; ASTM C473
 - 2. Compressive Strength: 900 psi; ASTM C473
 - 3. Permeance: >23 perms; ASTM E96
 - 4. Surface Water Absorption: <2.0 grams
 - 5. Flame Spread: 0; ASTM E84
 - 6. Smoke Developed: 0; ASTM E84
 - 7. Cover Board Thickness: 1/2 Inch

2.3 FASTENERS

- A. Flush-driven through flat round or hexagonal steel or plastic plates. Steel plates shall be zinc-coated, flat round not less than 1 3/8 inch diameter or hexagonal not less than 28 gage. Plastic plates shall be high-density, molded thermoplastic with smooth top surface, reinforcing ribs and not less than 3 inches in diameter. Fastener head shall recess fully into the plastic plate after it is driven. Plates shall be formed to prevent dishing. Do not use bell-or cup-shaped plates. Fasteners shall conform to insulation manufacturer's recommendations for concrete deck, and shall be spaced to withstand an uplift pressure of 84 pounds per square foot.

2.4 WOOD NAILERS

- A. Pressure-preservative-treated as specified in Section 06 10 05 - Rough Carpentry for EPDM Roofing.

PART 3 EXECUTION

3.1 EXAMINATION AND PREPARATION

- A. Surface Inspection
 - 1. Surfaces shall be clean, smooth, and dry. Check roof deck surfaces, including surfaces sloped to roof drains and outlets, for defects before starting work.
 - 2. The Contractor shall inspect and approve the surfaces immediately before starting installation. Prior to installing insulation, perform the following:
 - a. Examine concrete decks to ensure that joints are grouted and level to provide surface for the installation of the insulation in accordance with insulation manufacturer's requirements.
- B. Surface Preparation

1. Correct defects and inaccuracies in roof deck surface to eliminate poor drainage and hollow or low spots and perform the following:
 - a. Provide wood nailers the same thickness as insulation at eaves, edges, curbs, walls, and roof openings for securing cant strips and flashing flanges. Space nailers in accordance with approved shop drawings.
 - b. Solidly apply primer to concrete deck at a rate required by roofing manufacturer.
 - c. Solidly apply adhesive to concrete deck at a rate required by roofing manufacturer.

3.2 INSULATION INSTALLATION

- A. Lay insulation so that continuous longitudinal joints are perpendicular to direction of roofing and end joints of each course are staggered with those of adjoining courses. When using multiple layers of insulation, joints of each succeeding layer shall be parallel and offset in both directions with respect to layer below a minimum of 6 inches. Keep insulation 1/2 inch clear of vertical surfaces penetrating and projecting from roof surface.
- B. Tapered Edge Strips
 1. Provide edge strips in the right angle formed by junction of roof and wood nailing strips that extend above level of roof. Provide edge strips flush against vertical surfaces of wood nailing strips. Where possible, nail edge strips to adjoining surfaces. Where installed against non-nailable materials, use an approved adhesive.

3.3 PROTECTION

- A. Protection of Applied Insulation
 1. Completely cover each day's installation of insulation with the finished roofing specified in Section 07 53 10 Ethylene-Propylene-Diene-Monomer Roofing on same day. Phased construction is not allowed. Protect open spaces between insulation and parapets or other walls and spaces at curbs, scuttles, and expansion joints, until permanent roofing and flashing are applied. Do not permit storing, walking, wheeling, or trucking directly on insulation or on roofed surfaces. Provide smooth, clean board or plank walkways, runways, and platforms near supports, to distribute weight to conform to live load limits of roof construction.
- B. Damaged Work and Materials
 1. Restore work and materials that become damaged during construction to original condition or replace with new materials.

3.4 INSPECTION

- A. The Contractor shall establish and maintain an inspection procedure to assure compliance of the installed roof insulation with the contract requirements. Any work found not to be in compliance with the contract shall be promptly removed

and replaced or corrected in an approved manner. Quality control shall include, but not be limited to, the following:

1. Observation of environmental conditions; number and skill level of insulation workers; start and end time of work.
2. Verification of compliance with manufacturer's requirements for storage and handling of insulation and vapor retarder materials before, during, and after installation.
3. Inspection of mechanical fasteners; type, number, length, and spacing.
4. Coordination with other materials, sleepers, and nailing strips.
5. Inspection of insulation joint orientation and laps between layers, joint width and bearing of edges of insulation on deck.
6. Installation of cutoffs and joining of work in compliance with manufacturer's requirements on subsequent days.
7. Continuation of complete roofing system installation to cover insulation installed same day.

END OF SECTION

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

SECTION 07 53 10 ETHYLENE-PROPYLENE-DIENE-MONOMER ROOFING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fully-Adhered Elastomeric Sheet Membrane Conventional Roofing System with roofing membrane expansion joints.
- B. Related Sections:
 - 1. Section 06 10 05 – Rough Carpentry for EPDM Roofing
 - 2. Section 07 22 00 – Roof and Deck Insulation
 - 3. Section 07 60 00 –Flashing and Sheet Metal
 - 4. Section 07 92 00 – Sealants and Caulking

1.2 SYSTEM DESCRIPTION

- A. The roofing system shall consist of a fully adhered Ethylene-Propylene-Diene-Monomer (EPDM) roof membrane applied over insulation substrate.
- B. Performance Requirements: The roof system shall conform to Underwriter’s Laboratories (UL) and FM Global (FM) requirements.

1.3 REFERENCES

- A. American National Standards Institute
 - 1. ANSI/SPRI RD-1 - Standard for Retrofit Roof Drains.
- B. American Society of Civil Engineers
 - 1. ASCE 7 – Minimum Design Loads for Buildings and Other Structures.
- C. ASTM International
 - 1. ASTM D 4637 – Standard Specification for EDPM Sheet Used In Single Ply Roof Membrane.
 - 2. ASTM E 108 – Standard Test for Fire Tests of Roof Coverings.
 - 3. ASTM E 408 – Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.
 - 4. ASTM E 1980 – Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low Sloped Surfaces.
- D. FM Global
 - 1. FM AS 4470 – Approval Standard for Class 1 Roof Covers.

2. FM P 7825 – Approval Guide.
- E. Underwriters Laboratories
1. UL 790 – Standard Test Methods for Fire Test of Roof Coverings.
 2. UL RMSD – Roof Materials and Systems.

1.4 SUBMITTALS

- A. Refer to Section 01 33 00 - Submittal Procedures for overall submittal procedures and specific requirements associated with each type of submittal listed below.
- B. Types of submittals required for this Section:
1. Installer Qualifications
 2. Design Data
 3. Product Data
 4. Manufacturer Instructions
 5. Warranty
- C. Refer to the List of Submittals document at the end of Division I for a detailed list of every submittal required for the products and workmanship covered under this Section.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Roofing system installer shall be approved, authorized, or licensed, in writing, by the roof membrane manufacturer and shall have a minimum of three years experience as an approved, authorized, or licensed applicator with that manufacturer. Installer shall be approved at a level capable of providing the specified warranty.
- B. Wind Uplift Resistance:
1. Complete roof covering assembly, including insulation, shall be rated Class 1-180 in accordance with FM P7825 capable of withstanding an uplift pressure of 84 psf based on a design wind speed of 120 mph (3 second gust).
 2. Roof system manufacturer shall submit a letter indicating the proposed roof system will meet the wind uplift resistance requirements stated herein prior to starting construction.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials in their original, unopened containers or wrappings with labels intact and legible. Where materials are covered by a referenced specification number, the labels must bear the specification number, type, class, and shelf life expiration date where applicable. Deliver materials in sufficient quantity to allow continuity of work.

- B. Storage: Store and protect materials from damage and weather in accordance with manufacturer's printed instructions, except as specified otherwise. Keep materials clean and dry. Store and maintain adhesives, sealants, primers and other liquid materials above 60 degrees F. Insulated hot boxes or other enclosed warming devices must be required in cold weather. Mark and remove damaged materials from the site. Use pallets to support and canvas tarpaulins to completely cover material materials stored outdoors. Do not use polyethylene as a covering. Locate materials temporarily stored on the roof in approved areas, and distribute the load to stay within the live load limits of the roof construction. Remove unused materials from the roof at the end of each day's work.
- C. Handling: Prevent damage to edges and ends of roll materials. Do not install damaged materials in the work. Select and operate material handling equipment so as not to damage materials or applied roofing. Do not use materials contaminated by exposure or moisture. Remove contaminated materials from the site. When hazardous materials are involved, adhere to the special precautions of the manufacturer. Adhesives may contain petroleum distillates and may be extremely flammable; prevent personnel from breathing vapors, and do not use near sparks or open flame.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Do not install EPDM sheet roofing during high winds or inclement weather, or when there is ice, frost, moisture, or visible dampness on the substrate surface, or when condensation develops on surfaces during application. Unless recommended otherwise by the EPDM sheet manufacturer and approved by the Contracting Officer, do not install EPDM sheet when air temperature is below 40 degrees F or within 5 degrees F of the dew point. Follow manufacturer's printed instructions for installation during cold weather conditions.

1.8 SEQUENCING

- A. Coordinate the work with other trades to ensure that components which are to be secured to or stripped into the roofing system are available and that permanent flashing and counter flashing are installed as the work progresses. Ensure temporary protection measures are in place to preclude moisture intrusion or damage to installed materials. Application of roofing must immediately follow application of insulation as a continuous operation. Coordinate roofing operations with insulation work so that all roof insulation applied each day is covered with roof membrane installation the same day.

1.9 WARRANTY

- A. Provide roof system material and workmanship warranties meeting specified requirements. Provide revision or amendment to standard membrane manufacturer warranty to comply with the specified requirements.
- B. **Manufacturer Warranty:** Provide the roof membrane manufacturer's 20 year no dollar limit roof system materials and installation workmanship warranty, including flashing, insulation, and accessories necessary for a watertight roof system construction. The warranty must run directly to the Government and commence at time of Government's acceptance of the roof work. The warranty must state that:
 - 1. Warranty shall apply to the design wind speed of 120 mph (3 second gust).
 - 2. If within the warranty period the roof system, as installed for its intended use in the normal climatic and environmental conditions of the facility, becomes non-watertight, shows evidence of moisture intrusion within the assembly, splits, tears, cracks, delaminates, separates at the seams, shrinks to the point of bridging or tenting membrane at transitions, or shows evidence of excessive weathering due to defective materials or installation workmanship, the repair or replacement of the defective and damaged materials of the roof system assembly and correction of defective workmanship must be the responsibility of the roof membrane manufacturer. The roof membrane manufacturer is responsible for all costs associated with the repair or replacement work.
 - 3. When the manufacturer or his approved applicator fail to perform the repairs within 72 hours of notification, emergency temporary repairs performed by others does not void the warranty.
- C. **Continuance of Warranty:** Manufacturer shall approve any repair or replacement work that becomes necessary within the warranty period and the warranty shall continue for the remainder of the original warranty period.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Coordinate with other specification sections related to the roof work. Provide a combination of specified materials that comprise a roof system acceptable to the roof membrane manufacturer and meeting specified requirements for the service and climatic conditions of the installation. Roof system shall meet the following fire resistance rating:
 - 1. Class A in accordance with ASTM E 108, FM AS 4470, or UL 790

- B. EPDM Sheet
 - 1. Ethylene Propylene Diene Monomer (EPDM), ASTM D 4637, Type I, Class A, non-reinforced, single ply, 0.090 inch nominal thickness for fully adhered application. The minimum thickness must not be less than minus 10 percent of the specified thickness value. EPDM membrane thickness specified is exclusive of backing material on the EPDM membrane. Principal polymer used in manufacture of the membrane sheet must be greater than 95 percent EPDM. Width and length of sheet must be maximum width attainable as recommended by the manufacturer to minimize field formed seams in the field of the roof.
 - a. Tensile Strength: 1425 psi; ASTM D412
 - b. Tear Resistance: 450%; ASTM D624
 - c. Color: Black

- C. Accessories: Provide all accessories required for a complete EPDM roof system in accordance with the manufacturer recommendations. Accessories include, but are not limited to, the following:
 - 1. Seam Tape
 - 2. EPDM Lap Splice Adhesive, low VOC synthetic rubber adhesive
 - 3. Bonding Adhesive, low VOC
 - 4. EPDM Membrane Flashing
 - 5. Pre-Molded Cone Flashing

PART 3 EXECUTION

3.1 EXAMINATION

- A. Ensure that the following conditions exist prior to application of the roofing materials:
 - 1. Drains, curbs, control joints, perimeter walls, roof penetrating components, and equipment supports are in place.
 - 2. Surfaces are rigid, clean, dry, smooth, and free from cracks, holes, and sharp changes in elevation.
 - 3. Substrate is sloped at a 1/8" per foot minimum to provide positive drainage. Walls and vertical surfaces are constructed to receive counter flashing, and will permit mechanical fastening of the base flashing materials.
 - 4. Treated wood nailers are in place on non-nailable surfaces, to permit nailing of base flashing at minimum height of 8 inch above finished roofing surface.
 - 5. Pressure-preservative treated wood nailers are fastened in place at openings and intersections with vertical surfaces for securing of membrane, edging strips, attachment flanges of sheet metal, and roof fixtures.

6. Insulation boards are installed smoothly and evenly, and are not broken, cracked, or curled. There are no gaps in insulation board joints exceeding 1/4 inch in width. Insulation is being roofed over on the same day the insulation is installed.

3.2 APPLICATION

- A. Apply entire EPDM sheet utilizing fully adhered application method.
- B. Special Precautions
 1. Do not dilute coatings or sealants unless specifically recommended by the materials manufacturer's printed application instructions. Do not thin liquid materials with cleaners used for cleaning EPDM sheet.
 2. Keep liquids in airtight containers, and keep containers closed except when removing materials.
 3. Use liquid components, including adhesives, within their shelf life period. Store adhesives at 60 to 80 degrees F prior to use. Avoid excessive adhesive application and adhesive spills, as they can be destructive to some elastomeric sheets and insulations; follow adhesive manufacturer's printed application instructions. Mix and use liquid components in accordance with label directions and manufacturer's printed instructions.
 4. Provide clean, dry cloths or pads for applying membrane cleaners and cleaning of membrane
 5. Do not use heat guns or open flame to expedite drying of adhesives or primers.
 6. Require workmen and others who walk on the membrane to wear clean, soft-soled shoes to avoid damage to roofing materials.
 7. Do not use equipment with sharp edges which could puncture the EPDM sheet.
 8. Shut down air intakes and any related mechanical systems and seal open vents and air intakes when applying solvent-based materials in the area of the opening or intake. Coordinate shutdowns with the Contracting Officer's Representative.
- C. EPDM Sheet Roofing
 1. Provide a watertight roof membrane sheet free of contaminants and defects that might affect serviceability. Provide a uniform, straight, and flat edge. Unroll EPDM sheet roofing in position without stretching membrane. Inspect for holes. Remove sections of EPDM sheet roofing that are damaged. Allow sheets to relax minimum 30 minutes before seaming. Lap sheets as specified, to shed water, and as recommended by the roof membrane manufacturer's published installation instructions for the application required but not less than 3 inch in any case.

- D. Application Method
1. Fully Adhered Membrane Application
 2. Layout membrane and side lap adjoining sheets in accordance with membrane manufacturer's printed installation instructions. Allow for sufficient membrane to form membrane terminations in compliance with manufacturer's requirements. Remove dusting agents and dirt from membrane and substrate areas where bonding adhesives are to be applied. Apply specified adhesive evenly and continuously to substrate and underside of sheets at rates recommended by the roof membrane manufacturer's printed application instructions. When adhesive is spray applied, roll with a paint roller to ensure contact and coverage. Do not apply bonding adhesive to surfaces of membrane in seam or lap areas. Allow adhesive to flash off or dry to consistency prescribed by manufacturer before adhering sheets to the substrate. Roll each sheet into adhesive slowly and evenly to avoid wrinkles; broom or roll the membrane to remove air pockets and fish mouths and to ensure full, continuous bonding of sheet to substrate. Form field lap splices or seams as specified. Check all seams and ensure full lap seal. Apply lap sealant to all adhesive formed seams and all cut edges of reinforced membrane materials.
- E. Tape Seams / Lap Splices
1. Field form seams, or lap splices, with seam tape in accordance with membrane manufacturer's printed instructions and as specified. Clean and prime mating surfaces in the seam area.
- F. Adhesive Seams / Lap Splices
1. Use only field-applied adhesive formed seams where approved by the membrane manufacturer. Do not use adhesive formed seams for field of roof membrane seaming except as approved by the membrane manufacturer. Thoroughly and completely clean mating surfaces of materials throughout the lap area. Remove all dirt, dust, and contaminants and allow to dry.
- G. Perimeter Attachment
1. Adhesive bond or mechanically secure roof membrane sheet at roof perimeter in a manner to comply with wind resistance requirements and in accordance with membrane manufacturer's printed application instructions.
- H. Sacrament at Base Tie-In Conditions
1. Mechanically fasten the roof membrane at penetrations, at base of curbs and walls, and at all locations where the membrane turns and angle greater than 4 degrees (1:12). Space fasteners a maximum of 12 inch on center, except where more frequent attachment is required to meet specified wind resistance or where recommended by the roof membrane manufacturer. Flash over fasteners with a

fully adhered layer of material as recommended by the roof membrane manufacturer's printed data.

3.3 FLASHINGS

A. General

1. Provide flashings in the angles formed at walls and other vertical surfaces and where required to make the work watertight, except where metal flashings are indicated.

B. Membrane Flashing

1. Provide flashing and flashing accessories as the roof membrane is installed. Apply flashing to cleaned surfaces and as recommended by the roof membrane manufacturer and as specified.

C. Flashing at Roof Drain

1. Provide a tapered insulation sump into the drain bowl area. Avoid field seams running through or within 24 inch of roof drain, or as otherwise recommended by the roof membrane manufacturer. Do not cut back to bolt holes. Retrofit roof drains must conform to ANSI/SPRI RD-1.

3.4 SET-ON ACCESSORIES

- A. Where pipe or conduit blocking, equipment supports and similar roof accessories, are set on the membrane, adhere reinforced membrane or walk pad material, as recommended by the roof membrane manufacturer, to bottom of accessories prior to setting on roofing membrane. Specific method of installing set-on accessories must permit normal movement due to expansion, contraction, vibration, and similar occurrences without damaging roofing membrane. Do not mechanically secure set-on accessories through roofing membrane into roof deck substrate.

3.5 CLEAN UP

- A. Remove debris, scraps, containers and other rubbish and trash resulting from installation of the roofing system from job site each day.

3.6 PROTECTION OF APPLIED ROOFING

- A. At the end of the day's work and when precipitation is imminent, protect applied membrane roofing system from water intrusion.
- B. Water Cutoffs
 1. Straighten insulation line using loose-laid cut insulation sheets and seal the terminated edge of the roof membrane system in an effective manner. Remove the water cut-offs to expose the

insulation when resuming work, and remove the insulation sheets used for fill-in.

- C. Temporary Flashing for Permanent Roofing
 - 1. Provide temporary flashing at drains, curbs, walls and other penetrations and terminations of roofing sheets until permanent flashings can be applied. Remove temporary flashing before applying permanent flashing.

- D. Temporary Walkways, Runways, and Platforms
 - 1. Do not permit storing; walking, wheeling, and trucking directly on applied roofing materials. Provide temporary walkways, runways, and platforms of smooth clean boards, mats or planks to avoid damage to applied roofing materials, and to distribute weight to conform to live load limits of roof construction. Use rubber-tired equipment for roofing work.

3.7 FIELD QUALITY CONTROL

- A. Construction Monitoring
 - 1. During progress of the roof work, Contractor must make timely visual inspections to ensure compliance with specified parameters. Additionally, verify the following:
 - a. Equipment is in working order. Metering devices are accurate.
 - b. Materials are not installed in adverse weather conditions.
 - c. Substrates are in acceptable condition, in compliance with specification, prior to application of subsequent materials.
 - d. Nailers and blocking are provided where and as needed.
 - e. Insulation substrate is smooth and secured to its substrate without excessive gaps prior to membrane application.
 - f. The number, type, and spacing of fasteners are installed in accordance with manufacturer's requirements.
 - g. Materials comply with the specified requirements.
 - 2. All materials are stored, handled and protected from moisture or other damages. Liquid components are mixed prior to application in accordance with manufacturer's requirements.
 - 3. Membrane is allowed to relax prior to seaming. Adhesives are applied uniformly to both mating surfaces and checked for set prior to bonding mating materials. Mechanical attachments are spaced in accordance with manufacturer's requirements, including additional fastening of membrane in corner and perimeter areas.
 - 4. Membrane is overlapped in accordance with manufacturer's requirements.
 - 5. Membrane seaming is as specified and seams are hand rolled to ensure full adhesion and bond width. In-seam sealant is applied

when adhesive seams are used in the field of the roof. All seams are checked at the end of each work day.

6. Applied membrane is inspected and defects/damages are repaired.
7. Membrane is fully adhered without ridges, wrinkles, kinks, fish mouths.
8. Installer adheres to specified and detailed application parameters.
9. Associated flashings and sheet metal are installed in a timely manner in accord with the specified requirements.
10. Temporary protection measures are in place at the end of each work shift.

B. Manufacturer's Inspection:

1. At a minimum, the manufacturer's technical representative must visit the site at substantial completion to approve the overall installation.

END OF SECTION

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

SECTION 07 60 00 FLASHING AND SHEET METAL

PART 1 GENERAL

1.1 SUMMARY

- A. This section includes the fabrication and installation of various sheet metal work required to provide a complete weather tight roofing system.
- B. Related Sections:
 - 1. Section 06 10 05 – Rough Carpentry for EPDM Roofing
 - 2. Section 07 22 00 – Roof and Deck Insulation
 - 3. Section 07 53 10 – Ethylene-Propylene-Diene-Monomer Roofing
 - 4. Section 07 92 00 – Sealants and Caulking

1.2 REFERENCES

- A. American National Standards Institute
 - 1. ANSI/SPRI RD-1 – Standard Retrofit Roof Drains
- B. ASTM International
 - 1. ASTM B32 - 08 Standard Specification for Solder Metal
 - 2. ASTM B209 - 07 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
 - 3. ASTM B221 - 08 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
- C. American Welding Society
 - 1. AWS D1.2 – Structural Welding Code- Aluminum.
- D. Sheet Metal and Air Conditioning Contractors National Association
 - 1. SMACNA – Architectural Sheet Metal Manual

1.3 PERFORMANCE REQUIREMENTS

- A. Finished sheet metalwork will form a weathertight construction without waves, warps, buckles, fastening stresses or distortion, which allows for expansion and contraction. Sheet metal mechanic is responsible for cutting, fitting, drilling, and other operations in connection with sheet metal required to accommodate the work of other trades. Coordinate installation of sheet metal items used in conjunction with roofing with roofing work to permit continuous roofing operations.
- B. Fabrication and installation shall conform to the applicable standards and/or requirements of the following:
 - 1. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

2. AMERICAN WELDING SOCIETY (AWS)
3. ASTM INTERNATIONAL (ASTM)
4. SHEET METAL AND AIR CONDITIONING CONTRACTORS' NATIONAL ASSOCIATION (SMACNA)

1.4 SUBMITTALS

- A. Refer to Section 01 33 00 - Submittal Procedures for overall submittal procedures and specific requirements associated with each type of submittal listed below.
- B. Types of submittals required for this Section:
 1. Product Data
 2. Shop Drawing
- C. Refer to the List of Submittals document at the end of Division I for a detailed list of every submittal required for the products and workmanship covered under this Section.

1.5 DELIVERY, HANDLING, AND STORAGE

- A. Package and protect materials during shipment. Uncrate and inspect materials for damage, dampness, and wet-storage stains upon delivery to the job site. Remove from the site and replace damaged materials that cannot be restored to like-new condition. Handle sheet metal items to avoid damage to surfaces, edges, and ends. Store materials in dry, weather-tight, ventilated areas until immediately before installation.

1.6 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Aluminum Alloy Sheet and Plate: ASTM B 209M, ASTM B 209, alloy and temper appropriate for use.
 1. Alclad: When fabricated of aluminum, fabricate the items Alclad 3003, Alclad 3004, Alclad 3005, clad on both sides unless otherwise indicated.
 2. Finish: Exposed exterior sheet metal items of aluminum must have a baked-on, factory-applied color coating of polyvinylidene fluoride (PVF2) or other equivalent fluorocarbon coating applied after metal substrates have been cleaned and pretreated. Provide finish coating dry-film thickness of 0.8 to 1.3 mils.
 - a. Color: Dark Bronze unless otherwise noted.
 3. Thickness:
 - a. Drip Edge: 18 Ga (0.040 inch).
 - b. Cleats: 16 Ga (0.051 inch).

- c. Curb Flashing: 16 Ga (0.051 inch).
 - d. Counter Flashing: 20 Ga (0.032 inch).
4. Fasteners: Aluminum or stainless steel.

PART 3 EXECUTION

3.1 INSTALLATION

A. Workmanship

- 1. Make lines and angles sharp and true. Free exposed surfaces from visible wave, warp, buckle, and tool marks. Fold back exposed edges neatly to form a 1/2 inch hem on the concealed side. Make sheet metal exposed to the weather watertight with provisions for expansion and contraction.
- 2. Make surfaces to receive sheet metal plumb and true, clean, even, smooth, dry, and free of defects and projections. For installation of items not shown in detail or not covered by specifications conform to the applicable requirements of SMACNA Architectural Sheet Metal Manual. Provide sheet metal flashing in the angles formed where roof decks abut walls, curbs, ventilators, pipes, or other vertical surfaces and wherever indicated and necessary to make the work watertight.

B. Nailing

- 1. Confine nailing of sheet metal generally to sheet metal having a maximum width of 18 inch. Confine nailing of flashing to one edge only.
- 2. Space nails evenly not over 3 inch on center and approximately 1/2 inch from edge unless otherwise specified or indicated. Face nailing will not be permitted. Where sheet metal is applied to other than wood surfaces, include in shop drawings, the locations for sleepers and nailing strips required to secure the work.

C. Cleats

- 1. Provide continuous cleats for sheet metal drip edge. Cleats shall extend a minimum of 1" below the top of the concrete deck. Secure cleats into face of wood nailer at centerline using ring shank nails. Nails shall be spaced a maximum of 6" on center.

D. Aluminum Drip Edge

- 1. Provide continuous sheet metal drip edge. Drip edge shall extend a minimum of 1" below the top of the concrete deck. Secure drip edge into top of wood nailer using ring shank nails. Nails shall be spaced a maximum of 4" on center.

E. Bolts, Rivets, and Screws

- 1. Provide bolts, rivets, and screws where indicated or required. Provide compatible washers where required to protect surface of sheet metal and to provide a watertight connection. Provide mechanically formed joints in aluminum sheets.

F. Seams

1. Straight and uniform in width and height.
 - a. Flat-lock Seams: Finish not less than 3/4 inch wide.
 - b. Lap Seams: Overlap seams not less than 3 inches.
 - c. Loose-Lock Expansion Seams: Not less than 3 inch wide; provide minimum one inch movement within the joint. Completely fill the joints with the specified sealant, applied at not less than 1/8 inch thick bed.
 - d. Standing Seams: Not less than one inch high, double locked.
 - e. Flat Seams: Make seams in the direction of the flow.

- G. Mechanical Fastening
 1. Aluminum must be butted and the space backed with formed flashing plate; or lock joined, mechanically fastened, and filled with sealant as recommended by the aluminum manufacturer.
 2. Mechanical Fastening of Aluminum: Use No. 12, aluminum alloy, sheet metal screws or other equivalent aluminum alloy or stainless steel fasteners. Drive fasteners in holes made with a No. 26 drill in securing side laps, end laps, and flashings. Space fasteners 12 inch maximum on center. Where end lap fasteners are required to improve closure, locate the end lap fasteners not more than 2 inch from the end of the overlapping sheet.

- H. Protection from Contact with Dissimilar Materials
 1. Aluminum
 - a. Do not allow aluminum surfaces in direct contact with other metals except stainless steel, zinc, or zinc coating. Where aluminum contacts another metal, paint the dissimilar metal with a primer followed by two coats of aluminum paint. Where drainage from a dissimilar metal passes over aluminum, paint the dissimilar metal with a non-lead pigmented paint.
 2. Metal Surfaces
 - a. Paint surfaces in contact with mortar, concrete, or other masonry materials with alkali-resistant coatings such as heavy-bodied bituminous paint.
 3. Wood or Other Absorptive Materials
 - a. Paint surfaces that may become repeatedly wet and in contact with metal with two coats of aluminum paint or a coat of heavy-bodied bituminous paint.

- I. Expansion and Contraction
 1. Provide expansion and contraction joints at not more than 32 foot intervals for aluminum and at not more than 40 foot intervals for other metals. Provide an additional joint where the distance between the last expansion joint and the end of the continuous run is more than half the required interval. Space joints evenly. Join extruded aluminum fascias by expansion and contraction joints spaced not more than 12 feet apart.

- J. Flashing at Roof Penetrations and Equipment Supports
 1. Provide metal flashing for all pipes, ducts, and conduits projecting through the roof surface and for equipment supports, guy wire anchors,

.goose-necks, rainhoods, power roof ventilators and similar items supported by or attached to the roof deck

3.2 CLEANING

- A. Clean exposed sheet metal work at completion of installation. Remove grease and oil films, handling marks, contamination from steel wool, fittings and drilling debris, and scrub-clean. Free the exposed metal surfaces of dents, creases, waves, scratch marks, and solder or weld marks.

3.3 REPAIRS TO FINISH

- A. Scratches, abrasions, and minor surface defects of finish may be repaired in accordance with the manufacturer's printed instructions and as approved. Repair damaged surfaces caused by scratches, blemishes, and variations of color and surface texture. Replace items which cannot be repaired.

3.4 FIELD QUALITY CONTROL

- A. Establish and maintain a Quality Control Plan for sheet metal used in conjunction with roofing to assure compliance of the installed sheet metalwork with the contract requirements. Remove work that is not in compliance with the contract and replace or correct. Include quality control, but not be limited to, the following:
 - 1. Observation of environmental conditions; number and skill level of sheet metal workers; condition of substrate.
 - 2. Verification that specified material is provided and installed.
 - 3. Inspection of sheet metalwork, for sizes and thicknesses, fastening and joining, and installation in accordance with manufacturer's requirements.

END OF SECTION

DIVISION 7 – THERMAL AND MOISTURE PROTECTION

SECTION 07 71 23 GUTTERS AND DOWNSPOUTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes pre-finished aluminum gutters and downspouts.
 - 1. Provide precast concrete splash pads.

1.2 REFERENCES

- A. American Architectural Manufacturers Association:
 - 1. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum.
 - 2. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
 - 3. AAMA 2604 - Voluntary specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
 - 4. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
- B. ASTM International:
 - 1. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- C. Federal Specification Unit:
 - 1. FS TT-C-494 - Coating Compound, Bituminous, Solvent Type, Acid Resistant.
- D. Sheet Metal and Air Conditioning Contractors:
 - 1. SMACNA - Architectural Sheet Metal Manual

1.3 SUBMITTALS

- A. Refer to Section 01 33 00 - Submittal Procedures for overall submittal procedures and specific requirements associated with each type of submittal listed below.
- B. Types of submittals required for this Section:
 - 1. Product Data

- C. Refer to the List of Submittals document at the end of Division I for a detailed list of every submittal required for the products and workmanship covered under this Section.

1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with SMACNA Manual.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope to drain.
- B. Prevent contact with materials during storage capable of causing discoloration, staining, or damage.

PART 2 PRODUCTS

2.1 GUTTERS AND DOWNSPOUTS

- A. Product Description:
 - 1. Gutters: Aluminum, K Style, 5 inch, Seamless.
 - 2. Downspouts: Aluminum, Rectangular 2"x3", Corrugated.

2.2 COMPONENTS

- A. Pre-Finished Aluminum Sheet: ASTM B209, manufacturer's standard alloy and temper for specified finish; factory applied backed on enamel finish.
 - 1. Thickness:
 - a. Gutters: 0.032 inch thick
 - b. Downspouts: 0.024 inch thick
 - 2. Color: Dark Bronze

2.3 ACCESSORIES

- A. Anchors and Supports: Profiled to suit gutters and downspouts.
 - 1. Gutter Supports: Aluminum Bracket, hidden type with screw fastener.
 - 2. Downspout Supports: Aluminum Straps.
- B. Fasteners: Same material and finish as gutters and downspouts.
- C. Sealer: All joints, corners, seams, downspout leaders to be sealed with factory recommended sealer.

D. Gutters shall be provided complete with end caps, outlets, strainers and other accessories necessary for installation.

E. Splash Pads: Precast concrete type.

2.4 FABRICATION

A. Form gutters and downspouts of profiles and size indicated.

B. Gutters shall be fabricated in one piece continuous sections.

C. Form sections to shape indicated on Drawings, square, and accurate in size, free of distortion or defects detrimental to appearance or performance.

PART 3 EXECUTION

3.1 EXAMINATION

A. Verify surfaces are ready to receive gutters and downspouts.

3.2 INSTALLATION

A. Gutters shall be supported with brackets at points not more than 30 inches on center.

B. Pitch gutters towards a downspout in accordance with industry standards.

C. Downspouts shall be spaced at a maximum of twenty feet and within 12 inches of the end of gutter, set plumb and not less than 1 inch from the wall. Leaders shall connect gutters to downspouts. Leaders shall be set with a slope not less than 1/16 inch per foot or more than 30 degrees below a horizontal line. Leaders shall fit over the eave tube in the gutter bottom and shall fit into and be riveted to the downspout. Elbow fittings shall be used to make connections with downspout and eaves tube. Rivet spacing shall be not more than 2 inches.

D. Strainers shall be set loosely in the eave tube opening in the gutter.

E. Support downspouts with straps. One strap shall be provided adjacent to the joint at the top of each section of the downspout except that the bottom section shall have an additional strap adjacent to the bottom joint.

F. Set splash pads under downspouts.

END OF SECTION

DIVISION 07 – THERMAL AND MOISTURE PROTECTION

SECTION 07 92 00 SEALANTS AND CAULKING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes sealants and caulking to provide a positive barrier against passage of water, moisture and air.
- B. Related Sections:
 - 1. Section 07 60 00 –Flashing and Sheet Metal

1.2 REFERENCES

- A. ASTM International
 - 1. ASTM C920 – Standard Specification for Elastomeric Joint Sealants.
 - 2. ASTM C1193 - Standard Guide for Use of Joint Sealants.

1.3 SUBMITTALS

- A. Refer to Section 01 33 00 - Submittal Procedures for overall submittal procedures and specific requirements associated with each type of submittal listed below.
- B. Types of submittals required for this Section:
 - 1. Product Data
 - 2. Manufacturer Instructions
- C. Refer to the List of Submittals document at the end of Division I for a detailed list of every submittal required for the products and workmanship covered under this Section.

1.4 QUALITY ASSURANCE

- A. Use skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for performance of the work of this Section.
- B. All work shall be in strict accordance with the manufacturer's instructions. All joint sealers are required to establish and maintain air tight and watertight continuous seals on a permanent basis, within recognized limitations of wear and aging for each application.

Failures of installed sealers to comply with the requirement will be recognized as failures of material and workmanship.

- C. Perform Work in accordance with the International Building Code, latest edition.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Do not proceed with installation of sealants under unfavorable weather conditions. Provide sealants when temperature is in the range recommended by manufacturer for installation.

PART 2 PRODUCTS

2.1 SEALANTS

- A. Roofing:
 - 1. Exterior Sealant shall be pursuant to roofing manufacturer's requirements. Sealant used shall not void any roofing manufacturer's warranties.
- B. Flashing and General:: Non-sagging, Neutral-curing, One-Part, Silicon Sealant; ASTM C920, Type S, Grade NS, Class 50, Uses NT, G, A, and O.
 - 1. Color: Standard colors matching finished surfaces.
 - 2. Movement Capability: Plus 50 percent, Minus 50 percent

2.2 ACCESSORIES

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. Joint Backing: Round, soft, non-gassing, chemically inert, polyolefin foam backer rod compatible with sealant; oversized 30 to 50 percent larger than joint width.
- D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify joint openings are ready to receive work.

- B. Verify joint backing and release tapes are compatible with sealant.

3.2 PREPARATION

- A. Remove all existing joint sealant. Remove loose materials and foreign matter impairing adhesion of new sealant.
- B. Clean and prime joints.
- C. Perform preparation in accordance with ASTM C1193.
- D. Protect elements surrounding Work of this section from damage or disfiguration.

3.3 INSTALLATION

- A. Perform installation in accordance with ASTM C1193.
- B. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer.
- C. Install bond breaker where joint backing is not used.
- D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- E. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- F. Tool joints concave.

3.4 CLEANING

- A. Clean adjacent soiled surfaces.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

- A. Protect sealants until cured.

END OF SECTION

DIVISION 23 - HVAC

SECTION 23 05 29 HANGERS AND SUPPORTS FOR HVAC

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
1. Pipe hangers and supports.
 2. Hanger rods.
 3. Inserts.
 4. Flashing.
 5. Equipment Curbs
 6. Pipe Stands (Roofs)
 7. Sleeves.
 8. Mechanical sleeve seals.
 9. Formed steel channel.
 10. Firestopping relating to HVAC work.
 11. Firestopping accessories.
 12. Equipment bases and supports.
- B. Related Sections:
1. Section 23 23 00 – Refrigeration Piping: Execution requirements for placement of hangers and supports specified by this section.

1.2 REFERENCES

- A. American Society of Mechanical Engineers:
1. ASME B31.1 - Power Piping.
 2. ASME B31.5 - Refrigeration Piping.
 3. ASME B31.9 - Building Services Piping.
- B. ASTM International:
1. ASTM E84 - Test Method for Surface Burning Characteristics of Building Materials.
 2. ASTM E119 - Method for Fire Tests of Building Construction and Materials.
 3. ASTM E814 - Test Method of Fire Tests of Through Penetration Firestops.
 4. ASTM F708 - Standard Practice for Design and Installation of Rigid Pipe Hangers.
 5. ASTM E1966 - Standard Test Method for Fire-Resistive Joint Systems.

- C. American Welding Society:
 - 1. AWS D1.1 - Structural Welding Code - Steel.
- D. FM Global:
 - 1. FM - Approval Guide, A Guide to Equipment, Materials & Services Approved By Factory Mutual Research For Property Conservation.
- E. Manufacturers Standardization Society of the Valve and Fittings Industry:
 - 1. MSS SP 58 - Pipe Hangers and Supports - Materials, Design and Manufacturer.
 - 2. MSS SP 69 - Pipe Hangers and Supports - Selection and Application.
 - 3. MSS SP 89 - Pipe Hangers and Supports - Fabrication and Installation Practices.
- F. Intertek Testing Services (Warnock Hersey Listed):
 - 1. WH - Certification Listings.

1.3 PERFORMANCE REQUIREMENTS

- A. Firestopping: Conform to applicable code for fire resistance ratings and surface burning characteristics.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data:
 - 1. Hangers and Supports: Submit manufacturers catalog data including load capacity.
 - 2. Firestopping: Submit data on product characteristics, performance and limitation criteria.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years experience.
- B. Installer: Company specializing in performing Work of this section with minimum three years experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.

- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification.
- C. Protect from weather and construction traffic, dirt, water, chemical, and damage, by storing in original packaging.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply firestopping materials when temperature of substrate material and ambient air is below 60 degrees F.
- B. Maintain this minimum temperature before, during, and for minimum 3 days after installation of firestopping materials.

1.8 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

PART 2 PRODUCTS

2.1 PIPE HANGERS AND SUPPORTS

- A. Condensate Piping:
 - 1. Conform to MSS SP58, MSS SP69 & MSS SP89.Hangers for Pipe Sizes 1/2 to 1-1/2 inch: Malleable iron, adjustable swivel, split ring.

2.2 RODS

- A. Hanger Rods: Galvanized, mild steel threaded both ends, threaded on one end, or continuous threaded.

2.3 INSERTS

- A. 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.

2.4 FLASHING

- A. Metal Flashing: 26 gage galvanized steel.
- B. Metal Counterflashing: 22 gage galvanized steel.
- C. Flexible Flashing: 47 mil thick sheet buty; compatible with roofing.
- D. Caps: Steel, 22 gage minimum; 16 gage at fire resistant elements.

2.5 EQUIPMENT CURBS

- A. Fabrication: Welded 18 gage galvanized steel shell and base, mitered 3 inch cant, variable step to match roof insulation, 1 1/2 inch thick insulation, factory installed wood nailer. Minimum 18 inch height, unless specified otherwise.
- B. 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.

2.6 PIPE STANDS (ROOF)

- A. General Requirements for Pipe Stands: Shop or field –fabricated assemblies made of manufactured corrosion-resistant components to support roof-mounted piping.
- B. Compact Pipe Stand: One-piece plastic unit with integral-rod roller, pipe clamps, or V-shaped cradle to support pipe, for roof installation without membrane penetration.
- C. High-Type, Single-Pipe Stand:
- D. Description: Assembly of base, vertical and horizontal members, and pipe support, for roof installation without membrane penetration.
- E. Base: Plastic
- F. Vertical Members: Two or more cadmium-plated-steel or stainless-steel, continuous-thread rods.
- G. Horizontal Member: Cadmium-plated-steel or stainless-steel with plastic or stainless-steel, roller-type pipe support.
- H. High-Type, Multiple-Pipe Stand:
- I. Description: Assembly of Bases, vertical and horizontal members, and pipe supports, for roof installation without membrane penetration.
- J. Bases: One or more; plastic
- K. Vertical Members: Two or more protective-coated-steel channels.
- L. Horizontal member: Protective-coated-steel channel.
- M. Pipe Supports: galvanized-steel, clevis-type pipe hangers.

- N. Curb-Mounted-Type Pipe Stands: Shop- or field-fabricated pipe supports made from structural-steel shapes, continuous-thread rods, and rollers, for mounting on permanent stationary roof curb.

2.7 SLEEVES

- A. Sleeves for Round Ductwork: Galvanized steel.
- B. Sleeves for Rectangular Ductwork: Galvanized steel or wood.

2.8 FORMED STEEL CHANNEL

- A. Product Description: Galvanized 12 gage thick steel. With holes 1-1/2 inches on center.

2.9 FIRESTOPPING

- A. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.
 1. Silicone Firestopping Elastomeric Firestopping: Single or multiple component silicone elastomeric compound and compatible silicone sealant.
 2. Foam Firestopping Compounds: Single or multiple component foam compound.

2.10 FIRESTOPPING ACCESSORIES

- A. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.
- B. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.
- C. General:
 1. Furnish UL listed products.
 2. Select products with rating not less than rating of wall or floor being penetrated.
- D. Non-Rated Surfaces:
 1. Stamped steel, chrome plated, hinged, split ring escutcheons or floor plates or ceiling plates for covering openings in occupied areas where piping is exposed.
 2. For exterior wall openings below grade, furnish mechanical sealing device to continuously fill annular space between piping and cored opening or water-stop type wall sleeve.

2.11 FORMED STEEL CHANNEL

1. Product Description: Galvanized 12 gage (2.8 mm) thick steel. With holes 1-1/2 inches (38 mm) on center.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 30 00 - Administrative Requirements: Verification of existing conditions before starting work.
- B. Verify openings are ready to receive sleeves.
- C. Verify openings are ready to receive firestopping.

3.2 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter affecting bond of firestopping material.
- B. Remove incompatible materials affecting bond.
- C. Do not drill or cut structural members.

3.3 INSTALLATION - INSERTS

- A. Install inserts for placement in concrete forms.
- B. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- C. Provide hooked rod to concrete reinforcement section for inserts carrying pipe 4 inches and larger.
- D. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
- E. Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.

3.4 INSTALLATION - PIPE HANGERS AND SUPPORTS

- A. Install in accordance with MSS SP 58, MSS SP 69 & MSS SP 89.
- B. Support horizontal piping as scheduled.

- C. Install hangers with minimum 1/2 inch space between finished covering and adjacent work.
- D. Place hangers within 12 inches of each horizontal elbow.
- E. Use hangers with 1-1/2 inch minimum vertical adjustment.
- F. Support vertical piping at every floor.
- G. Where piping is installed in parallel and at same elevation, provide multiple pipe or trapeze hangers.
- H. Support riser piping independently of connected horizontal piping.
- I. Design hangers for pipe movement without disengagement of supported pipe.
- J. Provide clearance in hangers and from structure and other equipment for installation of insulation.

3.5 INSTALLATION - EQUIPMENT BASES AND SUPPORTS

- A. Using templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring equipment.
- B. Construct supports of formed steel channel. Brace and fasten with flanges bolted to structure.

3.6 INSTALLATION – FLASHING

- A. Provide flexible flashing and metal Counterflashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.
- B. Provide acoustical lead flashing around ducts and pipes penetrating equipment rooms for sound control.
- C. Provide curbs for roof installations 12 inches minimum high above roofing surface. Flash and counter-flash with sheet metal; seal watertight. Attach Counterflashing to equipment and lap base flashing on roof curbs. Flatten and solder joints.
- D. Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

3.7 INSTALLATION – SLEEVES

- A. Exterior watertight entries: Seal with mechanical sleeve seals.

- B. Set sleeves in position in forms. Provide reinforcing around sleeves.
- C. Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- D. Extend sleeves through floors inch above finished floor level. Caulk sleeves.
- E. Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with firestopping insulation and caulk [airtight]. Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- F. Install stainless steel escutcheons at finished surfaces.

3.8 INSTALLATION - FIRESTOPPING

- A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, and other items, requiring firestopping.
- B. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.
- C. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating.
- D. Place foamed material in layers to ensure homogenous density, filling cavities and spaces. Place sealant to completely seal junctions with adjacent dissimilar materials.
- E. Fire Rated Surface:
 - 1. Seal opening at floor, wall, partition, ceiling, and roof as follows:
 - a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.
 - b. Size sleeve allowing minimum of 1 inch void between sleeve and building element.
 - c. Pack void with backing material.
 - d. Seal ends of sleeve with UL listed fire resistive silicone compound to meet fire rating of structure penetrated.
- F. Non-Rated Surfaces:
 - 1. Seal opening through non-fire rated wall, partition, floor, ceiling, and roof opening as follows:
 - a. Install sleeve through opening and extending beyond minimum of 1 inch on both sides of building element.

- b. Size sleeve allowing minimum of 1 inch void between sleeve and building element.
 - c. Install type of firestopping material recommended by manufacturer.
2. Install escutcheons where conduit, penetrates non-fire rated surfaces in occupied spaces. Occupied spaces include rooms with finished ceilings and where penetration occurs below finished ceiling.
 3. Exterior wall openings below grade: Assemble rubber links of mechanical sealing device to size of piping and tighten in place, in accordance with manufacturer's instructions.

3.9 FIELD QUALITY CONTROL

- A. Inspect installed firestopping for compliance with specifications and submitted schedule.

3.10 CLEANING

- A. Clean adjacent surfaces of firestopping materials.

3.11 PROTECTION OF FINISHED WORK

- A. Section 01 70 00 - Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Protect adjacent surfaces from damage by material installation.

3.12 SCHEDULES

- A. Copper and Steel Pipe Hanger Spacing:

PIPE SIZE Inches	COPPER TUBING MAXIMUM HANGER SPACING Feet	STEEL PIPE MAXIMUM HANGER SPACING Feet	COPPER TUBING HANGER ROD DIAMETER Inches	STEEL PIPE HANGER ROD DIAMETER Inches
1/2	5	7	3/8	3/8
3/4	5	7	3/8	3/8
1	6	7	3/8	3/8
1-1/4	7	7	3/8	3/8
1-1/2	8	9	3/8	3/8
2	8	10	3/8	3/8

2-1/2 (Note 2)	9	11	1/2	1/2
3	10	12	1/2	1/2
4	12	14	1/2	5/8
5	13	16	1/2	5/8
6	14	17	5/8	3/4
8	16	19	3/4	3/4
10	18	22	3/4	7/8
12	19	23	3/4	7/8
14	22	25	7/8	1
16	23	27	7/8	1
18	25	28	1	1
20	27	30	1	1-1/4
24	28	32	1-1/4	1-1/4

B. Plastic and Ductile Iron Pipe Hanger Spacing:

PIPE MATERIAL	MAXIMUM HANGER SPACING Feet	HANGER ROD DIAMETER Inches
ABS (All sizes)	4	3/8
FRP (All Sizes)	4	3/8
Ductile Iron (Note 2)		
PVC (All Sizes)	4	3/8

C. Note 1: Refer to manufacturer's recommendations for grooved end piping systems.

D. Note 2: 20 feet maximum spacing, minimum of one hanger for each pipe section close to joint behind bell. Provide hanger at each change of direction and each branch connection. For pipe sizes 6 inches and smaller, subjected to loadings other than weight of pipe and contents, limit span to maximum spacing for water service steel pipe.

END OF SECTION

DIVISION 23 – HVAC

SECTION 23 07 00 HVAC INSULATION

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. HVAC ductwork insulation, jackets, and accessories.

1.2 REFERENCES

A. ASTM International:

1. ASTM A167 - Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
2. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
3. ASTM B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
4. ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement.
5. ASTM C449/C449M - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.
6. ASTM C450 - Standard Practice for Prefabrication and Field Fabrication of Thermal Insulating Fitting Covers for NPS Piping, Vessel Lagging, and Dished Head Segments.
7. ASTM C533 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.
8. ASTM C534 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
9. ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation.
10. ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
11. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
12. ASTM C585 - Standard Practice for Inner and Outer Diameters of Rigid Thermal Insulation for Nominal Sizes of Pipe and Tubing (NPS System).
13. ASTM C591 - Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
14. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation.

15. ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
16. ASTM C921 - Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
17. ASTM C1071 - Standard Specification for Thermal and Acoustical Insulation (Glass Fiber, Duct Lining Material).
18. ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation.
19. ASTM C1290 - Standard Specification for Flexible Fibrous Glass Blanket Insulation Used to Externally Insulate HVAC Ducts.
20. ASTM D1784 - Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.
21. ASTM D4637 - Standard Specification for EPDM Sheet Used in Single-Ply Roof Membrane.
22. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
23. ASTM E96 - Standard Test Methods for Water Vapor Transmission of Materials.
24. ASTM E162 - Standard Test Method for Surface Flammability of Materials Using a Radiant Heat Energy Source.

B. Sheet Metal and Air Conditioning Contractors’:

1. SMACNA - HVAC Duct Construction Standard - Metal and Flexible.

C. National Fire Protection Association:

1. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials.

D. Underwriters Laboratories Inc.:

1. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
2. UL 1978 - Standard for Safety for Grease Ducts.

1.3 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures: Submittal procedures.
- B. Product Data: Submit product description, thermal characteristics and list of materials and thickness for each service, and location.
- C. Manufacturer's Installation Instructions: Submit manufacturers published literature indicating proper installation procedures.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

1.4 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Accept materials on site in original factory packaging, labeled with manufacturer's identification, including product density and thickness.
- C. Protect insulation from weather and construction traffic, dirt, water, chemical, and damage, by storing in original wrapping.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 - Product Requirements: Environmental conditions affecting products on site.
- B. Install insulation only when ambient temperature and humidity conditions are within range recommended by manufacturer.
- C. Maintain temperature before, during, and after installation for minimum period of 72 hours.

1.6 FIELD MEASUREMENTS

- A. Verify field measurements prior to fabrication.

1.7 WARRANTY

- A. Furnish five year manufacturer warranty for man made fiber.

PART 2 PRODUCTS

2.1 DUCTWORK INSULATION

- A. TYPE D-1: ASTM C1290, Type III, flexible glass fiber, commercial grade with factory applied reinforced aluminum foil jacket meeting ASTM C1136, Type II.
 - 1. Thermal Conductivity: 0.23 at 75 degrees F.
 - 2. Maximum Operating Temperature: 250 degrees F.
 - 3. Density 1.5 pound per cubic foot.
- B. TYPE D-2: ASTM C612, Type IA or IB, rigid glass fiber, with factory applied reinforced aluminum foil facing meeting ASTM C1136, Type II.
 - 1. Thermal Conductivity: 0.23 at 75 degrees F (0.033 at 24 degrees C).
 - 2. Density: 3.0 pound per cubic foot (48 kilogram per cubic meter).
 - 3. Maximum Air Velocity: 6,000 feet per minute (30.5 meter per second).

2.2 DUCTWORK INSULATION JACKETS

- A. Aluminum Duct Jacket:
 - 1. ASTM B209M.
 - 2. Thickness: 0.025 inch (0.64 mm) thick sheet.
 - 3. Finish: Smooth.
 - 4. Joining: Longitudinal slip joints and 2 inch (50 mm) laps.
 - 5. Fittings: 0.016 inch (0.4 mm) thick die shaped fitting covers with factory attached protective liner.
 - 6. Metal Jacket Bands: 3/8 inch (10 mm) wide; 0.015 inch (0.38 mm) thick aluminum.

- B. Vapor Retarder Jacket:
 - 1. Kraft paper with glass fiber yarn and bonded to aluminized film 0.0032 inch (0.081 mm) vinyl.
 - 2. Moisture vapor transmission: ASTM E96; 13 perm.
 - 3. Secure with pressure sensitive tape.

2.3 DUCTWORK INSULATION ACCESSORIES

- A. Vapor Retarder Tape:
 - 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

- B. Vapor Retarder Lap Adhesive: Compatible with insulation.

- C. Adhesive: Waterproof , ASTM E162 fire-retardant type.

- D. Liner Fasteners: Galvanized steel, [self-adhesive pad] [impact applied] [welded] with [integral] [press-on] head.

- E. Tie Wire: 0.048 inch (1.22 mm) stainless steel with twisted ends on maximum 12 inch (300 mm) centers.

- F. Lagging Adhesive: Fire resistive to [ASTM E84] [NFPA 255] [UL 723].

- G. Impale Anchors: Galvanized steel, 12 gage self-adhesive pad.

- H. Adhesives: Compatible with insulation.

- I. Membrane Adhesives: As recommended by membrane manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify ductwork has been tested before applying insulation materials.
- B. Verify surfaces are clean and dry, with foreign material removed.

3.2 INSTALLATION - DUCTWORK SYSTEMS

- A. Duct dimensions indicated on Drawings are finished inside dimensions.
- B. Insulated ductwork conveying air below ambient temperature:
 - 1. Provide insulation with vapor retarder jackets.
 - 2. Finish with tape and vapor retarder jacket.
 - 3. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
 - 4. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
- C. Insulated ductwork conveying air above ambient temperature:
 - 1. Provide with or without standard vapor retarder jacket.
 - 2. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
- D. External Glass Fiber Duct Insulation:
 - 1. Secure insulation with vapor retarder with wires and seal jacket joints with vapor retarder adhesive or tape to match jacket.
 - 2. Secure insulation without vapor retarder with staples, tape, or wires.
 - 3. Install without sag on underside of ductwork. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift ductwork off trapeze hangers and insert spacers.
 - 4. Seal vapor retarder penetrations by mechanical fasteners with vapor retarder adhesive.
 - 5. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.
- E. Ducts Exterior to Building:
 - 1. Install insulation according to external duct insulation paragraph above.
 - 2. Provide external insulation with vapor retarder jacket. Cover with with caulked aluminum jacket with seams located on bottom side of horizontal duct section.
 - 3. Finish with aluminum duct jacket.
 - 4. Calk seams at flanges and joints. Located major longitudinal seams on bottom side of horizontal duct sections.

3.3 SCHEDULES

A. Ductwork Insulation Schedule:

DUCTWORK SYSTEM	INSULATION TYPE	INSULATION THICKNESS inches
Supply Ducts (externally insulated)	D-1	1.5
Return Ducts (externally insulated)	D-1	1.5
Exhaust Ducts Within 10 feet of Exterior Openings	D-1	1.5
Supply Air, Return Air, Exhaust Air (exterior to building on roof)	D-2	2.0

END OF SECTION

DIVISION 23 – HVAC

SECTION 23 30 00 HVAC AIR DISTRIBUTION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Ductwork.
 - 2. Ductwork accessories.
 - 3. Fans.
 - 4. Air Outlets and inlets.
 - 5. Duct test holes.
 - 6. Duct access doors.
 - 7. Ductwork roof support

1.2 SUBMITTALS

- A. Shop Drawings: Submit duct fabrication drawings, drawn to scale not smaller than 1/2 inch equals 1 foot, on drawing sheets same size as Contract Documents, indicating:
 - 1. Fabrication, assembly, and installation details, including plans, elevations, sections, details of components, and attachments to other work.
 - 2. Duct layout, indicating pressure classifications and sizes in plan view. For exhaust duct systems, indicate classification of materials handled as defined in this section.
 - 3. Fittings.
 - 4. Reinforcing details and spacing.
 - 5. Seam and joint construction details.
 - 6. Penetrations through fire rated and other walls.
 - 7. Hangers and supports, including methods for building attachment, vibration isolation, and duct attachment.
- B. Product Data:
 - 1. Submit sizes, capacities, materials, controls and connections to other work.
 - 2. Submit catalog performance ratings, construction, electric and duct connections, flashing and dimensions for fans and exhausters.
- C. Operation and Maintenance Data: Submit instructions for lubrication, motor and drive replacement, spare parts lists, and wiring diagrams.

D. Manufacturer's Installation Instructions: Submit relevant instructions.

1.3 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit instructions for filter replacement, spare parts lists, and wiring diagrams.

1.4 QUALITY ASSURANCE

A. Perform Work in accordance with State of New Jersey.

B. Maintain one copy of each document on site.

PART 2 PRODUCTS

2.1 DUCTWORK

A. HANGERS, SUPPORTS, ANCHORAGE, SEISMIC RESTRAINTS, AND SEISMIC CONTROL

a. Provide hangers, supports, anchorage, seismic restraints, and seismic control for products specified herein in accordance with the requirements of the contract documents and SMACNA "HVAC Duct Construction Standards."

B. SHEET METAL DUCTWORK

1. Galvanized Steel Ducts: ASTM A653/A653M galvanized steel sheet, lock-forming quality, having G60 zinc coating of in conformance with ASTM A90/A90M.
2. Minimum gauge, duct construction, joint reinforcing, and fittings shall be in accordance with SMACNA "HVAC Duct Construction Standards - Metal and Flexible."
3. Duct Classification: Ducts shall be considered low pressure when design velocities are 2000 fpm or less and maximum static pressure is 2-inch W.G., positive or negative.
4. The following ductwork shall be constructed in accordance with minimum reinforcement requirements for static pressure class of 2-inch W.G., positive or negative.
5. Supply ductwork downstream from terminal units.
6. Supply, return, or exhaust ductwork serving fans scheduled to operate at less than 1/2-inch W.G.
7. Supply, return, or exhaust branch ductwork which serves one or two inlets/outlets.
8. The following ductwork shall be constructed in accordance with minimum reinforcement requirements for static pressure class of 1-inch W.G. positive or negative.

9. Supply, return, or exhaust ductwork serving fans scheduled to operate at less than 1-inch W.G. On supply fans, pressure drops for louvers, coils, clean filters, and sound traps may be deleted from scheduled fan static.
10. Supply, return, or exhaust ductwork serving multiple duct branches where the Contractor can demonstrate that pressures will not exceed 1-inch W.G., positive or negative.
11. The following ductwork shall be constructed in accordance with minimum reinforcement requirements for static pressure class of 2-inch W.G., positive or negative.
12. Supply, return, or exhaust ductwork serving fans and AHU scheduled to operate at pressures greater than 1-inch W.G., positive or negative.
13. Longitudinal seams on rectangular duct shall be Pittsburgh or Button punch snap lock, or equal. Snap lock seams for round duct may be used only on ducts classified for 1/2-inch W.G. Longitudinal seams for round ducts using lap and rivet, spot weld, or fillet weld may be used only on ducts classified for statics 1-inch W.G. or less.

C. Ductwork Fabrication:

1. Fabricate and support rectangular ducts in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible and as indicated on Drawings. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
2. Fabricate and support round ducts with longitudinal seams in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible (Round Duct Construction Standards), and as indicated on Drawings. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
3. Construct T's, bends, and elbows with minimum radius 1-1/2 times centerline duct width. Where not possible and where rectangular elbows are used, provide turning vanes. Where acoustical lining is indicated, furnish turning vanes of perforated metal with glass fiber insulation.
4. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
5. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Minimum 4 inch (100 mm) cemented slip joint, brazed or electric welded. Prime coat welded joints.
6. Provide standard 45-degree lateral wye takeoffs. When space does not allow 45-degree lateral wye takeoff, use 90-degree conical tee connections.

D. Transverse Duct Connection System:

1. Product Description:SMACNA "F" rated rigidity class connection, interlocking angle and duct edge connection system with sealant, gasket, cleats, and corner clips.

2.2 FANS

- A. Downblast Centrifugal Roof Fans:
1. Fan Unit: Downblast type. direct drive, with spun aluminum housing.
 2. Motor: Totally enclosed explosion proof, NEMA MG1.
 3. Custom roof curb / roof curb adapter over existing opening.
 4. Disconnect Switch.
 5. Backdraft Damper.
 6. Motor Operated Damper.
 7. Fan speed controller.

2.3 DUCT ACCESSORIES

- A. Volume Control Dampers:
1. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated on Drawings.
 2. Fabricate splitter dampers of material matching duct gage to 24 inches (600 mm) size in each direction, and two gages heavier for larger sizes. Secure with continuous hinge or rod. Operate with minimum 1/4 inch (6 mm) diameter rod.
 3. Fabricate single blade dampers for duct sizes to 12 x 30 inch (300 x 760 mm).
 4. Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes 8 x 72 inch (200 x 1825 mm). Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
 5. Except in round ductwork 12 inches (300 mm) and smaller, furnish end bearings.
 6. Furnish locking, indicating quadrant regulators on single and multi-blade dampers. Where width exceeds 30 inches (750 mm), furnish regulator at both ends.
- B. Turning Devices and Extractors:
1. Multi-blade device with blades aligned in short dimension; steel or aluminum construction; with individually adjustable blades, mounting straps.
 2. Multi-blade device with radius blades attached to pivoting frame and bracket, steel or aluminum construction, with push-pull operator strap.

- C. Flexible Duct Connections:
 - 1. UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, approximately 3 inches (75 mm) wide, crimped into metal edging strip.

2.4 DUCT ACCESS DOORS

- A. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated on Drawings.
- B. Fabrication: Rigid and close fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, furnish minimum 1 inch (25 mm) thick insulation with sheet metal cover.
 - 1. Less than 12 inches (300 mm) square, secure with sash locks.
 - 2. Up to 18 inches (450 mm) Square: Furnish two hinges and two sash locks.
 - 3. Up to 24 x 48 inches (600 x 1200 mm): Three hinges and two compression latches with outside and inside handles.
 - 4. Larger Sizes: Furnish additional hinge.
 - 5. Access panels with sheet metal screw fasteners are not acceptable.

C. DUCT TEST HOLES

- D. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Furnish extended neck fittings to clear insulation.

2.5 CUSTOM ROOF DUCT SUPPORTS (NON-PENETRATING)

Coordinate duct layout and custom roof supports with roof curbs through which ductwork will be

connected to existing supply & return plenums.

- A. Duct and Cable Tray Support: Single or multiple duct supports and at varying heights above the roof and widths for maximum efficiency. System is designed to project specific requirements. The frame structure consists of two load distributing bases with vertical strut legs and a horizontal strut header. Supports are designed with a range of vertical adjustability. PROVIDE Horizontal cross bracing between adjacent frames . Provide rooftop duct layout drawings for manufacturer's use and the following:
 - 1. Deck Bases: UV resistant Polycarbonate, 9 by 15-1/4 inch (229 by 387 mm).
 - 2. Deck Bases: Stainless steel, 8 by 14 inch (203 by 356 mm).
 - 3. Deck Bases: Hot-dipped galvanized steel, 8 by 14 inch (203 by 357 mm).
 - 4. Duct Dimensions:SEE DRAWINGS
 - 5. Duct Material:SEEE SPEC SECTION 233000 for thickness.

6. Minimum / Maximum Clearance Above Roof: 16”-COORDINATE WITH CURBS.
7. Duct Insulation Thickness:Exterior Insulation, SEE SPEC SECTION 230700.
8. Maximum Outside Dimension: COORDINATE WITH DUCTS & ROOF CURBS (Width by Height).
9. Total Length of Duct Run: SEE DRAWINGS.
10. Quantity of Supports Required:Per SMACNA
11. Provide additional header bar to enclose equipment being supported.

B. ACCESSORIES

1. Fitted Support Pads: Designed specifically to fit non-penetrating rooftop supports for additional protection of the rooftop envelope. Slip resistant pads are heat molded with a small lip to hold the support pad and reduce movement on the rooftop. Holes in the pad save weight and allow for venting and drainage.
 - a. Support Pad Material: 100 percent recycled rubber.
 - b. Dimensions: Fitted 9 by 15 inch (230 by 381 mm).
 - c. Dimensions: Custom size as recommended by the manufacturer.
2. Flat Support Pads: Designed specifically to fit non-penetrating rooftop supports for additional protection of the rooftop envelope. Slip resistant pads are heat molded.
 - a. Support Pad Material: 100 percent recycled rubber.
 - b. Dimensions: 12 by 12 inch (305 by 305 mm).
 - c. Dimensions: Custom size as recommended by the manufacturer.
3. Spacers: Polycarbonate structure with gently rounded base, drainage holes and alignment pins that attached to other components to increase height.
 - a. Size: 1.5.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify sizes of equipment connections before fabricating transitions.
- B. Verify rated walls are ready for fire damper installation.
- C. Verify ducts and equipment installation are ready for accessories.
- D. Check location of air outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangement.
- E. **FOR ROOF MOUNTED CUSTOM DUCT SUPPORT:**
 1. Do not begin installation until substrates have been properly prepared.

2. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
3. Field Measurements and Quantity Take Off: A manufacturer certified technician shall perform on-site field measurements, coordinate design and layout, designate and tag products based on project conditions.

3.2 PREPARATION for roof mounted custom duct

- A. Clean roofing surfaces in accordance with the roofing manufacturer's instructions prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for each substrate under the project conditions.
- C. For ballasted or built-up roofs, all loose aggregate shall be removed from an area.

3.3 INSTALLATION

- A. Metal Ducts: Install in accordance with SMACNA Duct Construction Standards - Metal and Flexible.
- B. Connect flexible ducts to metal ducts with metal clamps.
- C. Use crimp joints with or without bead for joining round duct sizes 8 inch (200 mm) and smaller with crimp in direction of airflow.
- D. Install flexible connections immediately adjacent to fans and motorized equipment. Install flexible connections specified between fan inlet and discharge ductwork. Prevent flexible connectors being in tension while running.
- E. Install back-draft dampers on discharge of exhaust fans and as indicated on Drawings.
- F. Prevent passage of unfiltered air around filters by installing felt, rubber, or neoprene gaskets.
- G. Install filter gage static pressure tips upstream and downstream of filters. Mount filter gages on outside of filter housing or filter plenum, in accessible position. Adjust and level.
- H. Cut openings in ductwork to accommodate thermometers and controllers. Cut pitot tube openings for testing of systems, complete with metal can with spring device or screw to eliminate against air leakage.
- I. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities. Apply duct insulation specified in Section 22 07 00.

- J. Slope underground ducts to plenums or low pump out points at 1: 500. Install access doors for inspection. Coat buried ductwork with one coat and seams and joints with additional coat of asphalt base protective coating.
- K. Connect diffusers 5 feet (1.5 m) maximum length of flexible duct. Hold in place with clamp.
- L. During construction install temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- M. Install fire dampers at locations as indicated on Drawings. Install with perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
- N. Access Doors: Install access doors at the following locations:
 - 1. Spaced every 50 feet (15 m) of straight duct.
 - 2. Upstream of each elbow.
 - 3. Upstream of each reheat coil.
 - 4. Before and after each duct mounted filter.
 - 5. Before and after each duct mounted coil.
 - 6. Before and after each duct mounted fan.
 - 7. Before and after each automatic control damper.
 - 8. Install at locations for cleaning kitchen exhaust ductwork in accordance with NFPA 96.
- O. Access Door Sizes: Install minimum 8 x 8 inch (200 x 200 mm) size for hand access, 18 x 18 inch (450 x 450 mm) size for shoulder access, and [as indicated on Drawings]. [Install 4 x 4 inch (100 x 100 mm) for balancing dampers only.] Review locations prior to fabrication.
- P. Install balancing dampers on duct take-off to diffusers and grilles and registers, regardless of whether dampers are specified as part of diffuser, or grille and register assembly.
- Q. Do not operate fans until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.
- R. Install fans with resilient mountings and flexible electrical leads.
- S. Install sheaves required for final air balance.
- T. Install safety screen where fan inlet or outlet is exposed.
- U. Install fans with access to adjustable blade axial fan wheels for varying blade angle setting. Adjust blades for varying range of volume and pressure.

- V. Install temporary duct test holes required for testing and balancing purposes. Cut or drill in ducts. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

- W. FOR ROOF MOUNTED CUSTOM DUCT SUPPORT:
 - 1. Supports shall be installed as per the product specifications and or project specific submittals.
 - 2. Install an additional sheet of roofing material, a support pad, or a deck plate beneath the base of each stand.
 - 3. Place the supports:
 - 4. Center each stand beneath the component so supports are aligned.
 - 5. Adjustable Supports: Adjust height of each support to achieve proper height and level before installing supported item.
 - 6. Level hangers, rollers or struts before installing component.
 - 7. Make final height adjustments to provide even distribution of load on all supports.

3.4 FIELD QUALITY CONTROL

- A. For Roof mounted custom duct support:
 - 1. When requested by COR, provide a factory-trained representative of manufacturer to visit site while work is in progress to assure that installation complies with design requirements and manufacturer's installation requirements.
 - 2. After system startup, correct any deficiencies that arise, including but not limited to, improper location or position, improper seating or level on the roof, lack of roof pads or deck plates, inadequate operation, and as directed by COR.

3.5 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

DIVISION 23 – HVAC

SECTION 23 62 13 PACKAGED AIR COOLED DX AIR CONDITIONING UNITS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Perform all Work required to provide a fully packaged air-cooled, direct expansion (DX) air conditioning (AC) unit. The packaged AC unit shall perform to manufacturer's product data, installation instructions, Start-up instructions and maintenance information indicated by all Specification Sections, and Contract Documents with supplementary items necessary for proper operation.
- B. Packaged air-cooled AC unit shall consist of the following as a minimum: hermetic scroll compressor(s) component utilizing R-410A or 407C, evaporator coil, air-cooled condenser coil, condenser fans, supply fan, vibration isolation assemblies, and microprocessor control center.

1.3 REFERENCE STANDARDS

- A. The latest published edition of a reference shall be applicable to this Project unless identified by a specific edition date.
- B. All reference amendments adopted prior to the effective date of this Contract shall be applicable to this Project.
- C. All materials, installation and workmanship shall comply with the applicable requirements and standards addressed within the following references:
 - 1. ARI - 1060 Rating Air-to-Air Energy Recovery Equipment.
 - 2. ARI 210/240 - Unitary Air-Conditioning and Air-Source Heat Pump Equipment.
 - 3. ARI 340/360 - Commercial Unitary Air-Conditioning and Air-Source Heat Pump Equipment.
 - 4. ARI 410 - Standard for Forced-Circulation Air-Cooling and Air-Heating Coils.
 - 5. ANSI/ASHRAE 15 - Safety Standard for Refrigeration Systems.

6. ASHRAE 90.1 - Energy Standard for Buildings Except Low Rise Residential Buildings. Latest state adopted version.
7. ASHRAE 52.2 - Method of Testing General Ventilation Air-Cleaning Devices Used for Removal Efficiency.
8. ANSI/AMCA Standard 210 - Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
9. AMCA Publication 211 - Certified Ratings Program - Product Rating Manual for Fan Air Performance.
10. AMCA Standard 300 - Reverberant Room Method for Sound Testing of Fans.
11. AMCA Publication 311 - Certified Ratings Program.
12. AMBA Method of Evaluating Load Ratings of Bearings ANSI-11.
13. ANSI/AMCA Standard 204 - Balance Quality and Vibration Levels for Fans.
14. ASTM B-117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.
15. ANSI Z21.47 - Gas-Fired Central Furnaces.
16. ANSI/ASHRAE Standard 135 BacNet - A Data Communication Protocol for Building Automation and Control Network.
17. NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems.
18. AMCA Standard 500 – Standard for Testing Dampers

1.4 QUALITY ASSURANCE

- A. The design of the unit shall be AGA and ARI certified as combination heating-cooling units for rooftop installation.
- B. Unit construction shall comply with ASHRAE 15 safety code, NEC, and UL applicable codes.
- C. Cooling capacity ratings shall be in accordance with ARI standard 210/240, most recent edition.
- D. In no case shall the air cooled packaged DX air conditioning unit selected have an EER or SEER (if cooling capacity is less than 65,000 Btu/hr) less than that specified by AHRAE 90.1.
- E. Insulation and adhesive shall meet NFPA 90A requirements.

1.5 SUBMITTALS

- A. Product Data:

1. Provide literature that indicates dimensions, weight, loading, clearances, capacities, gauges, thickness, and finishes of materials, electrical characteristics and connections.
2. Rigging, installation, testing, Start-up and operating instructions, maintenance data including type and quantity of oil and refrigerant change (pounds), parts lists, and troubleshooting guide.
3. Data on energy input versus cooling load output from 100 percent to 20 percent of full load with constant entering condenser air temperature.
4. Information about control and wiring diagrams.
5. Product test data on sound power levels for both fan inlet and outlet at the rated design capacity.
6. Operating data such as fans speeds, compressor LRA and RA, sound levels
7. Product data on special condenser coating.
8. Product data on all condenser fan accessories such as controls.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store, protect and handle products to the Project Site under provisions of Division 01 and Division 20.
- B. Accept products on Site in factory-fabricated protective containers or coverings, with factory-installed shipping skids and lifting lugs. Inspect for damage.
- C. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.
- D. Check and maintain equipment on monthly basis to ensure equipment is being stored in accordance with manufacturer's recommended practices. Storage record shall be maintained that indicates above requirements have been met.

1.7 WARRANTY

- A. Units shall be furnished with full coverage warranty against defects in materials. Warranty on the complete unit shall be for one year from the Substantial Completion date. On the compressors, warranty shall be for five (5) years from the Substantial Completion date.

PART 2 PRODUCTS

2.1 GENERAL

- A. All materials shall meet or exceed all applicable referenced standards, federal, state and local requirements, and conform to codes and ordinances of authorities having jurisdiction.

- B. Factory assembled air-cooled packaged DX air conditioning unit using a refrigerant charge (R410A) with the following construction:
1. Double wall G90 galvanized cabinet.
 2. Factory control and electrical wiring and piping shall be contained within the unit cabinet.
 3. Double wall access doors with stainless hinges and zinc cast lockable handles.
 4. Compressors and unit controls contained within single isolated compartment.
 5. Scroll compressors installed on sheet metal deck with rubber isolation mounts for quiet efficient operation.
 6. Compressor isolation valves.
 7. DX coil(s).
 8. Hot gas reheat coil.
 9. Condenser coil(s) with protective coating on fins.
 10. Stainless steel gas heat exchanger.
 11. Stainless steel evaporator coil support.
 12. Direct drive blower plenum fan(s) with variable frequency drive (VFD).
 13. Stainless steel drain pan.
 14. Blower motor(s) installed on rubber isolation mounts for quiet efficient operation.
 15. Direct drive condenser fan(s).
 16. Bottom access return and supply air except as indicated on drawings.
 17. Air filters with multiple options, efficiencies and monitoring devices.
 18. Roof sloped for proper drainage.
 19. Single point power connection.
 20. Thermostatic expansion valves on DX coils.
 21. Manual reset high pressure cutoffs.
 22. Automatic reset low pressure cutoffs.
 23. Run test report, wiring diagram, installation manual and Start-up form in control access compartment.
 24. GFI convenience outlets.
 25. Weather-resistant finish paint coating which passes minimum 750 hour salt spray test.
- C. Other equipment as indicated on the Drawings and in these specifications:
1. Power return fan and economizer.
 2. Power exhaust fan, and energy recovery wheel.
 3. Smoke detectors in return and/or supply air.
 4. Phase and brown-out protection.
 5. Horizontal supply and return air curb.
 6. Humidity control.
- D. Compressor shall have load capacity ratings per the requirements ARI 210/240.

- E. Unit efficiency shall be in compliance with the requirements of the latest adopted version of International Energy Conservation Code and AHSRAE 90.1.
- F. Unit dampers shall have a maximum leakage rate of 4 cfm per square foot of damper area at 1” w.g. when tested according to AMCA/ANSI standard 500.

2.2 CABINET AND INSULATION

- A. The double wall cabinet housing shall be constructed of heavy gauge galvanized steel framework covered with galvanized steel sheet casing. Casing metal shall be finished with weather-resistant finish paint.
- B. Provide stainless steel lifting lugs to allow placement of the unit using a crane and sling.
- C. The double wall weatherproof cabinet of the indoor air section shall be suitably insulated and have thermal breaks to prevent condensation on any cabinet surface exposed to outside atmosphere conditions.
- D. If the unit is not placed on a roof, make provisions to elevate and support the unit off the ground or grade level to protect unit from standing in water.

2.3 COMPRESSORS

- A. Each scroll compressor shall be fitted with crankcase heater, vibration isolators, refrigerant dryer, external connections for external oil level control if multiple compressors are required, motor winding protection, high and low pressure cutouts, plus any other protective or operating device or fitting required and provided as standard by the compressor manufacturer. Compressors shall be designed for continuous or cycling operation at the specified design conditions without detrimental effect.
- B. Each unit shall include variable frequency controlled, variable speed scroll compressor on the lead refrigeration circuit or all compressors shall be digital scroll which shall be capable of modulating refrigerant capacity. All refrigeration circuits not using digital scroll compressors shall be provided with factory installed hot gas bypass.

2.4 FANS, MOTORS, AND DRIVES

- A. Indoor airflow and external static pressure capabilities shall be no less than the values indicated on the Drawings. Internal static pressure shall include a minimum allowance for 2-inch pleated type filters.
- B. All fan(s) and motor(s) shall be in compliance with the fan power limitation in ASHRAE 90.1.

- C. Outdoor fans shall be direct drive, shaft mounted propeller type, statically and dynamically balanced. Outdoor fan motor(s) shall be TEFC weather resistant with permanently lubricated bearings.
- D. Indoor fans shall be direct drive, shaft mounted centrifugal or plenum type, statically and dynamically balanced. Indoor fan motor(s) shall be TEFC with sealed lubricated bearings.
- E. All fans shall be either ECM or controlled by a variable frequency drive integral with the packaged unit.

2.5 AIR FILTERS

- A. Manufacturer shall provide one (1) set of scheduled filters for each air handling unit as shown on the Drawings. The filters shall be boxed and placed within the air handling unit during shipment. The box shall identify the type of filter and be labeled with the corresponding air handling unit identification tag number.
- B. Front frame loaded filters shall be easily accessible for removal through access panels or doors.
- C. Filters shall be [MERV 8] [MERV 13] efficiency in accordance with ASHRAE Standard 52.2. Furnish additional filter casings and filters per the Drawings. [MERV 8 filters shall have a clean air pressure drop of 0.25" w.g. at 500 fpm] [MERV 13 filters shall have a clean air pressure drop of 0.3" w.g. at 500 fpm]. Acceptable manufacturers shall be Flanders, 3M, American Air Filter, and Camfil Farr.
- D. Unit shall include a clogged filter switch.

2.6 COILS AND CAPACITY CONTROL

- A. Coils shall be standard construction copper tubes with aluminum fins. All copper work shall be brazed. Coils shall be factory pressure tested. Condenser coils have the option to be anti-corrosion coated aluminum fin and tube microchannel.
- B. Indoor coils shall be capable of the performance indicated on the Drawings with no "blow-off" of condensate.
- C. Indoor coils shall be equipped with a sloped, stainless steel condensate pan terminating at a condensate drain located outside the unit cabinet.
- D. Units with rated capacity smaller than 65,000 BTUH shall not be required to have part-load refrigeration capability. Units with a rated capacity greater than or equal to 65,000 BTUH shall have minimum two (2) stages of cooling per ASHRAE 90.1.

- E. The refrigeration system shall be equipped with filter dryers on the liquid lines and service valves with gauge port connections on the discharge and suction lines.
- F. Single zone units shall have hot gas reheat coils for humidity control.

2.7 ELECTRICAL HEAT OPTION

- A. Units shall be equipped with an electrical coil resistant heating element accessory in wattage as designated on Drawings and Schedules, that is to be set-up for emergency use.
- B. Limit switch shall shutdown the burner in case operating controls fail.
- C. Electric heat compartment:
 - 1. Aluminum foil- faced fiberglass insulation shall be used.
 - 2. Insulation and adhesive shall meet NFPA 90A requirements for flame spread and smoke generation.

2.8 ELECTRICAL REQUIREMENTS

- A. The unit shall be designed for the electrical service designated on the Drawings.
- B. Unit's will come wired with Power convenience outlet.
- C. Arrange electrical cabinet for connecting electrical service at one point only.
- D. Power and control wiring of the unit shall be factory installed complete within the unit. Provide correctly identified suitable lugs and terminal strips for field connection to electrical power and external controls.
- E. Factory equip unit with motor starters and VFDs for each of the motor driven components.

2.9 CONTROLS

- A. Integral Unit Controls: As a minimum, the packaged AC unit's components shall be protected with high pressure-stat, loss-of-charge protection, current and temperature sensitive overload devices, and anti-short cycle timer control circuit to prevent the compressor from restarting for five (5) minutes after stopping.
- B. The microprocessor controller provided by the equipment manufacturer shall be capable of BEING STANDALONE AND OPERATING EQUIPMENT FROM A TOUCH SCREEN OPERABLE THERMOSTATIC SENSOR & ALSO BEING CAPABLE OF receiving signals from a variety of control sources, which are not mutually exclusive.

1. The controller shall BE ABLE TO BE interfaced with the building automation system (BAS) via the BACNet in the future.
2. All variables listed in the points list shall be passed to the BAS via the LON or BACnet gateway.
3. BACnet controllers shall conform to ASHRAE Standard 135 and communicate to a TCP/IP Ethernet physical layer.
- 4.

2.10 ACCESSORIES

- A. Roof Curb:
1. Furnish one complete 24" high roof curb for each packaged unit, designed for weatherproof installation. Curb shall be furnished approved by unit manufacturer.
 2. Supply and return ducts shall connect through the curbed opening with flexible connections to the bottom (or front) of the A/C unit, unless shown otherwise on the Drawings.
 3. Curb shall comply with National Roofing Contractors Association requirements.
 4. Slope of roof curb shall match roof slope to provide for level support of packaged unit.
 5. Contractor shall be responsible for coordination of curb, supply and return ducts, and weatherproofing of the entire installation.
- B. On units of nominal cooling capacity 15 tons and higher, supply and install a 14-inch minimum height vibration isolation roof curb fabricated to the National Roofing Contractors Association. The curb shall be fabricated of aluminum upper and lower sections incorporating vibration isolation springs with a minimum of 1-inch deflection. Provide a continuous weather resistant skirt or seal to cover the spring assembly.
- C. Outside air intake assembly, including low-leak dampers, weather hood, and motorized open/closed actuators.
- D. Units shall be equipped with economizers as specified on the Drawings and as required by ASHRAE 90.1. Economizers shall include a fully modulating 100 percent outside air damper that is mechanically interlocked with a return air damper.
1. Where designated on the Drawings, units shall be equipped with a powered exhaust fan and necessary controls to prevent pressurization of the building during economizer operation.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Installation shall meet or exceed all applicable federal, state and local requirements, referenced standards and conform to codes and ordinances of authorities having jurisdiction.
- B. All installation shall be in accordance with manufacturer's published recommendations.
- C. Contractor shall furnish and maintain and replace clean pre-filter media in each air handling unit as listed in the equipment schedule on the Drawings during start-up and construction. The Contractor shall install the tagged set of new filter products provided by the air handling unit manufacturer for each unit after it has been tested, commissioned and receives final acceptance by the Owner.
- D. Gas/electric packaged air conditioning units shall be installed according to manufacturer's recommendations to be completely weatherproof. Protect the roof from damage during installation. Secure factory touch-up paint to repair scratches and minor damage to equipment prior to Start-up.
- E. Power wiring to the units, including externally mounted service disconnect switch, shall be furnished and installed under Division 26. Installing Contractor shall be provided with the manufacturer's Shop Drawings as required for power wiring installation.
- F. Controls for conditioned spaces shall be as required under Division 25, Building Automation System. Control wiring shall be under Division 23. Actual pulling of wires may be accomplished by subcontract or Division 26 Contractor; however, Division 25 shall retain responsibility for correctness of wiring, connections, and full operation of the control system.

3.2 TESTING

- A. Equipment shall be cycled through all heating, cooling, and ventilation cycles to ensure proper operation of all components and controls prior to test and balance.
- B. At time of Start-up, manufacturer's representative shall visit the Project Site and verify that unit installation and performance is satisfactory, and to make any adjustments or settings to unit operating and safety controls that may be required.
- C. Include Start-up checkout service of at least one working day for one service technician, including a written report of operational check provided to the Owner. Owner's Representative may require that the Start-up service be performed with Owner's attendance and on-site review.

- D. Clean filters shall be placed within the unit at the time of Substantial Completion.
- E. Refer to Division 01 91 00 for commissioning requirements.

3.3 TRAINING

- A. Refer to Division 01 for training and demonstration requirements.

END OF SECTION

DIVISION 26 – ELECTRICAL

SECTION 26 05 19 LOW-VOLTAGE CONDUCTORS AND CABLES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes building wire, wiring connectors and connections.
- B. Related Sections:
 - 1. Section 26 05 33 – Raceway & Boxes

1.2 REFERENCES

- A. National Fire Protection Association:
 - 1. NFPA 70 - National Electrical Code.
 - 2. NFPA 262 - Standard Method of Test for Flame Travel and Smoke of Wires and Cables for Use in Air-Handling Spaces.
- B. Underwriters Laboratories, Inc.:
 - 1. UL 62 – Flexible Cords and Cables
 - 2. UL 1277 - Standard for Safety for Electrical Power and Control Tray Cables with Optional Optical-Fiber Members.

1.3 SYSTEM DESCRIPTION

- A. Product Requirements: Provide products as follows:
 - 1. Solid conductor for feeders and branch circuits 10 AWG and smaller.
 - 2. Stranded conductors for control circuits.
 - 3. Conductor not smaller than 12 AWG for power and lighting circuits.
 - 4. Conductor not smaller than 14 AWG for fire alarm and control circuits.
 - 5. Increase wire size in branch circuits to limit voltage drop to a maximum of 3 percent.
- B. Wiring Methods: Provide the following wiring methods unless specifically noted otherwise on the Contract Drawings:
 - 1. Exposed Dry Interior Locations: Use building wire, Type THHN/THWN insulation, in raceway.
 - 2. Above Accessible Ceilings: Use building wire, Type THHN/THWN insulation, in raceway.

1.4 SUBMITTALS

- A. Refer to Section 01 33 00 - Submittal Procedures for overall submittal procedures and specific requirements associated with each type of submittal listed below.
- B. Types of submittals required for this Section:
 - 1. Product Data
- C. Refer to the List of Submittals document at the end of Division I for a detailed list of every submittal required for the products and workmanship covered under this Section.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years experience.

PART 2 PRODUCTS

2.1 BUILDING WIRE

- A. Product Description: Single conductor insulated wire.
- B. Conductor: Copper.
- C. Insulation Voltage Rating: 600 volts.
- D. Insulation Temperature Rating: 90 degrees C.
- E. Insulation Material: Thermoplastic or Thermosetting, as indicated above.

2.2 TERMINAL LUGS

- A. Terminal Lugs for Wires 6 AWG and Smaller: Solderless, compression type copper.
- B. Lugs for Wires 4 AWG and Larger: Color keyed, compression type copper, with insulating sealing collars.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify interior of building has been protected from weather.

- B. Verify mechanical work likely to damage wire and cable has been completed.
- C. Verify raceway installation is complete and supported.

3.2 COORDINATION

- A. Where wire and cable destination is indicated and routing is not shown, determine routing and lengths required.
- B. Wire and cable routing indicated is approximate unless dimensioned.

3.3 PREPARATION

- A. Completely and thoroughly swab raceway before installing wire.

3.4 EXISTING WORK

- A. Remove exposed abandoned wire and cable, including abandoned wire and cable above accessible ceiling finishes. Patch surfaces where removed cables pass through building finishes.
- B. Disconnect abandoned circuits and remove circuit wire and cable. Remove abandoned boxes when wire and cable servicing boxes is abandoned and removed. Install blank cover for abandoned boxes not removed.
- C. Provide access to existing wiring connections remaining active and requiring access. Modify installation or install access panel.
- D. Extend existing circuits using materials and methods as specified.
- E. Clean and repair existing wire and cable remaining or wire and cable to be reinstalled.

3.5 INSTALLATION

- A. Route wire and cable to meet Project conditions.
- B. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- C. Color Code wire and cable as stated herein.
- D. Equipment Grounding Conductor: Install separate, insulated copper conductor with each feeder and branch circuit. Terminate each end on suitable lug, bus, or bushing.
- E. Special Techniques--Building Wire in Raceway:
 - 1. Pull conductors into raceway at same time.

2. Install building wire 4 AWG and larger with pulling equipment.
- F. Special Techniques - Wiring Connections:
1. Clean conductor surfaces before installing lugs and connectors.
 2. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
 3. Install insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.
- G. Size lugs in accordance with manufacturer's recommendations terminating wire sizes. Install 2-hole type lugs to connect wires 4 AWG and larger to copper bus bars.
- H. For terminal lugs fastened together such as on motors, transformers, and other apparatus, or when space between studs is small enough that lugs can turn and touch each other, insulate for dielectric strength of 2-1/2 times normal potential of circuit.

3.6 WIRE COLOR

- A. General:
1. For wire sizes 10 AWG and smaller, install wire colors in accordance with the following:
 - a. Black and red for single phase circuits at 120/240 volts.
 - b. Black, red, and blue for circuits at 120/208 volts single or three phase.
 2. For wire sizes 8 AWG and larger, identify wire with colored tape at terminals, splices and boxes. Colors are as follows:
 - a. Black and red for single phase circuits at 120/240 volts.
 - b. Black, red, and blue for circuits at 120/208 volts single or three phase.
- B. Neutral Conductors: White.
- C. Branch Circuit Conductors: Install three or four wire home runs with each phase uniquely color coded.
- D. Feeder Circuit Conductors: Uniquely color code each phase.
- E. Ground Conductors:
1. For 6 AWG and smaller: Green.
 2. For 4 AWG and larger: Identify with green tape at both ends and visible points including junction boxes.

END OF SECTION

DIVISION 26 – ELECTRICAL

SECTION 26 05 29 HANGERS AND SUPPORTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Conduit supports.
 - 2. Firestopping relating to electrical work.
 - 3. Equipment bases and supports.

1.2 REFERENCES

- A. National Fire Protection Association:
 - 1. NFPA 70 - National Electrical Code.
- B. Underwriters Laboratories Inc.:
 - 1. UL 723 - Tests for Surface Burning Characteristics of Building Materials.
 - 2. UL 1479 - Fire Tests of Through-Penetration Firestops.

1.3 DEFINITIONS

- A. Firestopping (Through-Penetration Protection System): Sealing or stuffing material or assembly placed in spaces between and penetrations through building materials to arrest movement of fire, smoke, heat, and hot gases through fire rated construction.

1.4 SUBMITTALS

- A. Refer to Section 01 33 00 - Submittal Procedures for overall submittal procedures and specific requirements associated with each type of submittal listed below.
- B. Types of submittals required for this Section:
 - 1. Product Data
- C. Refer to the List of Submittals document at the end of Division I for a detailed list of every submittal required for the products and workmanship covered under this Section.

1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years experience.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Accept materials on site in original factory packaging, labeled with manufacturer's identification.
- B. Protect from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original packaging.

1.7 ENVIRONMENTAL REQUIREMENTS

- A. Do not apply firestopping materials when temperature of substrate material and ambient air is below 60 degrees F.

PART 2 PRODUCTS

2.1 CONDUIT SUPPORTS

- A. Hanger Rods: Threaded high tensile strength galvanized carbon steel with free running threads.
- B. Beam Clamps: Galvanized steel, with tapered hole in base and back to accept either bolt or hanger rod. Set screw: hardened steel.
- C. Conduit clamps for trapeze hangers: Galvanized steel, notched to fit trapeze with single bolt to tighten.
- D. Conduit clamps - general purpose: One hole galvanized steel for surface mounted conduits.
- E. Cable Ties: High strength nylon temperature rated to 185 degrees F. Self locking.

2.2 FIRESTOPPING

- A. Product Description: Different types of products by multiple manufacturers are acceptable as required to meet specified system description and performance requirements; provide only one type for each similar application.
 - 1. Silicone Firestopping Elastomeric Firestopping: Single or multiple component silicone elastomeric compound and compatible silicone sealant.

2. Foam Firestopping Compounds: Single or multiple component foam compound.
 3. Formulated Firestopping Compound of Incombustible Fibers: Formulated compound mixed with incombustible non-asbestos fibers.
 4. Fiber Stuffing and Sealant Firestopping: Composite of mineral or ceramic fiber stuffing insulation with silicone elastomer for smoke stopping.
- B. Firestopping Materials: UL 1479 to achieve fire ratings as noted on Drawings for adjacent construction, but not less than 1 hour fire rating.
- C. Accessories:
1. Primer: Type recommended by firestopping manufacturer for specific substrate surfaces and suitable for required fire ratings.
 2. Installation Accessories: Provide clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

PART 3 EXECUTION

3.1 PREPARATION

- A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter affecting bond of firestopping material.
- B. Remove incompatible materials affecting bond.

3.2 INSTALLATION - HANGERS AND SUPPORTS

- A. Anchors and Fasteners:
 1. Concrete Structural Elements: Provide precast inserts, expansion anchors, powder actuated anchors or preset inserts.
 2. Steel Structural Elements: Provide beam clamps, spring steel clips, or steel ramset fasteners.
 3. Concrete Surfaces: Provide expansion anchors.
 4. Hollow Masonry, Plaster, and Gypsum Board Partitions: Provide toggle bolts or hollow wall fasteners.
 5. Solid Masonry Walls: Provide expansion anchors or preset inserts.
 6. Sheet Metal: Provide sheet metal screws.
 7. Wood Elements: Provide wood screws.
- B. Inserts:
 1. Install inserts for placement in concrete forms.
 2. Install inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.

3. Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 4 inches.
 4. Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
- C. Install conduit and raceway support and spacing in accordance with NEC.
- D. Do not fasten supports to pipes, ducts, mechanical equipment, or conduit.
- E. Supports:
1. Fabricate supports from structural steel or formed steel channel. Install hexagon head bolts to present neat appearance with adequate strength and rigidity. Install spring lock washers under nuts.
 2. Install surface mounted cabinets and panelboards with minimum of four anchors.
 3. In wet and damp locations install steel channel supports to stand cabinets and panelboards 1 inch off wall.
 4. Support vertical conduit at every floor.

3.3 INSTALLATION - FIRESTOPPING

- A. Install material at fire rated construction perimeters and openings containing penetrating sleeves, piping, ductwork, conduit and other items, requiring firestopping.
- B. Apply primer where recommended by manufacturer for type of firestopping material and substrate involved, and as required for compliance with required fire ratings.
- C. Apply firestopping material in sufficient thickness to achieve required fire and smoke rating.
- D. Compress fibered material to maximum 40 percent of its uncompressed size.
- E. Place foamed material in layers to ensure homogenous density, filling cavities and spaces. Place sealant to completely seal junctions with adjacent dissimilar materials.
- F. Fire Rated Surface:
1. Where conduit penetrates fire rated surface, install firestopping product in accordance with manufacturer's instructions.
- G. Non-Rated Surfaces:
1. Install escutcheons, floor plates or ceiling plates where conduit, penetrates non-fire rated surfaces in occupied spaces. Occupied spaces include rooms with finished ceilings and where penetration occurs below finished ceiling.

2. Interior partitions: Apply sealant to both sides of penetration to completely fill annular space around sleeve and/or conduit.

3.4 INSTALLATION - EQUIPMENT BASES AND SUPPORTS

- A. Using templates furnished with equipment, install anchor bolts, and accessories for mounting and anchoring equipment.

3.5 FIELD QUALITY CONTROL

- A. Inspect installed firestopping for compliance with specifications and submitted schedule.

3.6 CLEANING

- A. Clean adjacent surfaces of firestopping materials.

END OF SECTION

DIVISION 26 – ELECTRICAL

SECTION 26 05 33 RACEWAY AND BOXES

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes conduit, tubing, boxes, and wall plates.
- B. Related Sections:
 - 1. Section 26 05 19 – Low-Voltage Electrical Power Conductors and Cables.
 - 2. Section 26 05 29 - Hangers and Supports for Electrical Systems.
 - 3. Section 27 13 53 – Communications Services Cabling.

1.2 REFERENCES

- A. American National Standards Institute:
 - 1. ANSI C80.3 - Specification for Electrical Metallic Tubing, Zinc Coated.
- B. National Electrical Manufacturers Association:
 - 1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).
 - 2. NEMA OS 1 - Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports.

1.3 SYSTEM DESCRIPTION

- A. Raceway and boxes located as indicated on Drawings, and at other locations required for splices, taps, wire pulling, equipment connections, and compliance with regulatory requirements. Raceway and boxes are shown in approximate locations unless dimensioned. Provide raceways for the entire wiring system.
- B. Outdoor Locations, Above Grade: For final connection to motor loads, provide short section of liquidtight flexible metal conduit from junction box inside building to roof mounted equipment.
- C. Above Accessible Ceiling: Provide electrical metallic tubing. Provide sheet-metal boxes. Provide hinged enclosure for large pull boxes.
- D. Exposed Dry Locations: Provide electrical metallic tubing. Provide sheet-metal boxes. Provide hinged enclosure for large pull boxes.

1.4 DESIGN REQUIREMENTS

- A. Minimum Raceway Size:
 - 1. Power: 3/4 inch
 - 2. Fire Alarm / Control: 1/2 inch

1.5 SUBMITTALS

- A. Refer to Section 01 33 00 - Submittal Procedures for overall submittal procedures and specific requirements associated with each type of submittal listed below.
- B. Types of submittals required for this Section:
 - 1. Product Data
- C. Refer to the List of Submittals document at the end of Division I for a detailed list of every submittal required for the products and workmanship covered under this Section.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.

PART 2 PRODUCTS

2.1 ELECTRICAL METALLIC TUBING (EMT)

- A. Product Description: ANSI C80.3; galvanized tubing.
- B. Fittings and Conduit Bodies: NEMA FB 1; galvanized steel, compression or set screw type. Provide insulated throat type connectors. Provide raintight fittings where installed in damp locations.

2.2 LIQUIDTIGHT FLEXIBLE METAL CONDUIT

- A. Product Description: Interlocked, hot-dipped galvanized steel construction with PVC jacket.
- B. Fittings: NEMA FB 1. Provide insulated throat type connectors.

2.3 BOXES

- A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.
 - 1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; furnish 1/2 inch male fixture studs where required.

2. Concrete Ceiling Boxes: Concrete type.
3. Wall / Cover Plates:
 - a. Flush Mount Box: 302 Stainless steel.
 - b. Surface Mount Box: Galvanized steel, Raised cover with rounded edges. Mud rings are not acceptable.
 - c. Above Accessible Ceiling: Galvanized steel, sheet metal, blank.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Verify equipment locations and routing and termination locations of raceway prior to rough-in.

3.2 EXISTING WORK

- A. Remove exposed abandoned raceway, including abandoned raceway above accessible ceiling finishes. Cut raceway flush with walls and floors, and patch surfaces.
- B. Disconnect abandoned outlets and remove devices. Remove abandoned boxes when raceway is abandoned and removed. Install blank cover for abandoned boxes not removed.
- C. Maintain access to existing boxes and other installations remaining active and requiring access. Modify installation or provide access panel.
- D. Extend existing raceway and box installations using materials and methods as specified.
- E. Clean and repair existing raceway and boxes to remain or to be reinstalled.

3.3 INSTALLATION

- A. Ground and bond raceway and boxes.
- B. Fasten raceway and box supports to structure and finishes in accordance with Section 26 05 29.
- C. Identify fire alarm raceway and boxes in accordance with Section 26 05 53.
- D. Arrange raceway and boxes to maintain headroom and present neat appearance.

3.4 INSTALLATION - RACEWAY

- A. Raceway routing is shown in approximate locations unless dimensioned. Route to complete wiring system.
- B. Arrange raceway supports to prevent misalignment during wiring installation.
- C. Support raceway using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- D. Do not support raceway with wire or perforated pipe straps. Remove wire used for temporary supports
- E. Do not attach raceway to ceiling support wires or other piping systems.
- F. Route exposed raceway parallel and perpendicular to walls.
- G. Route raceway installed above accessible ceilings parallel and perpendicular to walls.
- H. Route conduit in and under slab from point-to-point.
- I. Maintain clearance between raceway and piping for maintenance purposes.
- J. Maintain 12 inch clearance between raceway and surfaces with temperatures exceeding 104 degrees F.
- K. Cut conduit square using saw or pipe cutter; de-burr cut ends.
- L. Bring conduit to shoulder of fittings; fasten securely.
- M. Install sealing locknuts to fasten conduit to sheet metal boxes in damp locations. Utilize conduit hubs to fasten threaded conduit to cast boxes in wet locations.
- N. Install no more than equivalent of three 90 degree bends between boxes. Install conduit bodies to make sharp changes in direction, as around beams. Install factory elbows for bends in metal conduit larger than 2 inch size.
- O. Avoid moisture traps; install junction box with drain fitting at low points in conduit system.
- P. Install fittings to accommodate expansion and deflection where raceway crosses expansion joints.
- Q. Install suitable pull string or cord in each empty raceway except sleeves and nipples.

- R. Install suitable caps to protect installed conduit against entrance of dirt and moisture.

3.5 INSTALLATION - BOXES

- A. Install wall mounted boxes at elevations to accommodate mounting heights specified in section for outlet device.
- B. Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- C. In Accessible Ceiling Areas: Install outlet and junction boxes no more than 6 inches from ceiling access panel or from removable recessed luminaire.
- D. Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- E. Do not fasten boxes to ceiling support wires or other piping systems.
- F. Support boxes independently of conduit.
- G. Install gang box where more than one device is mounted together. Do not use sectional box.

3.6 INTERFACE WITH OTHER PRODUCTS

- A. Install conduit to preserve fire resistance rating of partitions and other elements.
- B. Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket. Coordinate location with roofing installation.
- C. Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.

3.7 CLEANING

- A. Clean interior of boxes to remove dust, debris, and other material.
- B. Clean exposed surfaces and restore finish.

END OF SECTION

DIVISION 26 – ELECTRICAL

SECTION 26 05 53 IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fire Alarm Raceway Markings.

1.2 SUBMITTALS

- A. Refer to Section 01 33 00 - Submittal Procedures for overall submittal procedures and specific requirements associated with each type of submittal listed below.
- B. Types of submittals required for this Section:
 - 1. Product Data
- C. Refer to the List of Submittals document at the end of Division I for a detailed list of every submittal required for the products and workmanship covered under this Section.

PART 2 PRODUCTS

2.1 FIRE ALARM RACEWAY MARKINGS:

- A. Cover Plate, Junction Box: Factory painted red cover plate.
- B. Conduit Marking: Field applied, self-adhesive, red, 1 inch wide, vinyl marking tape.
- C. Application: Refer to Part 3, Execution, of this specification for information on where red cover plates and conduit markings are required.

PART 3 EXECUTION

3.1 PREPARATION

- A. Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

A. Fire Alarm Raceway Marking:

1. Install a factory painted red cover plate on each junction box.
2. For conduit installed in crawl spaces, mechanical rooms, attics, above suspended ceilings, and other unfinished spaces: Mark conduit with a red colored band every 20 feet, minimum. All fire alarm conduits running completely through a space shall be marked at least once. A red colored cover plate within the 20 feet shall count as the conduit being marked.

END OF SECTION

DIVISION 26 – ELECTRICAL

SECTION 26 24 16 CIRCUIT BREAKERS

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes circuit breakers.

1.2 REFERENCES

- A. National Electrical Manufacturers Association:
 - 1. NEMA AB 1 - Molded Case Circuit Breakers and Molded Case Switches.
- B. National Fire Protection Association:
 - 1. NFPA 70 - National Electrical Code.
- C. Underwriters Laboratories Inc.:
 - 1. UL 67 - Safety for Panelboards.

1.3 SUBMITTALS

- A. Refer to Section 01 33 00 - Submittal Procedures for overall submittal procedures and specific requirements associated with each type of submittal listed below.
- B. Types of submittals required for this Section:
 - 1. Product Data
- C. Refer to the List of Submittals document at the end of Division I for a detailed list of every submittal required for the products and workmanship covered under this Section.

PART 2 PRODUCTS

2.1 CIRCUIT BREAKERS

- A. Molded Case Circuit Breakers: NEMA AB 1, bolt-on circuit breakers with integral thermal and magnetic trip in each pole.
 - 1. Circuit breakers shall be compatible with the existing Cutler-Hammer Panelboard.
 - 2. Provide circuit breakers with the number of poles and trip ratings as indicated on the Contract Drawings.

3. Furnish UL listed Type HACR circuit breakers for air conditioning equipment branch circuits.
4. Tandem type circuit breakers are not acceptable.
5. Provide bus connector kits.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Install filler plates for all unused spaces in panelboards.
- B. Install circuit breakers in accordance with manufacturer's recommendations.
- C. Revise existing panelboard directories as necessary.

3.2 FIELD QUALITY CONTROL

- A. Field test all new circuit breakers for proper on/off operation.

END OF SECTION

DIVISION 32 – EXTERIOR IMPROVEMENTS

SECTION 32 92 27 LAWN RESTORATION

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Topsoil
 - 2. Fertilizer
 - 3. Seeding

1.2 REFERENCES

- A. New Jersey Department of Transportation
 - 1. NJDOT Specifications – New Jersey Department of Transportation Standard Specifications for Road and Bridge Construction, 2001, with revisions.
- B. ASTM International:
 - 1. ASTM D 5268 Standard Specification for Topsoil Used for Landscaping Purposes.
- C. Association Of Official Seed Analysts
 - 1. AOSA – Rules for Testing Seeds

1.3 DEFINITIONS

- A. Weeds: Vegetative species other than specified species to be established in given area.

1.4 SYSTEM DESCRIPTION

- A. Provide and install all topsoil, soil amendments, fertilizers, lime, mulches, grass and all other material required to provide a good stand of grass at locations disturbed by the construction operations. Furnish all material, equipment, transportation, labor and all other incidentals necessary to complete the work.

1.5 SUBMITTALS

- A. Refer to Section 01 33 00 - Submittal Procedures for overall submittal procedures and specific requirements associated with each type of submittal listed below.
- B. Types of submittals required for this Section:
 - 1. Product Data

- C. Refer to the List of Submittals document at the end of Division I for a detailed list of every submittal required for the products and workmanship covered under this Section.

1.6 QUALITY ASSURANCE

- A. Provide seed mixture in containers showing percentage of seed mix, germination percentage, inert matter percentage, weed percentage, year of production, net weight, date of packaging, and location of packaging.
- B. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this Section.
- C. Use equipment adequate in size, capacity, and numbers to accomplish the work of this Section in a timely manner.
- D. Material and execution shall comply with New Jersey Department of Transportation Standard Specifications for Road and Bridge Construction, 2001, with revisions, hereon referred to as the NJDOT Specifications.

1.7 QUALIFICATIONS

- A. Seed Supplier: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing work of this section with minimum three years documented experience.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver grass seed mixture in sealed containers. Seed in damaged packaging is not acceptable.
- B. Deliver fertilizer in waterproof bags showing weight, chemical analysis, and name of manufacturer.

1.9 PROJECTS CONDITIONS

- A. Utilities: Determine location of above grade and underground utilities and perform work in a manner that will avoid damage. Hand excavate, as required.

1.10 COORDINATION AND SCHEDULING

- A. Coordinate installation of planting materials during the final phases of the project.

1.11 MAINTENANCE

- A. Begin maintenance of lawns immediately after each area is planted.
- B. Establish lawns by watering, fertilizing, weeding mowing, trimming, replanting, and other operations. Roll, re-grade, and replant bare or eroded areas and re-mulch to produce a uniformly smooth lawn.
- C. Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources. Water newly seeded areas a minimum of two times prior to final completion.

PART 2 PRODUCTS

2.1 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 below.

SEED MIXTURE SCHEDULE

<i>Proportion Pct.</i>	<i>Name</i>	Min. Pct. <i>Germ.</i>	Min. Pct. <i>Pure Sd.</i>	Max. Pct. <i>Weeds</i>
20	Perennial Rye Grass	90	98	0.50
80	Tall Fescue (3 Varieties)	90	95	1.00

2.2 TOPSOIL

- A. Topsoil: ASTM D 5268, pH range of 5.8 to 7.0. Fertile, agricultural soil, typical for locality, capable of sustaining vigorous plant growth, free of subsoil, clay, impurities, plants and weeds, with no more than 5% by mass of deleterious materials (rock, gravel, slag, cinder, roots, sod) 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 specified requirements and modify existing soil when necessary. Supplement existing soil with imported topsoil when quantities are insufficient.

2.3 SOIL AMENDMENTS

- A. Herbicides: EPA registered and approved, for type recommended by manufacturer.

- B. Water: Potable.

2.4 FERTILIZER

- A. Bonemeal: Commercial, raw, finely ground; minimum of 4 percent nitrogen and 20 percent phosphoric acid.
- B. Superphosphate: Commercial, phosphate mixture, soluble; minimum of 20 percent available phosphoric acid.
- C. 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-form, phosphorous, and potassium in the following composition:
 - 1. Composition: Nitrogen, phosphorous, and potassium in amounts recommended in soil reports from a qualified soil-testing lab.

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 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 re-grading is required.
- B. Recondition existing lawn where above conditions exist:
 - 1. Remove sod and vegetation from diseased or unsatisfactory lawn areas; do not bury into soil. Remove topsoil containing foreign materials resulting from Contractor's operation, including oil drippings, fuel spills, stone, gravel, and other construction materials, and replace with new topsoil.
 - 2. Where substantial lawn remains, mow, de-thatch, core aerate, and rake.
 - 3. Till stripped, bare and compacted areas thoroughly to a depth of 6 inches.
 - 4. Apply required soil amendments and initially fertilized to fill low spots and meet new finish grades.
 - 5. Apply seed as required for new lawns.

3.3 SEEDING LAWNS

- A. Evenly distribute seed with a spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 M.P.H.

1. Do not use wet seed or seed that is moldy or otherwise damaged in transit or storage.
- B. Sow seed at the following rates:
 1. Seeding Rate: 3 lbs to 4 lbs per 1000 square feet.
- C. Rake seed lightly into top 1/8 inch of topsoil, roll lightly, and water with fine spray.

3.4 CLEANUP AND PROTECTION

- A. During lawn establishment, keep pavements clean and work areas in an orderly condition.
- B. Protect lawn 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.

3.5 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus soil and waste materials, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of it off Coast Guard property.

END OF SECTION