HOWARD COMMUNITY COLLEGE

DUNCAN HALL

CONSTRUCTION DOCUMENTS

ROOF REPLACEMENT

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SECTION 011100 - SUMMARY OF WORK

PART 1 - GENERAL

1.1 SUMMARY

A. This Section outlines the scope of work included in the roof replacement project at Howard Community College, Duncan Hall in Columbia, MD. Refer to the appropriate specification section for further information about installation methods and components to be provided. In general, the work includes, but is not limited to, the following items:

1. Remove and dispose of existing roofing systems and components, including membrane, insulation, vapor barriers, flexible and metal flashings, wall panels and associated materials and components down to structural deck unless otherwise noted (Division 02 Section “Selective Structure Demolition”).
2. Repair or remove and replace existing deteriorated steel deck on a unit price basis (Division 05 Section “Steel Decking”).
3. Provide a roof access ladder and free standing stair (Division 05 Section “Metal Fabrications”).
4. Provide wood blocking and plywood at perimeter edges, parapets, walls, fascias, curbs, and other locations as required (Division 06 Section “Rough Carpentry”).
5. Provide new multi-layered flat and tapered insulation systems and crickets throughout the roof areas (Division 07 Section “Roof and Deck Insulation”).
6. Provide 4-ply asphalt built-up membranes with granule surfaced modified bitumen capsheet, and SBS modified bitumen membrane or liquid-applied base flashings and strippings (Division 07 Section “Built-Up Asphalt Roofing”).
7. Provide perimeter and penetration sheet metal flashings and counterflashings, and miscellaneous sheet metal fabrications (Division 07 Section “Flashing and Sheet Metal”).
8. Provide metal curbs, a roof access hatch, and non-penetrating conduit supports (Division 07 Section “Roof Accessories”).
9. Provide sealant materials at existing skylight assembly (Division 07 Section “Joint Sealants”).
10. Provide coating over finished roof membrane on areas indicated on Drawings (Division 09 Section “Elastomeric Coatings”).
11. Provide roof drain assemblies at existing roof drain locations and leader piping and extensions at existing vent pipes (Division 22 Section “Roof Drains”).
12. Disconnect and reconnect existing mechanical/electrical components, to include lightning protection to restore proper operation to rooftop equipment following installation of roofing (Division 23 Section “Mechanical/Electrical General Requirements”).
13. Provide all duct accessories as required for a complete system (Division 23 Section “Air Duct Accessories”).
14. Provide new metal ducts (Division 23 Section “Metal Ducts”).

B. The Contract Documents showing the existing construction of the facility were developed from historic documents and from limited field observations by the Architect and its consultants. Actual conditions may vary from those shown. Hidden conditions may be discovered over the course of the work. Further evaluation may uncover conditions which may require remedial attention prior to proceeding with demolition or construction. Contractor shall be aware of the need to proceed with diligence and care and shall notify Architect of conditions which do not reflect those indicated or which require further testing and repair prior to proceeding. Contractor shall correct conditions that are detrimental to timely and proper execution of the Work. Contractor shall not proceed until unsatisfactory conditions have been corrected. Commencement or continuation of work constitutes acceptance of conditions and responsibility for satisfactory performance.

1.2 PROJECT CONDITIONS

A. The building will be occupied during construction. Coordinate with the owner to segregate occupants from the building's interior space directly below and immediately adjacent to the work area(s). Work that will create significant noise or disturbance shall be completed on off hours.

B. Supply, install, and maintain barriers, protection, warning lines, and personnel required to segregate the interior space directly below and immediately adjacent to the work area(s) to prevent damage to the building and its occupants.

C. Supply, install, and maintain barriers, warning lines, and personnel required to segregate the work area(s) from pedestrian or vehicular traffic, as well as to prevent damage to the building, pedestrians and the surrounding landscaped and paved areas. The Contractor shall observe all applicable OSHA and MOSHA requirements

D. Schedule and execute work without exposing the building interior to the effects of inclement weather. Protect the building and its occupants against such risks and repair/replace work-related damage to the Owner's satisfaction.

E. The Contractor shall not be responsible for reported roof related leaks which exist prior to initiating work in the leak areas. The Contractor shall be responsible for all roof related leaks and damage to existing roofing at all locations in which he has initiated work, to include trafficking and materials storage. If damage occurs, the Contractor shall repair damaged areas. Provide and maintain necessary protection and repairs to existing roofing to prevent interior leakage.

F. Supply labor, equipment, tools and appliances necessary for the proper completion of the work.

G. Do not install roofing systems or sealants during precipitation, including fog, or when air temperature is below 40° F (4° C) or is expected to go below 40° F (4° C) during application, or when there is ice, frost, moisture, or visible dampness on the roof.

H. Phased or temporary construction will only be permitted as specified. Schedule, execute, and coordinate work on a daily basis so that components are installed completely and permanently as specified.

I. Schedule, coordinate, and execute work to avoid traffic on completed roof areas. Coordinate work to prevent this situation by working away from completed roof areas, toward roof edges and access ways.

J. Roofing that is removed shall be made 100% weathertight in the same day's operations.

K. Supply shoring, supports, and other items or materials necessary to brace and support the structure, fixtures, and facilities affected by the work. This includes, but is not limited to, heating and air handling ducts, lighting, rooftop equipment and other items presently supported by or suspended from the roof decks to be removed, and associated structural members. Supply temporary walkways and ramps necessary to remove existing decking systems and install the replacement deck materials.

L. Roof construction and materials shall comply with these specifications and the latest editions of the following:

1. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
2. The National Roofing Contractors Association (NRCA) "Roofing and Waterproofing Manual"
3. The Asphalt Roofing Manufacturers Association (ARMA).
4. Factory Mutual Global (FMG) publications "Loss Prevention Data for Roofing Contractors" and "Building Materials Approval Guide"
5. Underwriters Laboratories, Inc. "Roofing Materials and Systems Directory"
6. All work shall be performed in accordance with the International Building Code (IBC) in effect at the time of Bid and applicable Federal, State, and local code amendments, requirements, and publications.

M. All workmanship and materials shall be of the best construction practice. Should a conflict arise between the specification requirements and those of the referenced publications, the better quality or more stringent requirement will prevail. Specification requirements that exceed the minimum requirements of the Manufacturer shall be complied with by the Contractor.

N. Coordinate the work in this Section with other Sections, including preparatory work, building protection, daily clean-up, and protection of building and occupants.

O. Supply labor, vacuums, tools and appliances necessary to keep the interior and exterior building and site areas below and around the construction clean, with as little accumulation of dust and debris as possible on a daily basis.

P. Work will be observed by an on-site observer paid for by the Owner.

1.3 REFERENCES

A. Applicable publications: Publications listed herein form a part of this Specification to the extent referenced and are indicated in the text by basic designation only. Applicable publications referenced shall be those that were issued and in use at the time of the Bid Submission.

1.4 PRECONSTRUCTION CONFERENCE

A. A preconstruction conference will be held with the Owner, Owner's Representatives, Contractor, and involved trades to discuss all aspects of the project. The Contractor's foreman or field representative will attend this conference. The foreman must be proficient in reading and writing English and shall be on site at all times that work is performed.

B. The Owner shall reserve the right to require an alternate superintendent and/or foreman.

C. The preconstruction conference shall not be held until all specified submittals have been received, reviewed, and accepted as to form by the Owner and Owner's Representative.

D. Delivery of materials and commencement of construction shall not proceed until the preconstruction conference is held. Delays in obtaining a complete set of submittals shall not extend the contracted completion date.

1.5 EMERGENCY RESPONSE

A. The Contractor shall provide the Owner with after-hours (24-hour) emergency telephone numbers of the Contractor's superintendent and foreman.

B. The Contractor must respond to emergency situations or calls within two (2) hours.

1.6 CONSTRUCTION SCHEDULE

A. It is the intent of the Owner to have portions of the existing roof assembly removed and replaced in a completed, watertight condition on a daily basis.

B. Proper coordination of all aspects of the work by the Contractor and any sub-trades is critical to ensure proper installation and performance of the work. The Contractor's Construction Schedule shall clearly outline the coordination between job tasks of all involved disciplines. Subject to review and acceptance by the Owner, this Schedule will be strictly adhered to by the Contractor and sub-trades.

C. The Contractor's Construction Schedule shall clearly identify the on-site crew foreman and the size of the crew to be utilized. The crew size shall remain consistent and work shall be continuous throughout the project, from start-up to completion.

D. The Owner shall review the Contractor's Construction Schedule prior to the start of any work. After defining the location(s) of the work progress, the Owner shall arrange to control occupancy in the building to the greatest extent possible. It shall be the responsibility of the Contractor to supply the Owner with written notice, 72 hours in advance, if his work location(s) for a workday is different from the schedule. The Contractor shall update his Construction Schedule weekly and submit a copy to the Owner for review.

E. The Contractor shall schedule periodic site visits by the Membrane Manufacturer providing the warranty during the construction period. Announce the Manufacturer's site visit (inspection) to the Owner 72 hours prior to its occurrence. Visits by the Manufacturer's representative shall be

made prior to project start-up, one week into the start of construction, with inspections prior to the installation of the membrane surfacing, at project completion, and as requested by the Owner. The Contractor shall provide the Owner a copy of the Manufacturer's written report for each inspection, indicating Manufacturer's comments pertaining to installation of materials and any corrective recommendations. In addition, the Contractor is responsible to notify and obtain acceptance from the Membrane Manufacturer on detail changes that may affect the roof system warranty.

1.7 SCHEDULE OF VALUES

A. Provide a line item breakdown of construction labor and materials costs for each Specification Section included in these Contract Documents. Additionally, provide line item values for Unit Price, Alternate, and Allowance Work included in these Specifications. Utilize AIA Forms G702 and G703 to prepare and submit the Schedule of Values.

1.8 WORK HOURS

A. The Contractor will be allowed to work at the project site during daylight hours between 7:00 a.m. and 8:00 p.m., local time, Monday through Friday. Work on Saturday or Sunday may be performed from 8:00 a.m. to 5:00 p.m., with prior approval from the Owner. The Owner reserves the right to disapprove or suspend a request to work outside of normal working hours. The Owner also reserves the right to determine when building coverage is necessary or in the best interest of the Owner. The cost of providing building maintenance personnel onsite for weekend work or after hours work shall be borne by the Contractor.

1.9 PROGRESS MEETINGS

A. Progress meetings shall be scheduled bi-weekly by the Owner or as deemed necessary.

1.10 DIMENSIONS AND QUANTITIES

A. Verify dimensions and quantities in the field prior to bid submission. The Project Plans and Drawings have been compiled from various sources and may not reflect the actual field conditions at the time of construction.

B. The Contractor is solely responsible for means and methods of construction. Make necessary investigations to become familiar with the project conditions.

C. Additional compensation due to unfamiliarity with project conditions will not be considered.

D. In case of inconsistency between Drawings and Specifications or within either document, the better quality and/or greater quantity of work shall be provided, as determined by the Owner.

1.11 SAFETY DATA SHEETS

A. Safety Data Sheets (SDSs) shall be submitted in complete sets to the Owner for all products to be used prior to any work being performed.

1.12 GUARANTEES AND WARRANTIES

A. Refer to specific Sections of this specification for systems and product warranty requirements. Verify with Manufacturer of proposed systems and products that specified warranty requirements are acceptable, without exception, prior to selecting materials for use on this project.

B. Submit a full Contractor's Guarantee of the Work to be free from defect in materials and workmanship upon Substantial Completion, and prior to final payment. This Guarantee shall be for a period of five (5) years from the date of Substantial Completion and shall be signed by a Principal of the Contractor’s firm and sealed if a corporation. If the project is a phased project, the guarantee shall begin at the completion of the final phase.

1.13 CLEAN-UP

A. Restore property of the Owner to its original condition prior to the start of construction. Refer to Division 01 Section “Temporary Facilities and Controls.” General clean-up of the site shall be performed on a daily basis.

B. Clean, restore, and/or replace items stained, dirtied, discolored, or otherwise damaged due to the Work, as required by the Owner.

C. Clean roof, building (interior and exterior), landscaped areas, and parking areas so they are free of trash, debris, and dirt caused by or associated with the Work.

D. Clean out drain leaders and piping to the point where it exits the building. Demonstrate roof drainage systems are operating by running water from a hose for 30 minutes into each drain in the presence of the Owner.

E. Sweep paved areas clean.

1.14 PERMITS

A. The Contractor will obtain and pay for any and all permits required to perform the work.

1.15 OWNER OCCUPANCY

A. Owner may occupy or partially occupy the premises during the construction period. Contractor shall coordinate with Owner prior to scheduling operations and provide an activity hazard analysis to the owner for review prior to initiating work.

B. Predetermine and obtain approval, in advance, from Owner, for vertical and horizontal transportation of labor and construction materials onto and off of the building roof.

C. Do not transport labor or construction materials to the roof via the interior of the facility.

D. Utility Shutdowns: Obtain written approval from the Owner for any required shutdown or outage of any utility. Schedule any outages to minimize impact on existing operations. Comply with all applicable codes and ordinances.

1.16 PRE-JOB DAMAGE SURVEY OF FACILITY

A. Perform a thorough pre-job survey of property and all affected and adjacent areas of the building with Owner prior to starting the work in order to document existing damage. Damaged items identified during the survey will not be the responsibility of Contractor unless further damaged by Contractor during execution of project.

1.17 CORRECTION OF DAMAGE TO PROPERTY

A. Consider any damage to building or property not identified in the pre-job damage survey as having resulted from execution of this Contract and correct at no additional expense to Owner.

B. The Contractor will include in the Base Bid the cost to perform any roof related repair that is due to Contractor’s faulty workmanship and/or materials.

C. Repair, immediately, damages to facility or site that present a safety hazard or danger to the public.

1.18 SUMMARY OF PROJECT REQUIREMENTS

A. The Work requirements of the Contract are summarized by reference to the Bidding Requirements, the Contract forms, the Conditions of the Contract, the Specification, the Drawings, and Addenda and Contract Modifications, including, but not limited to, the printed matter referenced in these requirements. It is recognized that the Work is affected or influenced by governing regulations, natural phenomenon (including weather conditions), unforeseen conditions uncovered by the Work, and other forces outside of the Contract Documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011100

SECTION 012200 - UNIT PRICES

1.1 SUMMARY

A. The Owner may elect certain aspects of the work, whose quantity cannot be determined at this time, to be performed or deleted by the Contractor. If such work items are elected or are not performed, the Contract price will be adjusted accordingly by the Unit Price amount shown for each item in the Bid Forms.

1.2 GENERAL CONDITIONS

A. A Unit price is a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased.

B. By submitting a bid, the Contractor acknowledges acceptance of the established Unit Prices for their use in determining the value of change work. Prices as stated will remain in effect until final completion of the Contract.

C. Performance of Work not authorized by a Change Order or Field Order, whether or not such work is set forth hereunder as a Unit Price item, shall not be considered cause for extra payment beyond the Contract Sum.

1.3 PROCEDURES

A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.

B. Prior to commencing removal or replacement of materials set forth in the schedule of Unit Prices, the Contractor shall notify the Owner in sufficient time to permit proper inspection and measurements to be taken. Only quantities that have been approved in writing by the Owner will be considered in determination of adjustments to the Contract Amount.

C. Unit Prices and quantities are provided to adjust the specific work items because quantity of work is unknown. Work of similar scope as those unit price items contained in and defined by the Construction Documents shall not be considered as Unit Price Work.

D. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent inspector acceptable to Contractor.

E. List of Unit Prices: A list of unit prices and quantities to be provided in the Base Bid is included in Part 3. The quantities shown in the list of unit prices shall be exclusive of the quantities shown on the drawings. Specification sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 LIST OF UNIT PRICES

A. For scraping and priming of more/less surface rusted areas of steel deck and framing than the fifteen hundred (1,500) square feet carried in the Base Bid as outlined in Division 05 Section “Steel Decking.”

B. For removal and replacement of more/less steel deck than the seven hundred fifty (750) square feet carried in the Base Bid as outlined in Division 05 Section “Steel Decking.”

C. For the installation of more/less walkway pad than the one hundred fifty (150) linear feet carried in the Base Bid, as outlined in Division 07 Section “Built-Up Asphalt Roofing.”

D. For the removal and replacement of more/less damaged metal duct than the thirty (30) linear feet carried in the Base Bid as outlined in Division 23 Sections “Air Duct Accessories” and Metal Ducts.”

END OF SECTION 012200

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for alternates.

1.2 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to or deducted from the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.3 PROCEDURES

A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.

C. Execute accepted alternates under the same conditions as other work of the Contract.

D. Schedule: A Schedule of Alternates is included at the end of this Section. Specification sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Alternate No. 1: Shall be an ADD Alternate for the following work;
   1. Recertify the lightning protection system following reinstallation.

END OF SECTION 012300

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

1.2 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Architect's responsive action.

B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.3 SUBMITTAL PROCEDURES

A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
   1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
   2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
      a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

B. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
   1. Initial Review: Allow 10 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
   2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
   3. Resubmittal Review: Allow 10 days for review of each resubmittal.

C. Identification: Provide a title block on each submittal to include the, but not limited to the following:
   1. Name of firm or entity that prepared each submittal.
   2. Project name.

3. Date.
4. Name and address of Contractor.
5. Name and address of subcontractor.
6. Submittal number or other unique identifier, including revision identifier.
    a. Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
    b. Number and title of appropriate Specification Section.
    c. Drawing number and detail references, as appropriate.
    d. Location(s) where product is to be installed, as appropriate.

D. Deviations: Deviations from specifications are considered substitutions. Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals as proposed substitutions. Further identify deviations by providing a written description for each deviation or variation from the contract documents.

E. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will discard submittals received from sources other than Contractor.

F. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
1. Note date and content of previous submittal.
2. Note date and content of revision in title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked "Approved or approved as noted."

G. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

H. Use for Construction: Use only final submittals with mark indicating "Approved or approved as noted" taken by Architect.

PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
    a. Manufacturer's written recommendations.

b. Manufacturer's product specifications.
c. Manufacturer's installation instructions.
d. Manufacturer's catalog cuts.
e. Compliance with specified referenced standards.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data, unless submittal of Architect's CAD Drawings is otherwise permitted.
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
a. Dimensions.
b. Identification of products.
c. Fabrication and installation drawings.
d. Roughing-in and setting diagrams.
e. Shopwork manufacturing instructions.
f. Templates and patterns.
g. Schedules.
h. Notation of coordination requirements.
i. Notation of dimensions established by field measurement.
j. Relationship to adjoining construction clearly indicated.
k. Seal and signature of professional engineer if specified.
2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11-inches but no larger than 30 by 40-inches.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.
1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.
2. Identification: Attach label on unexposed side of Samples that includes the following:
a. Generic description of Sample.
b. Product name and name of manufacturer.
c. Sample source.
d. Number and title of appropriate Specification Section.
3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.
4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.
a. Number of Samples: Submit one full set of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.
    a. Number of Samples: Submit three sets of Samples. Architect will retain two Sample sets; remainder will be returned.

E. Product Schedule or List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location.

F. Construction Schedule: Construction schedule showing sequence and duration of activities.

G. Schedule of Values: Itemize separately labor and materials for each technical section within the Specification as they will be shown on the Application for Payment (use AIA form G703).

H. Subcontract List: Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design.

2.2 INFORMATIONAL SUBMITTALS

A. General: Prepare and submit Informational Submittals required by other Specification Sections.
1. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.

B. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

C. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

D. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

E. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

F. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

G. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

H. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

I. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

J. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer.

K. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
   1. Statement on condition of substrates and their acceptability for installation of product.
   2. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
   3. Results of operational and other tests and a statement of whether observed performance complies with requirements.

L. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.

M. Safety Data Sheets (SDSs): Submit information directly to Owner; do not submit to Architect.
   1. Architect will not review submittals that include SDSs and will return them for resubmittal.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken.

C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 013300

SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes requirements for the provision and utilization of temporary facilities to protect the Owner’s property, the site, and construction materials, and for daily maintenance and cleanup of the site during the project.

1.2 CONTRACTOR’S USE OF EXISTING FACILITIES

A. Limit use of the premises to the work indicated, so as to allow for the Owner's uninterrupted occupancy and use. Confine operations to the areas indicated under the Contract. Conformance to the regulations set forth by the Owner regarding use of existing facilities is mandatory.

B. Sanitary facilities shall be provided by the Contractor. Use of the building's sanitary facilities is not permitted.

C. Owner will assist in controlling occupancy immediately below and adjacent to the work area. Contractor shall provide and place portable barricades, as coordinated with the Owner, under work areas inside the building. Demolition activities may need to be adjusted based on interior space available for relocating occupants.

D. Clean interior and exterior areas affected by the construction on a daily basis. Do not allow construction debris, waste materials, tools, excess packaging materials or other construction related materials to accumulate on the roof, in the facility, or on the exterior grounds and pavements.

E. See Division 01 Section “Product Delivery Requirements” for product storage facilities and requirements.

1.3 UTILITIES

A. Electrical service will be provided to the Contractor free of charge by the Owner through exterior electrical outlets if available and operable. Use shall be limited to construction hours. The Owner reserves the right to charge the Contractor for excessive electrical service usage (i.e., wasteful usage). Should charges be considered, the Owner will notify the Contractor in writing of his intent, 48 hours in advance.

B. Water for construction purposes will be provided to the Contractor free of charge by the Owner through exterior water spigots if operable. The Owner reserves the right to charge the Contractor for excessive or wasteful use. Should charges be considered, the Owner will notify the Contractor in writing of his intent, 48 hours in advance. Drinking water shall be provided by the Contractor.

C. All other utilities required will be provided by the Contractor.

D. Plumbing, heating, and electrical work, including reinstallation of equipment and other work to be performed by the Contractor, shall be carried out without interference to the building's normal operation. Where work requires interruption of service, the Contractor shall make advance arrangements with the Owner for dealing with such interruption.

E. Ensure proper and safe operation and maintenance of utility systems within the construction limits, whether these are supplied by the Owner's distribution system or otherwise, until the work is accepted by the Owner. Maintain and operate appurtenances within the construction area that serve the distribution system, subject to periodic inspection by the Owner's operating personnel. Inspection by any representative or personnel of the Owner shall not relieve the Contractor of his responsibilities in connection with operation and maintenance of these facilities and equipment.

1.4 ACCESS

A. Provide ladders, scaffolding and staging as required to access the project area(s) in accordance with OSHA and MOSHA guidelines. Should damage to the exterior building occur, restore damaged areas to their original condition, clean up debris, and provide other access to the roof for the duration of the project.

B. Coordinate interior and exterior access to the building to minimize disruption to the normal building operations. Coordinate construction activities with the Owner and building occupants.

1.5 BARRIERS

A. Install temporary fencing, warning lines, barriers and guards, as required, to segregate the construction areas from adjacent operational facilities, occupants and the public. In the event that access cannot be interrupted in the construction area, provide protection above doorways and walks in the construction area. Provide guard lights on barriers and lighting as necessary to prevent vandalism of work and storage areas. The Owner is not responsible for Contractor's losses due to damage or theft by vandals.

B. Install protective coverings at paving and building walls adjacent to hoist prior to starting work. Lap protective coverings at least 1-foot, secure against wind, and vent to prevent condensation of moisture on covered surfaces. Maintain the protective coverings in place for the duration of the project. Cover windows adjacent to Contractor operation areas with plywood.

1.6 TEMPORARY PROTECTION

A. Provide suitable Owner approved temporary protection to prevent the entrance of debris and obstructions into the building. Provide warning signs to reroute personnel around areas of dangerous work. Place warning barriers at roof perimeters and at deck openings. Clearly label temporary covers over deck openings. Do not permit openings to remain unprotected overnight. Schedule operations to allow for completion of new roofing over a predetermined area of roof within a day's work. Use special care to avoid damaging roofing and flashing when working on the roof of the building.

B. Provide temporary tie-ins between existing and new roof systems as specified and detailed. Tie-in construction shall completely prevent interior leaks, migration of moisture from existing to new construction, and damage of any type to the facility. Provide necessary quality control at tie-ins on a daily basis to prevent leaks.

C. Avoid traffic on completed roof areas. Coordinate work to prevent this situation. Should temporary access be required, provide temporary substrate protection for trafficked areas.

D. Protect drainage systems from debris accumulation during construction. Ensure roof drains and leader pipes are not restricted when Contractor is not on site.

E. Protect materials scheduled to be reused from damage by placing them in labeled containers or wrappings stored in a weathertight trailer.

F. Provide temporary protection such as plywood and tarps for streets, drives, curbs, sidewalks, landscaping, and existing exterior improvements during all phases of the project.

1.7 ROOFTOP PROTECTION

A. Provide plywood walkways, with 1/2-inch thick rubber walkway pad or 1-inch thick high density insulation protection beneath, for protection of new or existing roof areas which must be trafficked, and for roof membrane protection below demolition work that occurs above new or existing roof areas.

1.8 DEBRIS REMOVAL

A. The Owner shall designate crane and refuse container locations. These areas shall be sectioned off with proper warning lines.

B. Removed materials shall not be thrown freely from the roof but shall be lowered to the ground by crane in suitable containers or in an enclosed chute, in order to reduce the spread of dust and other debris.

C. Supply adequate covered receptacles for waste, debris and rubbish. One receptacle will be allowed on site at a time, and must be immediately removed from the site when full. Clean the project area daily and prior to moving the receptacle to another location on the site. Locations shall be as permitted by the Owner. Disposal shall be off-site in a legal dump authorized to accept construction demolition solid wastes.

1.9 WEATHER PROTECTION

A. Weather protection includes temporary protection of components adversely affected by moisture, wind, heat, and cold by covering, patching, sealing, enclosing, ventilating, cooling, and/or heating. Provide protection for locations within the project area as necessary, to protect the building and its contents, trafficked adjacent areas, new construction materials and accessories. The cost of heat, fuel and power necessary for proper weather protection shall be the responsibility

of the Contractor. Installed weather protection shall comply with safety regulations and provisions for adequate ventilation and fire protection.

1.10 VOLATILE MATERIALS

A. The Contractor is reminded that adhesives, solvents, bitumens, etc., are highly volatile and flammable materials. These materials, along with tools, applicators, and rags, shall not be stored on or within the building. No overnight storage on the roof will be allowed. Do not transport materials through the building. Take precautions and closely follow the specification requirements for fire protection on site during construction.

B. Locate and use flame-heated equipment so as not to endanger the structure, other materials on site, or adjacent property. Do not place flame-heated equipment on the roof. Locate and use flame-heated equipment in specific areas approved by the Owner. Do not relocate flame-heated equipment without prior approval from the Owner.

C. The use of flame-heated equipment or torches on the roof is prohibited unless specifically approved in writing by the Owner.

1.11 FIRE PROTECTION

A. Provide necessary temporary fire protection for the building, its contents and materials during construction. Do not store combustibles inside the building or on the roof. Store adhesives, caulks, and cleaning solvents away from the building using a method approved by local fire officials. Should cutting, burning, or welding be necessary, provide a fire watch during operations and for four hours minimum after completion of the operations.

B. Do not use open flames near adhesives, caulks, or cleaning solvents as they will readily ignite. Rags soaked with cleaning solvent shall not be discarded in the dumpsters, but shall be stored in a separate metal receptacle and removed from the site daily.

C. Comply with local fire codes and obtain permits necessary from the local fire department. Provide a copy to the Owner. Provide recently tested, fully charged fire extinguishers around the storage area, rubbish receptacle and two fire extinguishers on the roof within 50 feet of the Work.

1.12 INTERIOR PROTECTION AND RESTORATION

A. Protect and cover fixed items, furniture, equipment, appliances, fixtures, bookcases, etc. within the building below the work areas.

B. At the Owner's direction, remove portable furniture, equipment, appliances, fixtures, materials, stock, etc. within the building below the work area to an adjacent area for protection.

C. Remove, temporarily support, suspend and protect existing items requiring removal during the installation of the new work and properly replace these items to their original condition and to the Owner's satisfaction. These items include but are not limited to suspended ceilings, lighting fixtures, heating and air handling ductwork, electrical conduit, etc.

1.13 CLEAN-UP

A. Clean and restore interior building spaces beneath the work areas to original condition prior to the construction.

B. Debris, dust and dirt shall be swept completely clean at the joists, beams, overhead accessories and similar items. Those items soiled or stained from the work shall be cleaned and refinished.

C. Electrical fixtures damaged by the construction shall be replaced with an equal in shape, color, manufacturer, and capacity at no added expense to the Owner.

D. Interior ceiling finishes which are damaged by the construction shall be repaired or replaced with a system equal in color, texture, and finish at no added expense to the Owner.

E. Floors shall be swept and vacuumed completely clean of dust, dirt, and debris. The Owner will wash and rewax floors, but only as part of a normal or routine maintenance procedure. Heavily soiled, stained, or damaged floor areas will be cleaned, repaired, and/or replaced by the Contractor at no additional cost to the Owner.

F. Open ducts, grills, thermostats, electric boxes, or similar fixtures and items which can be soiled or affected by the work or which might conduct dust to other areas shall be masked, protected, and cleaned by the Contractor.

G. Windows, blinds, curtains, shelving, edges, lighting, etc. shall be cleaned to their original condition prior to the start of the roof renovation, and to the satisfaction of the Owner.

H. Remove completely temporary protection materials and facilities from the site upon completion of the work and demobilization of the project.

I. Restore streets, drives, curbs, sidewalks, landscaping, and existing improvements disturbed by the construction operations to their condition at the start of the work.

1.14 NOTIFICATION

A. Notify the Owner's Representative at least 72 hours in advance of the desire to extend, connect, disconnect, turn on or off HVAC, steam, electric, water or other service from the Owner's supply systems. The actual operation shall be witnessed by authorized representatives of the Owner. Plumbing, heating and electrical work, including installation of equipment and any other work to be performed by the Contractor, shall be carried out without interference with the Owner's normal operation. Where work requires interruption of a service, make advance arrangements with the Owner for dealing with such interruption.

1.15 VEHICLES

A. Acceptable areas for the locations of the Contractor's vehicles shall be as designated by the Owner. No other areas may be utilized without the Owner's permission.

1.16 WALKWAY COVERING

A. Install walkway coverings where designated on the drawings or above entrances which must remain accessible. The framework supporting the walkway covering shall be free-standing and well braced. The roof covering and support framing shall be designed to support a live load of at least 150 psf. The roof coverings shall be of width sufficient to cover the entire walkway or sidewalk. A minimum height clearance of 6-feet 8-inches, or as required to allow building doors to open, shall be maintained below coverings. Should coverings obscure the building's address, a temporary address shall be installed so as to be visible from the street. Lettering shall be approved by the Owner. Protection shall be in accordance with all applicable OSHA standards.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Portable Chain-Link (Site Enclosure) Fencing: Minimum 2-inch, 9-gage, galvanized steel, chain-link fabric fencing; minimum 8-feet high with galvanized steel pipe posts; minimum 2-3/8-inch OD line posts and 2-7/8-inch OD corner and pull posts, with 1-5/8-inch OD top and bottom rails. Provide concrete bases for supporting posts.

B. Lumber and Plywood: Unless noted otherwise, comply with requirements in Division 06 Section "Rough Carpentry."

2.2 TEMPORARY FACILITIES

A. General: Maintain all temporary facilities and controls necessary for the performance of the Work. Comply with all applicable codes and regulations of authorities having jurisdiction; obtain permits as required. Locate and install all facilities and controls where acceptable to the local authorities having jurisdiction, utility, and Owner and remove same and terminate, in a manner suitable to the utility owner, at completion of the Work or when otherwise directed. Pay all costs associated with the provision and maintenance of temporary facilities and controls including power, water, and fuel (if any) consumed until Substantial Completion.

B. Storage and Staging Areas: The Contractor shall be responsible for coordination, protection, and safekeeping of products stored on site under this Contract, including soil cut and fill. Refer to Contract Documents for any defined staging areas.

1. Move stored products that interfere with construction of the Work, or operations of the Owner, or separate contractors.
2. Obtain any pay for use of additional storage or staging areas as needed for the Work.
3. Provide storage areas sized to storage requirements for products of individual Sections, allowing for access and orderly maintenance and inspection of products.

2.3 EQUIPMENT

A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.

B. Heating Equipment: Unless Owner authorizes use of permanent heating system, provide UL Listed or FM approved vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

C. Tankers

1. As part of the Contractor's Construction Schedule, the proposed location(s) of tanker equipment shall be submitted for the Owner's review.
2. Kettles will not be permitted on site. Tankers shall only be located in areas accepted by the Owner.
3. Tankers shall be kept a minimum of 15-feet away from exterior building walls and shall be segregated from the surrounding areas by temporary fencing.
4. Heat asphalt in a tanker designed to prevent contact of flame with surfaces of asphalt. Equip tankers with visible thermometer and thermostatic controls set to asphalt temperature limits specified herein. Keep controls in working order and calibrated. Use immersion thermometers, accurate within a tolerance of ± 2° F (± 1° C), to check temperatures of the asphalt each hour. Provide these temperatures to the Owner. If temperatures exceed the maximum temperatures specified, remove the asphalt from the site. Do not cut back the asphalt.
5. The designated asphalt tanker operator must remain on the same elevation, within 50 feet and within visual contact of the operational tanker at all times, and perform no other duties than tending the tanker to monitor bitumen temperatures during tanker operation and ensure that safe heating temperatures are not exceeded. The Owner reserves the right to require an alternate tanker operator, without obligation to show cause or reason for the request.
6. Provide a minimum of two fully charged and operable fire extinguishers at the asphalt tanker location. Fire extinguishers shall be of the type designed for the intended use.
7. Kettles will be considered for use if properly equipped with an operating fume recovery system or if “smokeless” asphalt is utilized.

PART 3 - EXECUTION (Not Used)

END OF SECTION 015000

SECTION 016500 - PRODUCT DELIVERY REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section contains instructions and requirements for the provision and maintenance of adequate delivery, storage, and handling on site of products and materials to be utilized in the Work.

1.2 PRODUCT DELIVERY, STORAGE, AND HANDLING

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

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

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

D. Deliver materials in sufficient quantity to allow continuity of work. Deliver materials to the site in original sealed containers bearing manufacturer's name and brand designation. Where materials are designated by a referenced specification, containers or packages shall bear specification

number, type, and class as applicable. Do not deliver materials that are not approved for use. Remove such materials from the site immediately.

E. Store roofing materials on site in areas designated by the Owner. Materials are to be stored in box trailers or in elevated piles completely wrapped in waterproof tarps. Tilt stock piles for effective drainage and utilize tie-downs to protect tarps against wind blow-offs. Store flammable materials such as adhesives in storage containers suitable for flammable substances. Mark materials that are exposed to the elements for removal from site. Do not incorporate defective or rejected materials in the Work.

F. Handle materials with equipment selected and operated so as not to damage the materials or the roofing. Handle roll materials in a manner to prevent damage to the edges or ends. Seal containers when their contents are not being used to prevent premature curing or damage to materials. Damaged or improperly stored materials shall be marked and removed from the site immediately.

G. No more materials shall be stored on the roof than can be installed in one day. Distribute materials brought to the roof so that the uniform load shall be less than 20 PSF. Evenly distribute materials for daily operations to prevent concentrated loads. The weight of workmen, equipment, and materials shall not exceed the capacity of the structure.

H. Misshapen, oval, creased, and/or damaged roll or bundled materials shall not be used in the new roof system. The Contractor shall handle and store roll or bundled materials to prevent such conditions. The Contractor shall also ensure that materials accepted from the manufacturer are in good condition. The Owner will not be responsible for, nor accept, materials that are defective.

1.3 TOOLS AND EQUIPMENT

A. Contractor is responsible for delivery, storage, maintenance, and security of tools and equipment.

1.4 INSPECTION AND NOTIFICATION

A. Materials stored on site and subject to damage from wind, precipitation, hail, or other potential climactic conditions will be subject to inspection on a daily basis by the Owner or Owner’s Representative. Absorptive materials such as lumber, insulation and felts will be tested periodically for moisture content.

B. Upon notification by the Owner or Owner’s Representative of insufficient protection of or damage to materials on site, the Contractor shall, within 24 hours, properly restore protection and replace or repair damaged materials and systems. Should the Contractor not accomplish immediate repair or replacement when notified, the Owner shall have the proper protection installed at the Contractor's expense.

1.5 MANUFACTURER’S INFORMATION

A. Submit the roofing system materials manufacturer's written instructions concerning storage and handling of materials, including adhesives, cements, sealants, and accessories. Provide the following information:

1. Manufacturer’s "shelf-life" of materials, including the date of manufacture of perishables such as volatiles, caulking, and mastics.
2. Acceptable latent moisture content for absorptive materials such as lumber, insulation, and felts.
3. Manufacturer's requirements for storage facilities concerning temperature, humidity, and ventilation.

B. Provide and maintain on site manufacturer's information concerning storage and handling of flammable or volatile materials, such as Safety Data Sheets, for the duration of the project.

C. Comply with the manufacturer’s recommendations and these Specifications for on site storage of materials.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 016500

SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for contract closeout.

1.2 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
   1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
   2. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
   3. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
   4. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
   5. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
   6. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
   7. Submit certificate of manufacturer's inspection.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
   1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
   2. Results of completed inspection will form the basis of requirements for Final Completion.

1.3 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
   1. Submit a final Application for Payment.

2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.4 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Preparation: Submit three copies of list. Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1.5 CORE SAMPLES

A. The Owner reserves the right to have core sampling performed by the Contractor where moisture contamination is suspected within the new roof system until the expiration of the Contractor's warranty. Core sample locations shall be chosen by the Owner and be performed at no cost to the Owner.

1.6 WARRANTIES

A. Submittal Time: Submit manufacturer's warranties and contractor's guarantees on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated.

1.7 PROJECT CLOSEOUT SUBMITTALS

A. When both the Owner or Owner's Representative and the Manufacturer's Representative agree that the Contractor has performed according to the Specifications and has installed the materials to the satisfaction of the Manufacturer, submit the following:

1. Specified Contractor's and Manufacturer's Warranties and Guarantees.
2. Lien Releases from Contractor, subcontractor, and suppliers (AIA Forms G706, G706A).
3. Consent of Surety to Final Payment (AIA Form G707).

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 017700

SECTION 024119 - SELECTIVE STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies requirements for the following Scope of Work:
   1. Removal of existing roofing and related materials.

1.2 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

C. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.3 SUBMITTALS

A. Schedule of Selective Demolition Activities: Indicate detailed sequence of selective demolition and removal work, with starting and ending dates for each activity, interruption of utility services, and locations of temporary set up areas.

B. Predemolition Photographs or Videotapes: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by selective demolition operations. Submit before Work begins.

C. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

D. Proposed locations of chutes, dumpsters, cranes, hoists, and other temporary equipment or facilities required for demolition work.

E. Proposed methods for interior and exterior protection and clean-up during removal and re-roofing operations.

F. Provide schedule, updated weekly, indicating areas of roof where demolition will occur. Notify Owner of schedule changes.

1.4 QUALITY ASSURANCE

A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

B. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

D. Standards: Comply with ANSI A10.6 and NFPA 241; OSHA, 29 CFR 1926.1101; EPA, NESHAP 40 CFR, Part 60.

E. Comply with Federal, State and Local requirements.

1.5 PROJECT CONDITIONS

A. The facility will be occupied during construction. The contractor shall submit a demolition plan for approval one (1) week prior to any work. Provide barricades to segregate area and provide interior protection to protect contents as indicated elsewhere in the contract documents. The Owner will attempt to relocate occupants to the greatest extent; however, the area of roof work may need to be adjusted based on the interior space available. In no case shall demolition be completed over occupied space.

B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

C. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
   1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Owner will remove hazardous materials under a separate contract.

D. Storage or sale of removed items or materials on-site is not permitted.

E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
   1. Maintain fire-protection facilities in service during selective demolition operations.

1.6 WARRANTY

A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

1.7 DEMOLITION AND TRANSPORT

A. Conveyances: Buggies or wheelbarrows used on roofs to transport removed debris to chutes or crane apparatus location shall be of size and design to prevent damage to deck and structure.

B. Chutes: Provide enclosed chutes for debris transfer from roof areas at height of 10-feet or more. Do not allow debris to spill from bottom of chute directly onto ground. Direct chutes into approved construction debris container (dumpster). Control and contain dust and noise from falling debris by use of breaks in vertical alignment of chute or tarps covering dumpster. Provide hose with nozzle near chute outlet to wet debris, as necessary, for dust control.

C. Hoists/Cranes: Provide hoists or cranes to remove debris and transport materials to and from roof. Secure materials to prevent loss during lifting. Place debris transported from roof directly in approved construction debris containers. Provide proper protection of wall areas for entire height directly adjacent to or under area of hoisting.

D. Use of "bobcat" type removal equipment on roof is prohibited.

E. Mechanical cutting equipment: Roof cutting equipment shall be equipped with operable blade depth setting mechanisms to control cutting depth of blade and prevent damage to structural deck during cutting operations.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

B. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

C. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

3.2 GENERAL

A. During removal of existing roofing and related materials, report to Owner areas of damaged, deteriorated, or otherwise unsuitable structural deck or framing materials exposed during work. Do not cover or remove unacceptable deck or framing areas until reviewed by Owner. Provide temporary protection to areas in question. Use care in removal of membrane flashings and decking to prevent damage to substrates.

B. Do not remove more material than can be replaced in one day with the new specified roof system.

C. Take precautions to prevent water on or within existing roof system from migrating into building or new roof system.

D. Review available prints and/or inspect interior of structure to ascertain if electrical or other service has been placed above roof deck or in contact with underside of deck.

E. Set cutting blades of mechanical cutting equipment to proper depth to prevent scoring or damage to structural deck. Use care in removal of membrane flashing to prevent damage to substrates.

F. Control visible emissions during roof removal and at dumpster level.

G. Remove roof materials down to structural deck. Sweep, clean, and vacuum debris from deck surfaces, including flutes of steel deck.

3.3 SELECTIVE DEMOLITION

A. Demolish and remove existing materials as expressly indicated or implied on the drawings. Demolition shall include but may not be limited to the following:

1. Remove existing roofing system(s) and associated components in preparation for new systems.
2. Remove abandoned rooftop curbs and penetrations and associated materials. Prepare opening to receive new decking or enclosure as specified.
3. Remove existing sheet metal caps, edge metal, counterflashings, penetration flashings, and related sheet metal items unless indicated on Drawings to remain.
4. Remove existing perimeter, expansion joint, and other wood blocking where indicated in preparation for new wood blocking.
5. Remove existing HVAC curbs in preparation for new metal curbs.
6. Remove and store rooftop fan and ventilator units. Remove existing fan and ventilator curbs unless indicated otherwise. Disconnection and reconnections of electrical and mechanical feeds are to be performed by licensed tradesmen. Notify Owner prior to disconnection of any mechanical equipment.
7. Remove existing primary and overflow roof drains and associated materials in preparation for new drain bowl assemblies and leader pipe connections.

B. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

C. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.4 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.5 CLEANING

A. Clean demolition materials and debris from roof daily.

B. Clean debris that has fallen into building, including material on top surface of ceiling. If deemed necessary by the Owner the Contractor shall remove and reinstall ceiling tiles suspected of harboring construction debris and clean the affected areas.

C. Clean all surfaces of exposed steel joists, suspended lighting and accessories within areas with exposed roof framing.

D. Repair damage to building by replacing damaged material or component in-kind.

E. Clean site daily to satisfaction of Owner.

F. Dispose of debris and demolition materials at landfill in accordance with applicable regulations.

G. Remove construction related debris that accumulates on top of ceiling tiles.

END OF SECTION 024119

SECTION 053100 - STEEL DECKING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies requirements for the following Scope of Work:
   1. Replace deteriorated steel deck uncovered during demolition operations.
   2. Clean and prime surficially rusted areas of steel decking and framing uncovered during removal operations.
   3. Provide roof drain stiffening plates.

1.2 UNIT PRICES

A. Technical requirements for related Unit Price work are defined in this section. Refer to Division 01 Section “Unit Prices,” for quantities to be carried in the Base Bid and provided on the Bid Form.

1.3 SUBMITTALS

A. Product Data: For each type of deck, accessory, and product indicated.

B. Shop Drawings: Show layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

C. Product certificates.

D. Welding certificates.

1.4 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."

B. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."

C. Verify profile of existing deck prior to ordering replacement panels.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.

B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 ROOF DECK

A. Steel Roof Deck: Fabricate panels, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 30, and with the following:

1. Galvanized Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 33, G60 zinc coating.
2. Deck Profile: To match existing.
3. Profile Depth: To match existing.
4. Design Uncoated-Steel Thickness: 20-gauge

2.2 ACCESSORIES

A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.

B. Fasteners for securing replacement roof deck panels and deck stiffening plates to overlapped deck: #10-16 x 1-inch, self-drilling, self-tapping screws, hex-head, either stainless steel or factory-treated, fluorocarbon-coated steel (in accordance with FM 4470 requirements) in order to prevent rusting. Fasteners shall be designed to penetrate structural steel over 1/4-inch thick.

C. Fasteners for securing steel deck to structural framing: #14-14 self-drilling, self-tapping screws, 1-inch long, hex-head, fluorocarbon-coated steel (in accordance with FM 4470 requirements).

D. Primer for steel framing: Rust-inhibitive industrial enamel primer by Sherwin Williams or accepted substitute. Primer shall be lead and chromate-free.

E. Roof drain stiffening plates: Refer to Division 22 Section “Roof Drains”.

PART 3 - EXECUTION

3.1 GENERAL

A. Decking found to be damaged, deteriorated, deflected or rusted must be reviewed by Owner or his Representative prior to roof system installation operations. Unsound steel deck panels shall be removed in their entirety. Partial panel replacement shall not be permitted.

B. Contractor shall notify Owner of damaged or deteriorated structural framing uncovered during deck replacement operations prior to installation of replacement decking.

C. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 30, manufacturer's written instructions, requirements in this Section, and as indicate

3.2 INSTALLATION

A. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.

B. Place deck panels flat and square and fasten to supporting frame without warp or deflection.

C. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.

D. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners along centerline of framing members or top joist chord angles. Attach deck according to deck manufacturer's written instructions. In no case shall fasteners be spaced more than 6-inches on center.

E. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches.

F. Laps: side laps shall be 3-inches, minimum. End laps shall be 6-inches minimum. Secure panel laps at 16-inches on center.

3.3 CLEANING AND PRIMING

A. Surficially rusted steel framing members (uncovered during deck removal work) and surficially rusted deck areas shall be mechanically cleaned of rust and scale according to Society for Protective Coating (SPC) SP-3 Standards and vacuumed clean.

B. Apply alkyd primer to cleaned deck and framing member areas, by brush, at rate of approximately 300 square feet per gallon. Allow 1-2 hours drying time prior to deck/roofing installation.

END OF SECTION 053100

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. This section specifies requirements for the following Scope of Work:
   1. Provide aluminum exterior roof access ladder.
   2. Provide aluminum exterior free-standing stair.
   3. Augment existing interior steel access ladder at access hatch.

1.2 SUBMITTALS

A. Shop Drawings: Include plans, elevations, sections, and details of metal fabrications and their connections.
   1. Include signature of Contractor and fabricator.
   2. Provide stamped and sealed fabrication drawings where indicated.

B. Templates: For anchors and bolts.

PART 2 - PRODUCTS

2.1 METALS

A. Metal Surfaces, General: Provide materials with smooth, flat surfaces without blemishes.

B. Ferrous Metals:
   1. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
   2. Stainless-Steel Bars and Shapes: ASTM A 276, Type 304.

C. Aluminum:
   1. Extrusions: ASTM B 221/, alloy 6061 or 6063-T6, mill finish.
   2. Pipe: Schedule 40
   3. Alloy Rolled Tread Plate: ASTM B 632/B 632M, alloy 6061-T6.

2.2 PAINT

A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements in FS TT-P-664 and compatible with finish paint systems indicated.

B. Galvanizing Repair Paint: SSPC-Paint 20, high-zinc-dust-content paint for regalvanizing welds in steel.

2.3 FASTENERS

A. General: Provide type 304 or 316 stainless-steel fasteners unless otherwise indicated.

B. Steel to steel connections: Bolts; ASTM A 325, endorsed by AISC; sized as indicated in Drawings.

C. Aluminum brackets to masonry connections: Epoxy anchors with 1/2-inch stainless steel rod and mesh screen tubes such as Hit-Hy-200A as manufactured by Hilti

2.4 MISCELLANEOUS MATERIALS

A. Non-shrink, Nonmetallic Grout: ASTM C 1107, factory-packaged, non-staining, noncorrosive, nongaseous grout.

B. Universal Shop Primer: Fast curing, lead and chromate free, universal modified-alloyed primer complying with MPI #79.

2.5 FABRICATION

A. General: Use connections that maintain structural value of joined pieces.
   1. Shear and punch metals cleanly and accurately. Remove burrs.
   2. Weld corners and seams continuously. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals. Obtain fusion without undercut or overlap. Remove welding flux immediately. Finish exposed welds smooth and blended.
   3. Fabricate joints that will be exposed to weather in manner to exclude water, or provide weep holes.
   4. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.
   5. Shop welds shall be in accordance with the American Welding Society (AWS) D1.1.

2.6 LADDERS

A. Ladders: Comply with ANSI A14.3 and CFR Part 1926, Section 1053, unless otherwise indicated.
   1. Aluminum Exterior Ladders
      a. Siderails: 3-inches by 1-1/2-inches by 1/8-inch thick, minimum, tubular; rails spaced 24-inches.
      b. Rungs: Corrugated, knurled, or dimpled, slip-resistant coating unacceptable; spaced 12-inches**.**

2. Provide brackets at not more than 48-inches on center. Size brackets and fasteners to support design loads specified in ANSI A14.3.
3. Provide a ladder safety system or personal fall arrest system for ladder height greater than 24-feet, to comply with ANSI A14.3.
4. Provide stamped and sealed fabrication drawings.

2.7 FEEE-STANDING STAIR

A. Stair and Accessories: Comply with IBC, OSHA and CFR requirements. Stairs shall be prefabricated and designed for a single span condition. Stairs and all accessories shall be hot aluminum. Width of stairway shall be 32-inches, fabricated at a height and depth to clear existing condensate pipes by minimum 3-inches, all sides.
   1. Stair and Railings
      a. Stairway rails: 5-inch deep channels.
      b. Grating: Diamond tread. Openings shall be approximately 3-1/2-inches long by 1-inch wide.
      c. Railings: 2-inch nominal pipe. Connections shall be flush-type rail fittings of commercial standard. Welded and ground smooth with railing locks secured with 3/8-inch recessed set screw.

2.8 FINISHES

A. Ferrous Metals: Finish metal fabrications after assembly. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Shop prime ferrous-metal items not indicated to be galvanized.
   1. Hot-dip galvanize items indicated to be galvanized to comply with ASTM A 123 or ASTM A 153/A 153M as applicable.
   2. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."
   3. Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1," for shop painting.

B. Non-Ferrous Metals: Provide mill finish.

PART 3 - EXECUTION

3.1 PREPARATION

A. General: Provide anchorage devices and fasteners for securing metal fabrications to in-place construction. Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, with edges and surfaces level, plumb, and true.
   1. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

2. Fit exposed connections accurately together. Weld connections, unless otherwise indicated. Do not weld, cut, or abrade galvanized surfaces.

3.2 EXTERIOR LADDER INSTALLATION

A. Position the ladder with the lowest rung 6-inches to 12-inches above the lower roof level and the upper platform just above the parapet cap. Ladder shall not penetrate either the upper or lower roof.

B. Ensure that the ladder extends down to within 6-inches of the upper roof surface.

C. Secure ladder to the existing wall with fasteners through mounting brackets as required or recommended by the manufacturer. In no case shall brackets be spaced more than 4-feet on center. Provide 4 brackets minimum.

3.3 EXISTING LADDER MODIFICATION

A. Existing interior ladders at hatch locations, not specifically indicated to be replaced, shall be repositioned, or extended to accommodate new roof system. Ladder shall provide for rungs not more than 12-inches above finished floor and level with the new hatch.

3.4 FREESTANDING STAIR

A. Install continuous walk pads at point of contact with roof.

B. Provide continuous wood blocking within roof system where freestanding stair assembly will come in contact with roof.

C. Install non-penetrating stair platform over existing condensate pipes with minimum 3-inch clearance on all sides.

3.5 SURFACE CORRECTION – FERROUS METALS

A. Touch up surfaces and finishes after erection.
   1. Shop painted Surfaces: Clean field welds, bolted connections, and abraded areas and touch up paint with same material as used for surrounding surfaces.
   2. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055000

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 SUMMARY

A. This section specifies requirements for the following Scope of Work:
   1. Provide wood blocking, stud walls, supports, shims, and other miscellaneous assemblies as indicated.

1.2 SUBMITTALS

A. Product Data: For each item specified in Part 2 of this Section.

1.3 PROJECT CONDITIONS

A. Wood blocking shown on Drawings may be greater or less than quantities required to match insulation thickness. Include required quantities in Base Bid.

B. Maintain constant perimeter heights to provide equal edge metal and fascia reveals.

C. Store wood to prevent distortion and to protect from atmospheric moisture.

D. Dimensional lumber and plywood shall be kiln dried unless otherwise indicated. If pressure treated lumber is required by the roof membrane manufacturer, additional compensation will not be considered. Additionally, if pressure treated wood is used, wood shall be separated from all metal components to avoid galvanic corrosion.

E. Wood blocking shown on the drawings shall be continuous unless specifically indicated otherwise.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of lumber grading agencies certified by ALSC.
   1. Factory mark each piece of lumber with grade stamp of grading agency.
   2. Maximum moisture content at time of dressing: 19 percent, maximum, for 2-inch nominal thickness or less.

B. Wood blocking and framing construction shall be No. 2 grade and any of following species:

1. Douglas fir-larch, Douglas fir-larch (north), or Douglas fir-south; NLGA, WCLIB, or WWPA.
2. Hem-fir or Hem-fir (north); NLGA, WCLIB, or WWPA.
3. Southern pine; SPIB.
4. Spruce-pine-fir (south) or Spruce-pine-fir; NELMA, NLGA, WCLIB, or WWPA.

2.2 DECKING AND SHEATHING

A. Plywood Sheathing: APA PS 1 Exposure 1 sheathing, 3/4-inch thick.

2.3 FASTENERS

A. Fasteners, washers, and accessories: Stainless steel or galvanized steel.
   1. Galvanized: ASTM A 153, hot-dip method. Electrogalvanized items unacceptable.

B. Wood-to-wood connections: Galvanized, annular-threaded or ring-shanked common nails, 3-inches long.

C. Termination bar to wood: Number 12, self-drilling, self-tapping screws of sufficient length to penetrate substrate 1-1/2-inches minimum.

D. Wood blocking to steel deck and steel framing: Number 14, self-drilling, self-tapping screws, factory treated with fluorocarbon coating or stainless steel, of sufficient length to penetrate upper flutes of steel deck or steel framing 1-inch minimum and 1-1/4-inches maximum.

E. Plywood to brick masonry or concrete walls: 1/4-inch diameter, 2-inch long drive pin anchors, with zinc sheath and stainless steel pin.

F. Dimension lumber to masonry or concrete: Masonry screws with high-low threads for tapping concrete and corrosion resistant coating; 1/4-inch diameter; Tapcon, by ITW Buildex, or approved equal.

2.4 ACCESSORIES

A. Batt insulation: See Division 07 Section “Roof and Deck Insulation.”

B. Self-Adhering Modified Bitumen: See Division 07 Section “Flashing and Sheet Metal.”

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Selection of lumber pieces:

1. Select members so that knots and obvious defects will not interfere with proper fastening and will allow making of proper connections. Cut out and discard defects that render piece unable to serve intended function.
2. Lumber may be rejected for excessive warp, twist, bow, crook, mildew, fungus, mold, or moisture content, as well as for improper cutting and fitting.

B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

C. Comply with Factory Mutual (FM) Data Sheet 1-49 for anchoring perimeter blocking. Reduce fastener spacing by half within 8-feet of exterior corners.

D. Cut butt joints in woodwork to provide smooth, uniform line without irregularities. Stagger butt joints at multiple layers of blocking, layer to layer. Gap joints 1/8-inch. Minimum length of any individual piece of woodwork at perimeter edge shall be 3-feet, with minimum of 2 fasteners per piece.

E. Overlap wood blocking joints at corners from layer to layer.

F. Protect installed wood from moisture and weather. Wood degraded by exposure shall be rejected.

3.2 FASTENING OF WOODWORK

A. General:
1. Countersink fasteners below top plane of nailers.
2. Achieve 1-1/4-inch minimum penetration into substrate when fastening 2x lumber to brick, structural concrete, or 2x lumber. Provide 1-inch minimum and 1-1/2-inches maximum penetration of metal decks.
3. Provide 2 rows of fasteners at the specified frequency for wood blocking 2-inches by 8-inches nominal and wider.
4. When attaching wood to concrete or masonry, through-drill wood 1/16-inch larger than fastener shank.
5. Re-secure existing wood blocking scheduled for reuse with appropriate fasteners spaced at 48-inches on center, staggered off centerline.

B. Wood blocking:
1. To wood blocking: With annular-threaded, ring-shank nails, 12-inches on center, maximum, and staggered slightly off centerline of member being installed.
2. To concrete/masonry substrates: With screws spaced 16-inches on center maximum and staggered slightly off centerline of member being secured.
3. At deck penetrations to steel framing and steel decking: With self-drilling, self-tapping screws spaced at 16-inches on center maximum in staggered pattern.
4. For nailer to nailer connections, penetrate member being fastened to 3/4 thickness of member. Fasten 16-inches on center, staggered.

C. Plywood:

1. To concrete/masonry walls: With drive pins spaced at 8-inches on center vertically and 16-inches on center horizontally staggered from row to row. Predrill pilot holes in accordance with fastener manufacturer's printed instructions.
2. To wood blocking: With nails spaced at 8-inches on center along each framing member.
    a. Countersink fasteners below top plane of plywood.
    b. Provide 1/8-inch gap between successive sections of plywood. Align finished surfaces to vary not more than 1/16-inch from plane of surfaces of adjacent units.
    c. Place panels with long dimension perpendicular to support.
    d. Install roof deck panels in staggered array, with panel ends in successive rows being offset. Minimum panel placement size shall be 48-inches by 48-inches. Each panel shall span minimum of 3 supports.
    e. Center joints accurately over support.

3.3 STUD WALLS

A. Fabricate stud walls with continuous top and bottom plates and studs spaced at 16-inches on center, maximum. Secure studs to top and bottom plates with 2 fasteners at top and bottom connections. Provide stud walls with extra wide bottom plate where indicated.

B. Secure bottom plate of stud wall to existing substrate with 2 rows of fasteners spaced at 16-inches on center. Provide stud walls in maximum 8-foot lengths. Secure mating studs of adjacent wall sections with 2 rows of fasteners spaced 8-inches on center.

C. Position plywood so that ends align with studs and extend onto adjacent section of stud walls 32-inches minimum. Overlap plywood onto existing wall and or framing where indicated. Secure plywood to exterior and interior of wall along top and bottom plates with fasteners spaced at 16-inches on center. Secure plywood to studs with 2 fasteners per stud. Provide batt insulation between studs unless otherwise indicated.

D. Shim and adjust perimeter parapet walls as required to provide a plumb and true wall. Provide a longitudinal wall deviation of 1/2-inch maximum in 50 feet.

END OF SECTION 061000

SECTION 072200 - ROOF AND DECK INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. This section specifies requirements for the following Scope of Work:
   1. Provide tapered and flat thermal insulation and cover board.
   2. Provide insulation crickets, fillers, and cants.

1.2 SYSTEM DESCRIPTION

A. Tapered Insulation System:
   1. Provide minimum insulation thickness as specified.
   2. The maximum thickness for any given insulation board or layer shall be 3-inches.
   3. Provide minimum average aged R-Value of 30 throughout roof areas.
   4. Maintain constant perimeter height at edges of each roof section.
   5. Utilize existing and augmenting drain locations as indicated on Drawings.
   6. Provide crickets and saddles between interior drainage points. Cricket width shall be as required to provide positive slope to drain but in no case less than 8-foot wide unless specifically indicated otherwise.
   7. Provide 8-foot by 8-foot sumps at each drain location.

1.3 SUBMITTALS

A. Product Data: For each product indicated in Part 2 of this Section.

B. Manufacturer’s full size tapered insulation/cricket drawing with the following:
   1. Outline of roof area with drain and major penetration locations.
   2. Profile of tapered sections to include crickets.
   3. Average R-value of system.

C. Certifications: Provide documentation for requirements described in Paragraph 1.4, Quality Assurance.

D. Insulation attachment pattern: Provide a drawing showing typical fastener pattern and frequency at field, corners, and edges.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Provide insulation and related materials with fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84 for surface-burning characteristics, by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.

B. Securement: Fasten or secure components of system to meet or exceed requirements of FMG Data Sheets 1-28 and 1-29. Comply with requirements to achieve wind uplift rating of 1-90.

C. Insulation products incorporated into roof system shall be included in roof membrane manufacturer's system warranty. Provide documentation from membrane manufacturer that proposed insulation will be included in required warranty.

D. Tapered insulation plan in Drawings is a conceptual configuration showing basic design intent. Do not interpret Drawings as approved tapered insulation layout plan.

PART 2 - PRODUCTS

2.1 INSULATION BOARDS

A. Roof insulation system materials shall be manufactured by or acceptable to roof membrane manufacturer for inclusion in full system warranty to be issued by manufacturer.

B. Polyisocyanurate: ASTM C 1289, Type II; Class I, Grade 2.
   1. Flat Board Stock: Minimum thickness 2.6-inches.
   2. Tapered System: 1/4 or 1/2-inch per foot slope as indicated on Drawings, to provide consistent slope; minimum thickness of tapered isocyanurate shall be 1/2-inch.
   3. Crickets: 1/2-inch per foot, minimum slope.
   4. Board size, maximum:
      a. For Adhered Installation: 4-feet by 4-feet.
      b. For Mechanically Attached Insulation: 4-feet by 8-feet.

C. Wood Fiberboard: ASTM C 208.
   1. Coverboard: High density, non-asphaltic; minimum 1/2-inch thick; maximum board size, 4-feet by 4-feet.
   2. Cants: 4-inch face; 1-1/2-inch thickness.
   3. Tapered Edge Strip: Taper from 1-1/2-inch thickness to feather edge; 2-feet by 4-feet.
   4. Crickets and Drain Sumps: 1/2-inch per foot, minimum, slope.

D. Mineral-fiber batt insulation consisting of fibers manufactured from glass, slag wool, or rock wool:

1. Unfaced Mineral-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indices of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.
2. Faced Mineral-Fiber Blanket Insulation: ASTM C 665, Type III, Class A; Category 1, faced with foil-scrim-Kraft, foil-scrim, or foil-scrim-polyethylene vapor-retarder membrane on one face.

2.2 MECHANICAL INSULATION

A. Insulation for drain bowls and leader piping: fibrous glass batt type with premolded polyvinyl chloride jackets. Seaming tape for jacket seams shall be as supplied by insulation jacket manufacturer. Minimum thickness 1-inch.

B. Fiberglass batt insulation for use at locations other than hot pipes: Conforming to ASTM C 665, Type II, Class C and E84, I, 3-inches thick.

2.3 ACCESSORIES

A. Asphalt: ASTM D 312, Type IV.

B. Fasteners
1. Insulation Fasteners: Number 12, self-drilling, self-tapping screws; sufficient length to penetrate top flange of steel decking by 1-inch minimum and 1-1/4-inches maximum; with fluorocarbon coating complying with FMG 4470.
2. Stress Plates: Nominal 3-inch diameter, 26 gauge galvalume coated steel.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ensure that surfaces to receive insulation are clean and dry. If necessary, provide equipment to dry surface prior to application. Do not dry with open flames.

B. Remove dirt, debris, and dust from substrates by brooming or vacuuming. Clean dirt and debris from between steel deck ribs.

C. Provide roof insulation boards free of defects, including, but not limited to, broken corners, improperly adhered skins, excessive moisture content (if insulation surface “foams” when hot bitumen is applied, excessive moisture is present), dimensional irregularities, or other defects that may adversely affect replacement roof system. Mark defective insulation boards permanently and remove from site.

3.2 ROOF INSULATION INSTALLATION

A. Mechanical Attachment:

1. Secure base layer of insulation to steel roof decks using specified fasteners. Stagger end joints to middle of long dimension of insulation boards. Install fasteners at a rate of 1 fastener per 2 square feet (16 fasteners per 4-feet by 8-feet board) in the field of the roof. Increase fasteners to 24 fasteners per 4-feet by 8-feet board 8 feet minimum from the building perimeter. Further increase fastener frequency to 32 fasteners per 4-feet by 8-feet board for minimum of 8-feet in each direction from building corners where parapets do not exceed 3-feet in height. Drive fasteners straight, perpendicular to insulation. Install fasteners in accordance with the pattern established by the FMG Approval Guide. Adhere subsequent layers of insulation in asphalt.
2. Install insulation boards with minimum surface area of 16 square feet within 8-feet of building perimeters. Minimum dimension on cut insulation boards in field of roof shall be 12-inches, with minimum surface area of 2 square feet.

B. Asphalt Attachment:

1. Secure insulation layers and cover board, not schedule for mechanical attachment, using hot asphalt. Adhere each insulation layer, including the cover board, over acceptable substrate in full moppings of hot steep asphalt applied at rate of 30 pounds per square.
2. Stagger joints of insulation and coverboard within each layer. Offset joints between insulation layers 12-inches minimum. Gaps between boards shall not exceed 1/4-inch. Install boards with minimum surface area of 6 square feet within 8-feet of roof edge. In field of roof, minimum dimension of cut board shall be 12-inches, with minimum surface area of 2 square feet.
3. Place boards carefully to prevent bitumen from being forced between joints and onto top surface of board. Walk in boards immediately upon placement. Remove and replace poorly adhered boards.
4. Asphalt Temperature: Apply asphalt at 375 degrees F minimum, or within 25 degrees F of equiviscous temperature (EVT). Adjust asphalt application temperatures to prevent blistering of insulation facers. Do not heat asphalt above finish blowing temperature (FBT) for longer than four consecutive hours. Use thermometers to check temperature during heating and application. Monitor bitumen temperatures and ensure that safe heating temperatures are not exceeded.

C. Utilize tapered edge strips and filler boards at drain sump locations. Place taper from surrounding insulation system down to drain bowl locations, providing 8-foot by 8-foot minimum drain sumps.

3.3 EXPANSION JOINT INSTALLATION

A. Place fiberglass batt insulation in expansion joints as indicated on Drawings. Do not compress insulation.

B. Provide continuous self-adhering membrane over expansion joint curb.

3.4 PIPE INSULATION INSTALLATION

A. Install insulation and jackets at drain bowls as indicated on Drawings, in accordance with manufacturer's printed instructions. Refer to Division 22, "Roof Drains" for additional information

B. Install batt insulation at hot pipe locations as indicated on Drawings. Place foil facing toward pipe penetration.

END OF SECTION 072200

SECTION 075113 - BUILT-UP ASPHALT ROOFING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies requirements for the following Scope of Work:
   1. Provide 4-ply built-up roof membrane and modified bitumen cap sheet and 2-ply modified bitumen base flashings and strippings.
   2. Provide associated roof system components as required to complete the roof system installation.

1.2 UNIT PRICES

A. Technical requirements for related Unit Price work are defined in this Section. Refer to Division 01 Section “Unit Prices,” for quantities to be carried in the Base Bid and provided on the bid form.

1.3 SUBMITTALS

A. Product Data: For each product specified in Part 2.

B. Certifications: Provide documentation for requirements outlined in Paragraph 1.4, Quality Assurance.

C. Sample roof membrane manufacturer’s warranty.

D. Contractor’s letter certifying a minimum of 5-years commercial roofing experience to include 3 projects of similar size and scope to this project completed in the last 5 years. Provide a list of project references, including names and phone numbers.

E. Provide the following information for each shipment of asphalt:
   1. Equiviscous temperature (EVT).
   2. Flash point (FP).
   3. Finished blowing temperature (FBT).
   4. Softening point.
   5. Asphalt type (ASTM D 312).

1.4 QUALITY ASSURANCE

A. Manufacturer approval:
   1. Installer Qualifications: Approved by manufacturer to install manufacturer’s products.

2. Source Limitations: To greatest extent possible, obtain components for roofing system from roofing system manufacturer. Provide letter of acceptance from manufacturer for components, including insulation products and asphalt, from other sources.
3. System approval: Provide statement from manufacturer that specified roof system meets requirements for requested warranty.
4. Identify in writing specific contract requirements that are not approved or warrantable by manufacturer.

B. Do not deliver to site or install material or system that has not been approved. Remove materials installed without prior approval upon Owner's request.

C. Restrict traffic on completed roof areas. Coordinate work to prevent trafficking by working toward roof edges and access ways. Should access to completed roof areas be necessary, provide protection for trafficked areas in accordance with Division 01 Section "Temporary Facilities and Controls".

D. Minimum quality standards: Comply with NRCA/ARMA publications "Quality Control Guidelines for the Application of Built-up Roofing" and "Quality Control Guidelines for Polymer Modified Bitumen Roofing." Standards within these specifications that exceed NRCA/ARMA shall prevail.

E. Project construction will be monitored and evaluated by the Owner or Owner's Representative for compliance with the Contract Documents.

1.5 GUARANTEES AND WARRANTIES

A. Provide complete roof system, including insulation, to be covered by roof membrane manufacturer's system warranty. Provide materials not included in Specifications where required by manufacturer to obtain requested warranty, without additional charge to Owner.

B. Roof membrane manufacturer's system warranty meeting following minimum criteria:
1. Coverage to repair damage to system components resulting from leaks due to failure of materials or workmanship.
2. Non-prorated, non-penal sum (no dollar limit), 20-year warranty period.
3. Coverage of cost of removal and replacement of wet or damaged insulation due to failure of materials or workmanship.
4. No exclusion from coverage for damage to roof system from wind gusts less than 55 miles per hour.

C. Contractor's Guarantee: Refer to Division 01 Section "Summary of Work," for Contractor's Guarantee.

PART 2 - PRODUCTS

2.1 PRODUCT PERFORMANCE

A. Fire resistance: Listed by Underwriters' Laboratories as Class A roof system.

B. Wind uplift resistance: Meets attachment requirements for FM Global 1-90.

2.2 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of following:
   1. Asphalt Built-up Roofing:
      a. Firestone Building Products Company.
      b. Johns Manville International, Inc.
      c. GAF Materials Corp.
      d. Soprema, Inc.
      e. Accepted substitute.

2.3 ROOFING MEMBRANE PLIES

A. Roof Membrane Ply Sheet: ASTM D 2178, Type VI, asphalt-impregnated, glass-fiber felt.

B. Capsheet: ASTM D 6164, Grade G, Type II, polyester-reinforced, SBS-modified asphalt sheet; granular surfaced; fire rated; suitable for application with hot asphalt**;** white granules.

2.4 FLASHING MATERIALS

A. Reinforcing ply: ASTM D 6164, Grade S, Type I, polyester reinforced, SBS-modified asphalt sheet; suitable for application with cold adhesive.

B. Flashing Sheet: ASTM D 6164, Grade G, Type I or II, polyester-reinforced, SBS-modified asphalt sheet; granular surfaced; suitable for application with hot asphalt; white granules.

C. Liquid-Applied Flashing: 2-part fully-reinforced PMMA flashing membrane supplied by or approved by the roof manufacturer.

2.5 ASPHALT MATERIALS

A. Asphalt Primer: ASTM D 41.

B. Roofing Asphalt: ASTM D 312, Type IV.

C. Flashing/Stripping Adhesive: Heavy-duty, trowel grade, adhesive for stripping and base flashing membrane, specifically manufactured for vertical surface applications such as:

1. “MB Flashing Cement” by Firestone Building Products
2. “MBR Utility Cement” by Johns Manville
3. “Matrix 202 SBS Flashing Cement” by GAF Materials
4. “FM Adhesive VOC-1 Trowel Grade” by Soprema

D. Flashing Lap Coating: Fibrated aluminum roof coating, ASTM D 2824, Type III; asbestos free.

2.6 ACCESSORIES

A. Sealant: One-part polyurethane, gun grade, high performance elastomeric sealant: ASTM C 920, Type S, Grade NS, Class 25.

B. Fabric Mesh: Woven and treated glass or cotton fabric for flashing applications: 6-inches wide.

C. Self-Adhering Membrane: See Division 07 Section “Flashing and Sheet Metal.”

D. Lap Bleed Finish Granules: Ceramic granules sized and colored to match flashing sheet surfacing as supplied by membrane manufacturer.

E. Temporary Foam Night Seal: Two-part polyurethane foam pack: Roofpak by Dow Chemical Company or accepted substitute.

F. Lead Sheet: See Division 07 Section “Flashing and Sheet Metal.”

G. Walkway Pads
1. Walkway pads throughout field of roofs: ASTM D 6164, Grade G, Type II, polyester-reinforced, SBS-modified asphalt sheet; granule-surfaced; suitable for application method specified; granule color as selected by Owner from standard colors.

H. Roof Coating: Refer to Division 09 Section “Elastomeric Coatings.”

2.7 FASTENERS

A. Nails for membrane terminations at wood nailers and curbs: 11 gauge; ASTM A 153, hot-dip galvanized; large-head, annular threaded roofing nails, 1-1/2-inches long, with 1-inch diameter cap.

B. Fasteners for terminating base flashings through plywood sheathing at masonry walls:
1. Stainless steel or fluorocarbon coated concrete/masonry screws 1/4-inch diameter, 2-inch long; Rawl Tapper manufactured by Powers/Rawl.
2. Drive pins with zinc sheaths and stainless steel pins 1/4-inch diameter, 2-inch long; Zamac Nailins by Powers/Rawl.
3. Accepted substitute.

C. Flat discs to be installed beneath masonry fasteners for securing base flashings: ASTM A 153, 20 gauge galvanized steel; 1-1/2-inches in diameter, minimum.

PART 3 - EXECUTION

3.1 PREPARATION

A. Ensure that surfaces to receive membrane, flashing, and surfacing are clean and dry. Should surface moisture such as dew exist, provide necessary equipment to dry surface prior to application. Use of open flames is strictly prohibited.

B. Remove dirt, debris, and dust from substrate surfaces by brooming and vacuuming prior to application of roofing.

C. Verify that drains, curbs, cants, expansion joints, perimeter blocking, wall flashing, roof penetrating elements, and other items necessary to begin installation of membrane are installed.

D. Verify that insulation boards are installed smoothly and evenly and are not broken, cracked, or curled. Insulation shall be roofed over on same day as installed.

E. Prime masonry, concrete, and sheet metal surfaces in contact with bituminous materials, including sheet metal flanges (both sides) and lead sheet at drain sumps (both sides) with asphaltic primer prior to roofing or flashing installation. Allow primer to dry thoroughly prior to installing bituminous flashings.

F. Install built-up roofing membrane system according to roofing system manufacturer's written instructions and applicable recommendations of ARMA/NRCA.

G. Coordinate installing roofing system components so insulation and roofing membrane sheets are not exposed to precipitation or left exposed at end of workday or when rain is forecast.

H. Substrate-Joint Penetrations: Prevent roofing asphalt from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

3.2 ROOFING MEMBRANE INSTALLATION

A. Install four ply sheets starting at low point of roofing system. Align ply sheets without stretching. Shingle side laps of ply sheets uniformly to achieve required number of plies throughout thickness of roofing membrane. Shingle in direction to shed water. Extend ply sheets over and terminate beyond cants. Embed each ply sheet in solid mopping of hot roofing asphalt.

1. Application of felt plies utilizing mechanical felt layers will not be accepted. “Gang rolling” of three or more plies of felt together will not be accepted. When applying felt rolls, ensure that adequate mopping asphalt is present in front of felt rolls. Maintain interply mopping asphalt maximum of 4-feet in front of leading edge of felt roll. Broom felts into hot asphalt.
2. Do not use rolls with frayed edges, oval shaped rolls, rolls with moisture contamination, or rolls with similar defects which may inhibit embedment during installation. Remove rolls from job site.
3. Apply asphalt at rate of 23 pounds per ply per square, plus or minus 20 percent. Broom in each ply while asphalt is fluid. Do not traffic on felts before asphalt has solidified.

4. Ensure by inspection that visible bleed-through of asphalt is present over entire surface of each ply of felt, and that there is visible but not excessive bleedout at edge of each ply. Repair bare spots, dry laps, voids in interply moppings, fishmouths, and wrinkles with 2 additional plies. Cut and reset fishmouths and wrinkles prior to application of subsequent plies. Extend each ply minimum of 9-inches in each direction beyond extent of defect area.

B. Asphalt Application:

1. Do not exceed application temperature and asphalt heating temperatures specified for asphalts to be used. Refer to asphalt supplier's EVT, FBT, and FP temperature data when heating and setting asphalts.
2. Temperature variance of steep asphalt: When installing felt plies, apply asphalt when asphalt temperature is within plus or minus 25 degrees F of EVT printed on bitumen container label or bill of lading. Typical application temperatures will range from 415 degrees F to 465 degrees F. Do not heat asphalt above finish blowing temperature or 500 degrees F, whichever is lower, for more than four hours.
3. Remove heated asphalt that has exceed temperature restrictions cited above from site. Ensure that such asphalt is not included in Work.
4. Apply asphalt to achieve complete coverage at rates specified. Maintain asphalt spreaders, if used, to ensure proper application rates and temperatures. Voids in asphalt created by use of spreaders shall be cause for rejection by Owner of use of mechanical spreaders. Use felt envelope strips to prevent drippage of bitumen into building and down exterior walls.

3.3 SELF-ADHERING MODIFIED BITUMEN INSTALLATION

A. Condition surfaces with primer at walls and perimeter elements to receive membrane as recommended by membrane manufacturer. Do not prime more than can be covered by sheet installation in one day.

B. Install self-adhering modified bitumen membrane as detailed.

C. Cut modified bitumen into lengths not to exceed 8-feet.

D. Remove release paper backing, set membrane into place, provide minimum 3-inch head laps, and roll down smooth with metal roller.

E. Lap membrane over vertical base flashings and substrate surfaces 3-inches minimum or as indicated in Drawings.

3.4 REINFORCING PLY INSTALLATION (Base Flashings and Strippings)

A. Verify that repairs have been made to field membrane in area adjacent to flashing area.

B. Metal flanges shall be treated with a brush coat of asphaltic primer (both sides) and set in full bed of adhesive prior to reinforcing ply installation.

C. Set reinforcing plies at base flashings, metal flanges, and other detailed areas in full, uniform bed of SBS-modified bitumen adhesive applied by trowel at minimum rate of coverage, as recommended by membrane manufacturer.

D. Cut reinforcing plies for horizontal metal flange applications wide enough to provide full coverage of flange and 6-inches onto built-up membrane. Embed end of strip in wet adhesive by applying pressure with dry trowel, working toward metal flange and opposite end of strip. Ensure that membrane is solidly set in adhesive with no voids. Provide 3-inch laps at end of strips.

E. Cut reinforcing plies across width of roll for base flashings at walls, curbs, and other vertical applications to lengths sufficient to provide full coverage to top of vertical element, across cant, and 6-inches onto horizontal surface of built-up membrane. Embed sheet in adhesive by applying pressure with dry trowel at top of cant and working toward top of wall or curb.

F. Starting again at top of cant, apply pressure with trowel, working across face of cant and toward horizontal surface of base ply and embed lower portion of sheet. Ensure that membrane is solidly set in adhesive with no voids or bridging at cant.

G. Provide 3-inch laps and stagger laps. Provide additional reinforcing strip at vertical corners lapped 3-inches onto each vertical side and 3-inches onto horizontal built-up membrane.

3.5 MODIFIED CAP SHEET INSTALLATION

A. Verify that all repairs have been made to the field membrane and reinforcing plies have been properly installed. Surfaces should be free of sawdust, dirt, insulation debris, and other contaminants prior to starting installation.

B. Cap sheets shall be laid perpendicular to the flow of water starting at the low point of the area and working to the high point. Unroll dry membrane and allow it to relax. Provide 3-inch side laps and 6-inch end laps, and stagger end laps of adjacent cap sheets by 24-inches. Align the granulated side of the sheet over the selvage side of the adjacent sheet. While maintaining alignment, reroll approximately one-half of the dry membrane sheet.

C. Apply asphalt at the specified temperature and at the rate of 25 pounds per square plus or minus 20 percent. Apply even pressure with stiff bristle broom directly behind roll to ensure full adhesion and visible bleed out of asphalt at side and end laps. Avoid excessive bleed out of more than 1-inch. Distribute loose granules into hot asphalt bleed out directly behind membrane applicable to ensure complete color uniformity of cap sheet surface. Repeat procedure for the other half of the roll.

D. Membrane cap sheets shall be applied free of wrinkles, creases, fishmouths, or voids. Maintain alignment of sheets utilizing marked lap lines. Should the lap lines become misaligned while unrolling, cut the sheet and establish a new end lap. Do not attempt to realign a partially adhered membrane roll.

E. Inspect cap sheet application for defects. Cut wrinkles, creases, and fishmouths to relax the membrane. Apply a full width strip of cap sheet membrane over the defect in a full bed of cold adhesive and lapped a minimum of 6-inches beyond the cut. Unbonded lap seams of more than

1/2-inch wide shall be embedded in cold adhesive troweled under the unbonded membrane. Reapply granules to repairs as needed.

3.6 FLASHING AND STRIPPING SHEET INSTALLATION

A. Verify that repairs have been made to field membrane and reinforcing sheet in area adjacent to cant to receive flashing sheet. Snap chalk line 4-inches minimum from edge of reinforcing ply and on field side of roof.

B. Verify that flashing and stripping reinforcing plies set in cold adhesive have sufficiently cured prior to mopping in top stripping or flashing sheet. Follow manufacturer's recommendations for curing times. Flashing and stripping plies that exhibit voids, bridging, lack of adhesion, open laps, and other defects are unacceptable and must be repaired.

C. Cut flashing sheet across width of roll to provide full coverage to top of vertical element and minimum of 4-inches beyond edge of reinforcing ply on horizontal membrane surface. Apply asphalt to both vertical element and back of flashing sheet. Embed flashing sheet into hot asphalt by applying pressure, starting at top of cant and working toward top of wall or curb.

D. Apply sufficient pressure to ensure full and continuous adhesion of membrane with no air pockets, voids, wrinkles, fishmouths, or bridging. Apply pressure from top of cant working down across face of cant and toward field of roof in similar manner until entire flashing sheet is solidly adhered.

E. Allow 3-inch laps onto adjacent sheets and nail top edge of flashing sheets at 6-inches on center with specified fastener. Inspect other laps of completed flashing sheet installation and repair defects with adhesive.

F. Apply 6-inch wide asphalt saturated fabric set in flashing cement over vertical laps. Coat fabric and cement with aluminum coating.

G. Cut stripping top ply wide enough to provide full coverage from leading edge of edge metal flange and 10-inches onto horizontal surface of built-up membrane. Apply uniform mopping of hot asphalt at rate of 15-20 pounds per 100 square feet, to both horizontal element and back of flashing sheet to be installed.

H. Set stripping sheet in place and broom in stripping, applying even pressure throughout sheet. Ensure that sheet is solidly set in hot asphalt with no voids or bridging. Provide 3-inch minimum laps and stagger laps (12-inches minimum) with previously installed reinforcing ply sheets.

3.7 LIQUID-APPLIED FLASHING

A. Provide liquid-applied flashing at locations indicated on Drawings.

B. Flashing Installation:

1. Apply base coat of liquid-applied flashing to thickness recommended by manufacturer.
2. Immediately embed reinforcement fabric into the wet base coat.

3. Roll fabric into base coat while installing top coat of liquid flashing.
4. Provide finished mil thickness as recommended by manufacturer.

3.8 DRAIN FLASHING

A. Install roofing felts onto drain bowl flange (beneath clamping ring) as detailed. Trim felts flush with inside diameter of drain bowl as detailed.

B. Install lead flashing sheet at drains in full bed of adhesive as shown. Cut single piece of reinforcing ply membrane 39-inches by 39-inches and chalk diagonal lines to establish center of sheet. Cut hole at center of this target sheet to provide minimum of 1-inch of membrane inside clamping ring.

C. Install target sheet centered over drain bowl in a full bed of modified bitumen adhesive at specified rate and directly to primed lead sheet and 4-inches minimum onto field membrane.

D. Offset flashing sheet from edge of drain approximately 6-inches so that no seams are installed under clamping ring. Position additional flashing ply to cover remaining exposed target sheet and lap onto previously installed flashing sheet 6-inches. Install flashing sheet in full bed of modified bitumen adhesive. Offset capsheet from edge of drain approximately 6-inches so that no seams are installed under clamping ring.

3.9 WALKWAYS

A. Provide capsheet walkway pads at at locations indicated by the owner and as shown on the drawings. Provide walkways using full width of roll cut in maximum 5-foot lengths. Provide 6-inch gaps between adjacent pieces.

B. Embed pads in full applications of hot asphalt. “Step in” and broom each piece to ensure total adhesion.

3.10 TEMPORARY PROTECTION

A. Unfinished perimeter and penetration components: Provide temporary waterstops adequate to prevent moisture intrusion into newly installed work around exposed edges and incomplete flashing locations. Remove temporary materials completely prior to continuing with subsequent work.

B. Tie-ins: Provide temporary waterstops at deck and tie-ins between newly installed 4-ply and existing membrane as detailed. Inspect tie-ins thoroughly and repair as needed to provide watertight assembly prior to leaving site.

3.11 FIELD QUALITY CONTROL

A. Inspect and repair each completed section of built-up roofing plies prior to application of membrane surfacing. Mark deficiencies such as fishmouths, dry laps, voids, and excessive asphalt with keel or paint for repairs.

B. Areas of finished 4-ply membrane with numerous deficiencies due to failure to broom-in felts or restrict traffic on newly installed felts will require additional overlay of two plies, at discretion of Owner.

C. Ensure by inspection that visible bleed-through of asphalt is present over entire surface of each ply of felt, and that there is visible but not excessive bleedout at edge of each ply. Bare spots, dry laps, voids in interply moppings, fishmouths, and wrinkles shall be repaired with two additional plies. Cut and reset fishmouths and wrinkles prior to application of subsequent plies. Extend each ply minimum of 9-inches in each direction beyond extent of defect area.

D. Prior to application of capsheet, notify Owner and Owner's Representative in writing that 4-ply roof membrane installation, quality control inspection, and repair work are complete. Provide manufacturer's technical inspection and report the results in writing to Owner and Owner's Representative.

END OF SECTION 075113

SECTION 076000 - FLASHING AND SHEET METAL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies requirements for the following Scope of Work:
   1. Provide perimeter and penetration sheet metal flashings and components at locations indicated on the drawings and as required to properly terminate the roof system.

1.2 SUBMITTALS

A. Product Data:
   1. For each item specified in Part 2 of this Section.
   2. Color charts for coated metals.

B. Shop Drawings: Show layouts, profiles, shapes, seams, dimensions, and details for fastening, joining, supporting, and anchoring sheet metal flashing and trim.

C. Certifications: Perimeter sheet metal assembly must be in compliance with IBC requirements, specifically ANSI/SPRI ES-1 protocol.

1.3 QUALITY ASSURANCE

A. Installation procedures shall be in accordance with the industry standards and codes indicated in Division 01 Section “Summary of Work” and those indicated in this Section.

B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

C. Sheet Metal Standard: Comply with NRCA “Roofing and Waterproofing Manual, Fifth Edition.” Conform to dimensions and profiles shown unless more stringent requirements are indicated.

D. Mockups: Build mockups to demonstrate aesthetic effects and set quality standards for fabrication and installation. Include seams, attachments, underlayment, and accessories.
   1. Parapet Cap

1.4 WARRANTY

A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SHEET METALS

A. Stainless-Steel Sheet: ASTM A 240, Type 304, No. 2D finish.

B. Galvanized (Zinc-Coated) Steel Sheet: ASTM A 653, G90 coating designation; structural quality, mill phosphatized for field painting.

C. Prepainted, Metallic-Coated Steel Sheet: Galvanized sheet steel (G90); prepainted by coil-coating process, ASTM A 755; provide with manufacturer's strippable plastic film. Exposed finishes:

1. High-Performance Organic Finish: Two-coat thermocured system containing not less than 70 percent polyvinylidene fluoride (Kynar/Hylar) resin by weight; complying with AAMA 2604. Color as selected by Owner from standard colors.

D. Lead Sheet: ASTM B 749, Type L51121, copper-bearing lead sheet.

2.2 ACCESSORIES

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation.

B. Self-Adhering Membrane: High temperature self-adhering, SBS modified bitumen membrane with poly-surface and release-paper backing, minimum 40-mil thickness, designed for a minimum melting temperature of 220 deg F such as Ice & Water Shield HT by W.R. Grace, Lastobond Shield HT by Soprema, Metshield by MetFab, or accepted substitute.

C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.

D. Exposed elastomeric Sealant: Refer to Division 07 Section "Joint Sealants".

E. Concealed sealant for metal-to-metal connections: Refer to Division 07 Section "Joint Sealants".

F. Band Clamps: Stainless steel, including screw-adjustable clamps; 1/2-inch wide.

G. Flux: muriatic acid based with zinc.

H. Solder: ASTM B 32, 50% block tin and 50% pig lead; manufactured for use with stainless steel or copper.

I. Splash Block: Precast concrete formed to divert water in one direction. Splash block shall be in smooth forms with bottom edges rounded or chamfered to prevent abrasion.

J. Cold Applied Adhesive: See Division 07 Section "Built-up Asphalt Roofing."

K. Termination Bar: Manufacturer's standard, predrilled aluminum bars, approximately 1 by 1/8-inch thick with sealant edge. Holes shall be predrilled at 6-inches on center.

L. EPDM Membrane: 0.060-inch EPDM membrane, with self-adhering backing, white.

2.3 FASTENERS

A. Sheet metal to wood blocking connections (concealed securement): No. 12 annular threaded Series 300 stainless steel nails minimum 1-1/2-inches long.

B. Sheet metal to wood blocking connections and mechanical unit securement (exposed securement): Self-drilling, self-tapping, Number 10, stainless steel hex-washer-head screws, 1-1/2-inch long, with metal-capped EPDM washers.

C. Sheet metal to masonry wall connections: 1/4-inch diameter, concrete/masonry screws of sufficient length to penetrate substrate 1-1/2-inch minimum. Provide metal capped EPDM washers at exposed locations.

D. Sheet metal fascia to wood connections: 1-inch long, #10, Series 300 stainless steel pan head screws.

E. Fasteners for downspout to downspout outlet connections: #10 Series 300 stainless steel screws, 1/2-inch long or stainless steel pop rivets.

F. Nuts and bolts for gutter assembly: Series 300 stainless steel, #12-24, 1-inch to 1-1/2-inch long.

G. Gutter Spacers: 3-inches long, #12, Type 304, Series 300 stainless steel screws or #14 fluorocarbon coated screws.

2.4 FABRICATION – GENERAL

A. General: Fabricate sheet metal flashing and trim to comply with IBC and recommendations in SMACNA and NRCA that apply to design, dimensions, metal, and other characteristics of item indicated. Obtain field measurements for accurate fit before shop fabrication.

B. Fabricate sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

1. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints for additional strength.
2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.

C. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant to comply with SMACNA recommendations.

D. Expansion Provisions: Where lapped expansion provisions in Work cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1-inch deep, filled with butyl sealant concealed within joints.

E. Provide concealed fasteners and expansion provisions where possible on exposed-to-view sheet metal flashing and trim, unless otherwise indicated.

F. Provide cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal, and in thickness not less than that of metal being secured.

2.5 FABRICATION SCHEDULE

A. PVDF Coated Galvanized Steel (24 gauge)
   1. Edge Metal/Cover Plates
   2. Parapet Caps
   3. Closures
   4. Fascia Metal
   5. Downspout Outlet
   6. Conductor Head/Downspout
   7. Scupper Face Plate

B. Galvanized Steel (22 gauge)
   1. Cleats

C. Stainless Steel (26 gauge)
   1. Reglet Counterflashing and Receiver (Roof to Wall)
   2. Skirt Flashing/Clips
   3. Expansion Joint Covers
   4. Expansion Joint Counterflashing Cleat
   5. Clips (Expansion Joint, Counterflashing)
   6. Storm Hoods
   7. Scupper Sleeve
   8. Door Threshold Cover
   9. Curb Covers

PART 3 - EXECUTION

3.1 PREPARATION

A. Verify that substrate and anchorage materials to receive sheet metal flashings are properly secured and aligned, without gaps, lumps, or offsets that may distort metal.

B. Install underlayment at roof edges, parapets, curbs, and similar transitions, and as shown on Drawings.

3.2 INSTALLATION, GENERAL

A. Comply with these specifications and applicable industry standards to include the IBC, NRCA, and SMACNA, whichever is more stringent.

B. General: Anchor sheet metal flashing and trim and other components of Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Torch cutting of sheet metal flashing and trim is not permitted.

C. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by fabricator or manufacturers of dissimilar metals.

D. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.

E. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and butyl sealant.

F. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.

G. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10-feet, with no joints allowed within 18-inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1-inch deep, filled with butyl sealant concealed within joints.

H. Fasteners: Use fasteners of sizes that will penetrate substrate not less than 1-1/4-inches for nails and not less than 3/4-inch for wood screws.

I. Non-moving seams and joints on non-solderable metal shall be interlocked, filled with sealant, and riveted, unless otherwise indicated.

J. Seal joints as required for watertight construction. Use elastomeric sealant for exposed conditions. Use butyl sealant for hidden conditions.

K. Provide sheet metal closure components at transitions to rising walls and similar changes in plane for edge metal, parapet caps, expansion joint covers, and other termination flashings. Fully crimp and seal closures to continuous blind nailed cleats.

L. Soldered Joints: Comply with SMACNA and CDA requirements. Use conduction soldering methods.

1. Clean surfaces to be soldered, removing oils and foreign matter. Smooth irregularities and round edges. Pretin edges of sheets to be soldered to width of 1-1/2-inches except where pretinned surface would show in finished Work.
2. Apply flux to surfaces to receive solder. Remove oxides and other impurities from joint.

3. Position and immobilize parts to be soldered. Heat parts above fluid temperature of solder. Draw solder into joint, creating 1-inch wide lap. Allow to cool before moving parts.
4. Remove flux and acid by cleaning with neutralizing agent.

M. Fabricate sheet metal components to the dimensions and shapes shown on the Drawings.

3.3 METAL COMPONENT INSTALLATION

A. Securement Clips
1. Securement clips shall be 6-inches long and 2-inches wide.
2. Secure clips to substrate with specified fasteners. Space clips 12-inches on center.
3. Bend clips minimum of 1-inch over bottom drip edge of counterflashing and crimp loosely.

B. Deck Flanges
1. Fabricate deck flanges 4-inches wide with hemmed edges unless otherwise indicated.
2. Prime deck flanges and set in bed of adhesive.
3. Secure deck flanges at 3-inches on center in staggered pattern. Hold fasteners back 2-inches minimum from edge metal dam.
4. Flash flanges in accordance with membrane requirements and Drawings.

C. Cleats
1. Form cleats with 3/4-inch kicks, bent out at maximum angle of 45 degrees to the vertical surface. Height of cleat shall be 3-3/4-inches unless otherwise indicated on Drawings.
2. Secure continuous cleats to wood blocking with fasteners spaced at 6-inches on center.
3. Provide 1/4-inch gap between cleat sections. Offset from joints in cover metal being secured.

D. Cover Plates
1. Fabricate cover plates 6-inches wide, with 4-inch wide deck flanges unless otherwise indicated on Drawings. Hem edges of cover plates to fit snugly against edge metal and fascia sections.
2. Install continuous beads of sealant on each side of edge metal joint.
3. Install cover plates centered over edge metal joint.
4. Secure edge metal cover plates with 2 fasteners driven through center and crimped to edge metal drip.
5. Hook fascia cover plates to drip edge and secure to wood blocking with 2 fasteners at areas that will be concealed by edge metal.

E. Sheet Metal Transition Closures
1. Extend sheet metal 4-inches minimum vertically up wall at sheet metal-to-wall transitions.
2. Set sheet metal in full bed of butyl mastic and secure using appropriate screws with EPDM washers spaced at 4-inches along centerline of vertical portions.
3. Fold vertical portion down over fasteners. Provide bead of sealant along sheet metal at wall.

F. Parapet Caps

1. Provide self-adhering membrane over parapet.
2. Fabricate parapet cap to dimensions and shapes shown on Drawings and to fit snugly over parapet and membrane flashings.
3. Secure continuous cleat at interior and exterior face.
4. Provide 1-1/4-inch high standing seams. Hook cap on cleats and crimp. Provide butyl mastic in each standing seam. Fold seams over to form standing seam and fold corners. Provide shop fabricated end and corner sections minimum 18-inches long.

G. Fascia

1. Secure fascia cleat. Hook fascia onto cleat and provide 3-inch lap joints filled with sealant.
2. Secure fascia along top edge at +/- 16-inches on center through slotted holes.
3. Do not secure upper edge metal cleat through fascia.

H. Edge Metal

1. Secure continuous cleats as specified.
2. Stagger butt joints between cleat and edge metal sections minimum 24-inches.
3. Crimp edge metal onto cleat and set deck flange in bed of adhesive. Secure deck flange at 6-inches on center.
4. Provide cover plates as previously specified.
5. Flash flanges in accordance with membrane requirements and Drawings.

I. Reglet Counterflashing

1. Sawcut reglet into brick masonry mortar joints to depth of 1-1/2-inches and width of 3/8-inch. Clean loose particles from reglet and fill reglet with butyl sealant.
2. Form horizontal flange of counterflashing receiver with “V” bend up at 45 degree angle and not less than 3/4-inch long. Provide bend with spring action within reglet.
3. Insert counterflashing receiver into reglet and secure with lead wedges spaced at 8-inches on center. Provide minimum of 3 wedges per length of counterflashing receiver. Ensure that counterflashing receiver and wedges are driven in sufficiently to provide proper sealant coverage. Install sealant above exterior edge of counterflashing receiver. Secure counterflashing into receiver with clips.

J. Expansion Joint Assembly

1. Install fiberglass batt insulation within expansion joint curb as detailed, supported by loop of membrane if required.
2. Install self-adhering modified bitumen across curb as indicated on Drawings. Provide 4-inch laps and extend down curb.
3. Form counterflashing/cleats to allow 1-inch minimum movement and to counterflash base flashings 4-inches minimum. Secure to top of wood blocking with fasteners spaced at 6-inches on center. Provide 3-inch-wide lap joints.
4. Form expansion joint cover to fit onto cleat, providing loose locked but snug fit.
5. Roof-to-roof expansion joints: Provide 1-1/4-inch high standing seams, at metal section joints filled with sealant.

K. Pipe Hoods

1. Prior to flashing vent pipes, verify that vent pipes have been extended to 12-inches minimum above finished roof surfaces.
2. Fabricate and install sheet metal hoods on conduit and pipe penetrations to cover liquid flashings. Set hoods in bed of sealant and clamp to penetration.

L. Skirt Flashing

1. Insert skirt flashing beneath existing and new equipment covers. Lap skirt flashing sections 3-inches minimum.
2. Secure skirt flashing with sheet metal clips spaced 12-inches on center and minimum of 2 per side of curb.

M. Scupper/Conductor Head

1. Provide scupper with locked and folded seams. Insert scupper sleeve into opening and secure interior flanges to wood blocking with specified fasteners at 3-inches on center.
2. Install sheet metal scupper sleeve prior to parapet cap installation. Scupper sleeve flanges shall be secured to previously installed wood blocking and extend up wall as indicated in Drawings.
3. Secure conductor head to wood blocking with specified fasteners spaced at 3-inches on center.
4. Secure downspout to wall with straps spaced at 4-feet on center, maximum.
5. Provide 45 degree downspout elbow at bottom outlet and splash block at roof surface. Set elbow 2 to 4-inches above receiving surface.

N. Multi-Pipe/Chiller Pipe Penetration Curbs

1. Fabricate enclosure with fully soldered corners and of a size to cover existing piping and conduit.
2. Pop rivet cover onto enclosure with minimum 2 per side.
3. Provide skirt flashing as outlined above.

O. Curb Covers

1. Fabricate curb covers to fit snugly over existing curbs.
2. Provide 3/4-inch plywood and self-adhering underlayment on existing curb as required for a solid substrate. Provide slope to edges in plywood.
3. Provide fully soldered corners.
4. Provide continuous skirt flashing as previously outlined.
5. Provide metal channel framing over curb covers, where indicated. Fasten mechanical equipment to horizontal metal framing. Attach framing to vertical face of curb.
6. At duct penetrations, turn cover up onto existing duct and provide continuous termination bar and sealant. Provide white EPDM stripping at transition.

P. Threshold Cover

1. Extend threshold beneath existing door jambs 1-inch minimum.
2. Remove, trim, cut, or otherwise modify existing door and frame as required to provide specified flashing height and install threshold cover.

3. Install self-adhering modified bitumen underlayment and provide full bed of butyl mastic at corners.
4. Set threshold in place and secure to masonry with screws spaced 12-inches on center.

3.4 CLEANING

A. Remove scrap metal, burrs, fasteners, and related debris from roof daily. Take precautions to prevent damage to roof membrane and flashings.

END OF SECTION 076000

SECTION 077200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies requirements for the following Scope of Work:
   1. Provide roof accessory components as indicated on the Drawings.

1.2 SUBMITTALS

A. Product Data: For each type of roof accessory indicated.

B. Shop Drawings: Show fabrication and installation details for roof accessories.

C. Manufacturer Installation Instructions: For each product in Part 2.

1.3 QUALITY ASSURANCE

A. Comply with manufacturer’s recommendations and requirements.

B. Verify locations, dimensions, and substrate conditions before installation.

PART 2 - PRODUCTS

2.1 CONDUIT SUPPORTS

A. Conduit Support:
   1. Galvanized steel strut with high-density polypropylene base, 10-inches by 16-inches by 3-inches with stainless steel hardware, and stainless steel hardware.

2.2 ROOF CURBS

A. Fan and Vent Curbs: Prefabricated with welded seams and corner joints and integral mounting flange at perimeter bottom. Coordinate dimensions with roof openings.
   1. Material: Galvanized steel sheet, 18 ga min.
   2. Factory installed wood nailers at tops of curbs.
   3. Factory insulation with 1-1/2-inch thick, glass-fiber board insulation.
   4. Curb height: 24-inches minimum, unless otherwise indicated.

2.3 ROOF HATCHES

A. Roof Hatches: Roof hatches shall have insulated double-wall lids and frames with integral deck mounting flange and lid frame counterflashing. Curbs and lids shall have fully welded corners. Units shall be provided with continuous weathertight perimeter gasketing.

1. Type and Size: Single-leaf lid, sized to match existing.
2. Curb and Lid Material: Aluminum (0.0907-inch).
3. Lid Insulation: concealed fiberglass.
4. Curb Insulation: Fiberboard insulation.
5. Curb Height: 12-inches.
6. Hardware: Stainless-steel spring latch with turn handles, butt- or pintle-type hinge system, and padlock hasps inside and outside.
7. Provide OSHA compliant fixed hatch railing system with self-locking gate. Attachment shall be directly to hatch.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General

1. Coordinate installation of roof accessories with installation of roof deck, roof insulation, flashing, roofing membranes, penetrations, equipment, and other construction to ensure that combined elements are weatherproof and watertight.
2. Install roof accessory items according to construction details in NRCA's "Roofing and Waterproofing Manual," unless otherwise indicated,
3. Separation: Separate metal from incompatible metal or corrosive substrates, including wood, by coating concealed surfaces, at locations of contact, with bituminous coating or providing other permanent separation.
4. Operational Units: Test-operate units with operable components. Clean and lubricate joints and hardware. Adjust for proper operation.
5. See Division 23 Section Mechanical/Electrical General Requirements for additional information on disconnection and reconnection of units.

B. Hatch, Fan and Vent Curb Installation

1. Set curb flange on wood blocking and secure with specified fasteners, minimum 2 per side and maximum 24-inches on center.
2. Where new fan and vent curbs are specified for reuse, shim curb level with continuous wood blocking attached to the substrate as previously specified.

C. Conduit Supports

1. Place protection layer on completed roof membrane to extend beyond base minimum 3-inches in each direction.
2. Set supports to provide stable base for conduits. Adjust as necessary. Accurately locate and align.

3. Set pipe supports at 8-feet on center.
4. Secure conduit to supports.

3.2 REINSTALLATION

A. Reinstall equipment disturbed or disconnected by work of this section. Extend and reconnect electrical and mechanical connections. Restore normal operation of equipment.

3.3 CLEANING

A. Clean exposed surfaces according to manufacturer's written instructions. Touch up damaged metal coatings.

END OF SECTION 077200

SECTION 079200 – JOINT SEALANTS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies requirements for the following Scope of Work:
   1. Provide sealant materials as indicated on the Drawings.

1.2 SUBMITTALS

A. Product Data: All items specified in Part 2 of this Section.

1.3 QUALITY ASSURANCE

A. Utilize skilled and experienced specialty workers to install work. Experienced trade workers shall be utilized for each aspect of work.

B. Preconstruction Field-Adhesion Testing: Before installing elastomeric sealants, field test their adhesion to Project joint substrates according to the method in ASTM C 1193 that is appropriate for the types of Project joints.

C. Mockups: Build mockups incorporating sealant joints, as follows, to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution:
   1. Install a minimum 20 linear feet of each color and type of sealant and sealant configuration at all new sealant joint locations referenced in scope of work. Sealant installation shall conform to Contract Documents and once accepted shall become standard for subsequent work on project. Trial areas shall be determined by Owner or Engineer. Areas shall be repeated until acceptable results are obtained. Installation of test items shall be in conformance with Contract Documents and shall use only submitted materials. Evidence of improper or unsatisfactory performance shall be ground for rejection of submitted materials.

1.4 WARRANTY

A. Special Installer's Warranty: See Division 01 Section “Summary of Work.”

B. Special Manufacturer's Warranty: Manufacturer's standard form in which elastomeric sealant manufacturer agrees to furnish elastomeric joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
   1. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SEALANTS

A. Color(s) shall be selected by Owner from approved manufacturer's color chart. Colors shall be manufacturers available premium colors such as "Fast Pak" by Tremco or approved equal. Owner may require a minimum of two (2) sealant colors to be installed at each new sealant joint type. Contractor will include multiple colors in his/her Bid.

B. Sealant for exposed joints: Single component urethane conforming to ASTM C 920, Type S, Grade NS, Class 25, Use M and A.

C. Sealant for use on skylight joints: One part silicone sealant for general construction usage conforming to ASTM C 920, Type S, Grade NS, Class 25, Uses NT, M, G, A, such as D.C. 795, as manufactured by Dow Corning or approved equal.

D. Sealant for concealed joints: One-part butyl sealant, conforming to ASTM C 1311.

E. Sealant for hot pipe shall be one-part silicone, non-corrosive, with service temperature from -60° F to +400° F, minimum, such as “Dow Corning 999-A” or equal.

2.2 ACCESSORIES

A. Primer shall be non-staining type as manufactured or recommended by sealant manufacturer for each substrate.

B. Joint cleaner shall be non-corrosive and non-staining as recommended by sealant manufacturer. Cleaner shall be totally compatible with sealant for each substrate.

C. Bond breaker tape shall be pressure-sensitive tape as recommended by sealant manufacturer.

D. Backer rod shall be continuous length, closed-cell polyethylene foam, as recommended by sealant manufacturer. Backer rod shall be compressible, resilient, non-waxing, non-extruding, and non-staining. Backer rod shall be of sufficient size to be compressed 30% of maximum joint width and shall be totally compatible with sealant, primer, and substrates. Backers shall conform to requirements of ASTM C 1330, ASTM D 1622, ASTM D 1623, and ASTM D 5249.

E. Masking material shall be commercially available masking tape of appropriate width or other material recommended by sealant manufacturer. Self-adhesive masking materials shall be of low tack and completely strippable, leaving no adhesive residue behind when removed.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants.

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant.
    a. Clean porous joint substrate surfaces by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air.

B. Joint Priming: Prime joint substrates, where recommended in writing by joint-sealant manufacturer, based on preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.2 INSTALLATION – GENERAL

A. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

B. Install sealant backings to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability. Provide a 2:1 width to depth ratio unless otherwise indicated by the manufacturer.
    1. Do not leave gaps between ends of sealant backings.
    2. Do not stretch, twist, puncture, or tear sealant backings.
    3. Provide approximately 30% compression of backer materials.

C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

D. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
    1. Place sealants so they directly contact and fully wet joint substrates.
    2. Completely fill recesses in each joint configuration.
    3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

E. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.
    1. Remove excess sealant from surfaces adjacent to joints.

2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint configuration per Figure 8A in ASTM C 1193, unless otherwise indicated.

F. Skylight Sealant Installation:
1. Remove existing sealants and prepare substrate to receive new.
2. Provide sealant at all glass-to-metal and metal-to-metal interfaces.
3. Tool sealants into glazing pockets and at transitions to create a watertight barrier.

G. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

END OF SECTION 079200

SECTION 099653 - ELASTOMERIC COATINGS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies requirements for the following Scope of Work:
   1. Provide coating on newly installed roof system at locations indicated on the Drawings.

1.2 PERFORMANCE REQUIREMENTS

A. Provide elastomeric coating systems with the following properties as determined by test methods indicated:
   1. Elongation: Not less than 100 percent with a tensile strength of 1.3 MPA and not less than 88 percent recovery after 1 hour and 90 percent recovery after 24 hours when tested according to ASTM D 2370 using parameters established by MPI 113.
   2. Accelerated Weathering: No cracking, peeling, blistering, chalking, or visual deterioration after 1000 hours when tested according to procedures in ASTM G 155.
   3. Low-Temperature Flexibility: No crack formation when tested according to ASTM D 1737.
   4. Wind-Driven Rain Resistance: No water penetration according to procedures in FS TT-C-555.

1.3 SUBMITTALS

A. Product Data: For each elastomeric coating system specified. Include crack fillers, block fillers, and primers.
   1. Material List: An inclusive list of required coating materials. Indicate each material and cross-reference the specific coating, finish system, and application. Identify each material by manufacturer's catalog number and general classification.
   2. Manufacturer's Information: Technical information including label analysis and instructions for handling, storing, and applying each coating material.

B. Qualification Data: For Applicator.

C. Material Certificates: For each elastomeric coating material, signed by manufacturers.

D. Product Test Reports: Based on evaluation of comprehensive tests by a qualified testing agency for each elastomeric coating material indicating compliance of elastomeric coatings with requirements based on comprehensive testing within the last two years of current product formulations.

1.4 QUALITY ASSURANCE

A. Applicator Qualifications: A firm or individual experienced in applying elastomeric coating systems similar in material and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in-service performance.

B. Source Limitations: Obtain crack fillers and other undercoat materials from same manufacturer as finish coats.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label.

B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 7 deg C (45 deg F). Maintain storage containers in a clean condition, free of foreign materials and residue.

1.6 WARRANTY

A. Elastomeric Coating Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace elastomeric coatings that fail within specified warranty period. Failures include, but are not limited to, water penetration through the coating.

B. Warranty Period for Elastomeric Coatings: Two years from date of Substantial Completion.

1.7 EXTRA MATERIALS

A. Furnish extra elastomeric coating materials from same production run as materials applied and in quantities described below. Package materials in unopened, factory-sealed containers for storage and identify with labels describing contents. Deliver extra materials to Contracting Officer's Representative.

1. Quantity: Furnish Contracting Officer's Representative with 2 gal. of elastomeric coating materials applied.

PART 2 - PRODUCTS

2.1 ELASTOMERIC COATING MATERIALS, GENERAL

A. Material Compatibility: Provide crack fillers, block fillers, primers, elastomeric finish-coat materials, and related materials that are compatible with one another and substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

B. Material Quality: Provide manufacturer's best-quality elastomeric coating materials that are factory formulated, comply with requirements in FS TT-C-555, and are recommended by manufacturer for the application indicated. Material containers not displaying manufacturer's product identification are not acceptable.

1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish manufacturer's material data and certificates of performance of proposed substitutions.

C. Colors and Textures: Manufacturer's standard smooth texture. Color shall be white.

2.2 CRACK FILLERS

A. Crack Fillers: Factory-formulated acrylic emulsion crack fillers compatible with substrate and finish-coat materials indicated.

2.3 PRIMERS

A. Factory-formulated, alkali-resistant, acrylic-latex primer as recommended by coating manufacturer.

2.4 ELASTOMERIC FINISH-COAT MATERIALS

A. Smooth Elastomeric Finish: Smooth, factory-formulated, 100 percent acrylic elastomeric coating with a minimum of 50% solids by volume and a minimum SRI of 80 such as Eterna-Seal 8101 by Truco, Inc. or RCS 5000 by Lapollo Industries, Inc.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for coating application. Comply with procedures specified in PDCA P4.

1. Proceed with coating application only after unsatisfactory conditions have been corrected and surfaces are thoroughly dry.
2. Start of coating application will be construed as Applicator's acceptance of surface conditions.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

3.2 PREPARATION

A. General: Remove hardware and hardware accessories, plates, machined surfaces, light fixtures, and similar items already installed that are not to be coated. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and coating.

1. After completing coating operations, reinstall items removed, using workers skilled in trades involved.

B. Cleaning: Before applying coatings or other surface treatments, clean substrates of substances that could impair bond of coating systems. Remove oil and grease before cleaning.

1. Schedule cleaning and coating application so dust and other contaminants from cleaning process will not fall on wet, newly coated surfaces.

C. Surface Preparation: Clean and prepare surfaces to be coated according to manufacturer's written instructions for particular substrate conditions and as specified.

1. Provide barrier coats over incompatible primers or remove and reprime.

D. Material Preparation: Mix and prepare materials according to coating manufacturer's written instructions.

1. Maintain containers used in mixing and applying elastomeric coatings in a clean condition, free of foreign materials and residue.
2. Stir materials before application to produce a mixture of uniform density. Stir as required during application. If surface film forms, do not stir film into material. If necessary, remove film and strain coating material before using.
3. If manufacturer permits thinning, use only thinners recommended by manufacturer, and only within recommended limits.

3.3 APPLICATION

A. General: Apply elastomeric coatings according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.

1. Do not paint over conditions detrimental to formation of a durable coating film, such as dirt, rust, scale, grease, moisture, and scuffed surfaces.
2. Provide finish coats compatible with primers used.

B. Scheduling Coating: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. Number of coats and film thickness required are same regardless of application method. Do not apply succeeding coats until previous coat has cured as recommended by manufacturer.
2. If undercoats or other conditions show through final coat, apply additional coats until coating film is of uniform finish, color, and appearance. Ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners, receive a dry film thickness equivalent to that of flat surfaces.
3. Allow sufficient time between successive coats to permit proper drying. Do not recoat

surfaces until coating has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat does not cause undercoat to lift or lose adhesion.

C. Application Procedures: Apply elastomeric coatings by brush, roller, or spray according to manufacturer's written instructions.

1. Brushes: Use brushes best suited for material being applied.
2. Rollers: Use professional-quality quick-release rollers of carpet, velvet back, or high-pile sheep's wool covers with a 25 mm to 31 mm (1- to 1-1/4-inch) nap as recommended by manufacturer for material and texture required.
3. Spray Equipment: airless spray equipment shall not be used.

D. Minimum Coating Thickness: Apply each material no thinner than manufacturer's recommended spreading rate. Provide total dry film thickness as recommended by manufacturer but in no case less than .3 mm (.012-inch).

E. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.

F. Prime Coats: If recommended by manufacturer, apply a primer to material being coated before applying finish coats.

G. Brush Application: Brush out and work brush coats into surfaces in an even film. Eliminate cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Neatly draw glass lines and color breaks.

H. Roller Application: Keep cover wet at all times; do not dry roll. Work in sections. Lay on required amount of material, working material into grooves and rough areas; then level material, working it into surface.

I. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or recoat work not complying with specified requirements.

3.4 CLEANING

A. Cleanup: At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

3.5 PROTECTION

A. Protect work of other trades from damage whether being coated or not. Correct damage by cleaning, repairing, replacing, and recoating as approved by Contracting Officer's Representative. Leave in an undamaged condition.

B. Provide "Wet Paint" signs to protect newly coated finishes. Remove temporary protective wrappings provided by others to protect their work after completing coating operations.

1. After construction activities of other trades are complete, touch up and restore damaged or defaced coated surfaces. Comply with procedures specified in PDCA P1.

3.6 COATING SCHEDULE

A. Provide elastomeric coating systems according to the following schedule:
   1. All Surfaces:
      a. Primer: 1 coat if required by the coating manufacturer.
      b. Finish Coats: 2 coats.

END OF SECTION 099653

SECTION 221426.13 – ROOF DRAINS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies requirements for the following Scope of Work:
   1. Provide drain bowls, strainers, clamping rings, underdeck clamps, and pipe joint connections at all roof drain locations.
   2. Clear roof drain systems from roof level to the point where the leaders exit the building to achieve a free-flowing system.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 PROJECT CONDITIONS

A. Sections of the existing interior finish ceiling systems will require removal. These areas should be reviewed with Owner prior to removal. Work areas shall be clearly defined and closed-off from building occupants. Areas of ceiling removal shall be as small as possible to effectively install the work. Any adjacent ceilings damaged during installation shall be repaired or replaced by the Contractor at no cost to the Owner.

B. Existing roof drain outlet diameters vary. Contractor shall confirm conditions prior to ordering materials.

C. The plumbing work shall be coordinated with roof work in such a manner that drain bowl assemblies are installed concurrently with the roofing and that no interior portions of the building are left exposed to the elements at the end of a day's work. Install replacement drain bowl assemblies before new roofing is in place.

D. The Contractor shall provide all rooftop protection for new and existing roofs.

E. All plumbing work shall be performed by a licensed plumber in accordance with the International Plumbing Code (IPC)

F. The Contractor shall investigate the ceiling conditions. PVC piping shall not be used if the ceiling is used as a return air plenum.

PART 2 - PRODUCTS

2.1 ROOF DRAIN COMPONENTS

A. Roof drain: Coated cast iron with bottom outlets, large-sump style, with wide roof flanges, such as “Series 21500” manufactured by Josam Company, or approved equal. Outlet diameters shall match the existing leader pipe diameters.

B. Drain strainers: Coated cast iron of suitable size and configuration to be installed on the new drain bowl assemblies.

C. Clamping rings: Non-puncturing type, with integral gravel stops, either coated cast iron or stainless steel, sized to match the drain bowls. Bolts, nuts, and washers required for securement of clamping rings to drain bowls shall be stainless steel.

D. Underdeck clamps: Coated cast iron, provided by the drain bowl manufacturer for application beneath roof decks.

2.2 ACCESSORIES

A. Ceiling access panel shall be flush-mount type, meeting the following minimum requirements:
   1. Size: 2-feet by 2-feet, minimum.
   2. Door: 18 gauge steel, or 20 gauge steel with a 1/2-inch minimum hardboard backer.
   3. Door Frame: 16 gauge steel.
   4. Door Hinge: Continuous, concealed-type.
   5. Lock: Screwdriver-activated cam.
   6. Door and Frame Finish: Baked-on enamel primer coat with factory-applied finish enamel color to match the surrounding ceiling finish to the greatest extent possible.

B. Leader pipe: Schedule 40 PVC pipe. Pipe and connections shall be sized to tie into existing leader piping.

C. Drain bowl to leader pipe connections: 4 band, no hub, neoprene connections.

D. Pipe Connections: Solvent welded connections.

E. Steel plate for drain bowl locations shall be minimum 24 gauge hot dipped galvanized plate as provided by the drain bowl manufacturer. Plate shall be a minimum size of 16-inches by 16-inches with central hole of suitable size to receive new drain bowl.

F. Insulation for drain bowls and leader piping: Fibrous glass batt type with premolded PVC jackets. Insulation shall be minimum 1-inch thick.

PART 3 - EXECUTION

3.1 PREPARATION

A. The Owner shall be notified at least 72 hours prior to all underdeck work. All materials, equipment and daily clean-up shall be the responsibility of the Contractor.

B. All flashing-in of the roof drains and membrane repairs as a result of the plumbing work shall be the responsibility of and provided for by the Contractor.

C. The Contractor is cautioned to investigate all existing conditions and materials of construction. All replacement items must be completely compatible with and match the existing system.

D. Comply with Division 1 GENERAL REQUIREMENTS for preparation, protection and clean-up of interior and exterior work areas.

3.2 CEILING REMOVAL

A. Do not remove any ceiling areas without the prior approval of the Owner and Owner's Representative. The limits of ceiling removal to facilitate installation of the new plumbing work shall be clearly defined. All precautions shall be taken to protect the building interior and occupants during ceiling removal and replacement.

B. Do not damage or cut any of the ceiling support system without the Owner's and Owner's Representative's approval. Should the support system be damaged or removed to facilitate plumbing work installation, it shall be replaced with a new support system equal to the existing, at no additional cost to the Owner.

C. All floor and adjacent areas, both interior and exterior, damaged or stained by the installation of the plumbing work shall be cleaned of all dust, debris and any other materials to the Owner's satisfaction.

3.3 DRAIN BOWL ASSEMBLY INSTALLATION

A. Install new roof drains such that the bowl flange with clamping ring and integral gravel stop are level (see Detail Drawings for assembly position).

B. Provide manufacturer supplied, prefabricated, galvanized steel plate over opening. Mechanically attach plate to steel deck with specified fasteners, 2 per side.

C. Make drain to leader connections watertight and of proper strength using no hub connections.

D. Install drain bowl insulation and PVC jackets. Join sections with tape or other methods indicated by the manufacturer. Extend insulation to the first elbow or 2-feet.

E. Drain components shall be completed and flashed in the same day's operation.

F. Check all drain joints with a water test once the roofing and flashing are completed.

3.4 CEILING ACCESS PANEL

A. Install ceiling access panels in accordance with the Manufacturer's printed instructions.

B. Panel door hinge shall be balanced manually to provide a smooth operating motion when installed.

3.5 CLEANING OF DRAINAGE SYSTEM

A. Once the new roof system has been installed, clear all roof drain leader piping and underground leaders of debris and clogs such that the system is free-flowing.

B. The Contractor shall clear the existing leader pipe with rooter-type equipment from the roof deck level to the point where the drain pipes exit the building.

3.6 WATER TESTS

A. Perform water tests on roof drain assemblies, including leader piping. Using 3/4-inch garden hose, run water into the drainage components for thirty minutes. Inspect all drainage components for leakage and repair as required. Inform Owner of test findings.

END OF SECTION 221426.13

SECTION 230500 – COMMON WORK RESULTS FOR HVAC

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes administrative and procedural requirements for work under Division 15.

B. Coordinate the work of this Section with the requirements of the Project.

1.2 REFERENCES

A. Building Code – International Building Code (IBC, IMC, IPC) - 2018

B. NFPA Standards, ASHRAE Handbooks and Manuals, SMACNA Manuals

1.3 DEFINITIONS

A. Following are definitions of terms and expressions used in the Mechanical Sections in addition to definitions found in the Contract Conditions:
   1. "Piping" includes pipe, fittings, valves, hangers, and other accessories that comprise a system.
   2. "Ductwork" includes ducts, fittings, housings, dampers, hangers, and other accessories, which comprise a system.

1.4 QUALITY ASSURANCE

A. Regulatory Requirements
   1. Work shall conform to the requirements of the codes, laws and ordinances of the Howard County, Maryland, National Fire Protection Association, American Society of Mechanical Engineers and other authorities having jurisdiction.
   2. Comply with applicable codes, laws, standard practices.
   3. Comply with the standards of good practice as outlined in the ASHRAE Guide, the Sheet Metal and Air Conditioning Contractor's Association's "Duct Manual", and the Apprentice Training Manual of the Steam Fitters Union.
   4. The requirements of the authorities having jurisdiction shall take precedence over the Drawings and Specifications and changes required by the authorities shall be made after review by the Architect.

1.5 SUBMITTALS

A. Shop drawings are required for the following:
   1. Heating and Air Conditioning
      a. Heating and Air Conditioning Equipment
      b. Testing, Adjustment and Balancing Reports and Qualifications

B. Review of shop drawings does not relieve the Contractor of responsibility for complying with the contract documents.

1.6 PROTECTION

A. Protect material and equipment from damage.

B. Cap or plug openings in equipment, piping and ductwork with proper caps and plugs.

1.7 VARIANCES

A. Where conflicts exist within the contract documents, request clarification prior to the submission of a bid. If clarification is not requested, provide the work representing the higher cost and quality.

1.8 WARRANTY

A. During the warranty period, make the proper adjustments of systems, equipment and devices installed and perform work necessary to ensure the efficient and proper operation of the systems, equipment and devices.

B. Certain items of equipment shall be warranted for a longer time than the general warranty period. Provide for service or replacement required in connection with the warranty of these items.

PART 2 - PRODUCTS

2.1 MATERIALS AND WORKMANSHIP

A. Items shown and not specifically called for, or items specified and not specifically indicated or detailed on the Drawings, or items neither specified nor shown, but which are reasonably incidental to and commonly required to make a complete job, shall be provided.

2.2 ROOF SUPPORTS AND CURBS

A. Provide equipment supports and curbs for the equipment and piping installed on or through the roof. Roof curbs shall be approved for use by the National Roofing Contractors National Association and shall be a minimum of 14 inches high. Curbs shall be sloping roof type suitable for pitch of the roof and shall set the equipment level. Curbs shall be double wall insulated type.

B. Provide wood blocking to raise the level of the bottom of the curb to be level with the top of the roof insulation.

C. Pipe curb assemblies, except for plumbing vent pipes shall be constructed of 18 gauge galvanized steel with base plate, raised cant, wood nailer strip and galvanized steel counter flashing. Top shall be provided with acrylic clad ABS plastic cover and graduated neoprene boots secured to cover and pipes by stainless steel band clamps. Pipe curbs shall be Pate Company PCA-5 or equivalent of Thy Curb.

D. Equipment supports shall be constructed of 18 gauge galvanized steel with base plate, raised cant, insulation, wood nailer strip and galvanized steel counter flashing. Equipment supports shall be Pate Company ES-5b or equivalent of Thy Curb.

2.3 HANGERS AND PIPE SUPPORTS

A. Provide pipe hangers and supports to maintain required slope and alignment for equipment and piping. Pipe hangers shall be as manufactured by Carpenter & Patterson, Fee & Mason, Modern Hanger or Grinnell.

B. Pipes may not be supported from other pipes. Trapeze hangers may be used for parallel runs of pipe with same slope.

C. Provide sway bracing at sufficient intervals to prevent lateral motion of horizontal or vertical piping.

D. For pipe and tubing, both horizontal and vertical, and regardless of the spacing of other supports, provide supports at or near changes in direction. Hangers shall be spaced at not over 6 feet apart for ½ inch pipe, not over 8 feet apart for 3/4 and 1-inch pipe and not over 10 feet for larger sizes.

E. Hangers for pipe shall be similar to Carpenter & Paterson "Clevis" figure 100. Hangers for insulated lines with vapor barrier and carrying fluids with temperatures below 70 degrees shall be large enough to permit continuous insulation. Hangers on vapor barrier insulated piping shall be provided with rigid protector saddles with rigid core of insulation to thickness of adjacent insulation. Saddles shall be 16 gauge galvanized steel and shall cover one half of the circumference of the pipe covering. Saddle shall be secured to insulation with adhesive.

F. Pipes upon or within close distance of walls shall be carried by wall brackets, Carpenter & Paterson, Fig. 221, 139, or 227 as approved.

G. Special supports required shall be provided to suit the conditions.

2.4 ACCESS PANELS

A. In general, valves, dampers, traps and equipment shall be accessible through the removable panels.

2.5 IDENTIFICATION

A. After piping has been installed, tested and insulated, it shall be identified with adhesive type labels at least 2 inches high. Labels indicating direction of flow shall be applied adjacent to the name identification and shall point away from the name in the direction of flow.

B. Labels shall identify the piping system. Labels shall be located where pipe enters and leaves a space and at 30 foot centers on normal runs. Duct systems shall be similarly identified by noting the system and direction of flow.

C. Equipment shall be identified with engraved plastic laminate or anodized aluminum nameplates with pressure sensitive backing. Plates shall also be provided with drilled holes and fastened to equipment with moly-rivets. Letters shall be at least 3/8 inch high and larger in proportion to the size of the piece of equipment. Identification shall be the same as noted on schedules on the Drawings. Labels shall be provided for the following equipment.
   1. Air Handling Units
   2. Dampers

D. On valves, except immediately adjacent to equipment, provide 1 inch diameter brass tag with embossed and painted black numbers to identify the valve. Tag numbers shall be coordinated between trades. Tags shall be attached to valve wheels with a brass link. Tags shall be manufactured by Brady, Seton Nameplate, or Wilmington Plastics.

PART 3 - EXECUTION

3.1 EXISTING CONDITIONS

A. Visit the site and become familiar with existing conditions. Modifications to work required to allow for existing conditions shall be provided. Submit proposed modifications to the Architect for approval prior to installation.

B. Relocate existing hangers and supports where necessary to install new work. Maximum spacing requirements shall apply for relocated supports.

C. Coordinate interruptions in service of existing systems with the Owner. Provide temporary connections to maintain operation of existing systems.

D. The construction will be phased. Maintain service for required systems during phases of construction.

3.2 MANNER OF INSTALLATION

A. Piping and ductwork shall be installed to preserve access to valves, dampers and equipment. Valves, dampers and equipment which require frequent service, adjustment or control and which cannot be located in a readily accessible and safe place, shall be provided with extension devices and remote operators, as necessary.

B. Piping and ductwork shall be run to follow the lines of the building and to allow the maximum headroom consistent with proper pitch. Piping subject to thermal expansion shall be arranged to permit movement without damage to the piping, ductwork and equipment.

C. The Drawings are generally indicative of the work to be installed, but they do not show all offsets, fittings and similar details required, which shall be provided to meet the job conditions. In areas where work is installed in close proximity to work of other trades or within trades covered by this Division of the Specifications, prepare larger scale drawings consisting of plans and sections to show how work is to be installed in relation to work of other trades.

3.3 RECORD DRAWINGS

A. Keep at the site two (2) sets of black and white prints for the express purpose of showing changes from the contract Drawings made during construction. Mark up the prints with red pencil during construction and deliver the prints, before final inspection, to the Architect as a final set of “Record Drawings”. Refer to Division 1 for additional requirements.

3.4 TESTING

A. Before concealing piping and before insulating piping, test piping and prove tight.

B. Replace and retest to Owner's satisfaction pipe or fittings broken or damaged under test.

C. Before testing piping systems, remove or otherwise protect from damage, control devices, air vents, and other parts which are not designed to stand pressures used in testing piping.

3.5 CLEANING OF SYSTEMS

A. After satisfactory completion of pressure tests and before permanently connecting fixtures, equipment, strainers and other accessory items, clean systems. Remove burrs, cuttings and waste. Blow and flush piping until interiors are free of foreign matter.

B. Clean strainers and dirt pockets as often as required to guarantee no system stoppage by end of warranty period.

C. Dust shall be removed from ductwork before Substantial Completion. Filter media shall be new at Substantial Completion.

D. If systems become stopped with refuse, remove the obstruction and replace and repair work disturbed.

E. Remove rust and clean surfaces to be insulated or painted.

F. Leave systems in clean condition and running order.

3.6 PAINTING

A. Remove rust, scale, grease, and dirt from equipment and material and leave ready for finish painting. Equipment specified with factory baked enamel finish shall be touched up as required to provide a surface visually free of scratches, nicks and blemishes.

3.7 PERFORMANCE TEST

A. Should the performance or capacity of the systems, equipment or devices furnished be questioned by written notice from the Owner after installation, provide necessary test equipment and complete a satisfactory test of the items in question. The test shall be run when and as directed by the Architect and in the presence of his representative. Should the items furnished not pass such a test, they shall be removed and replaced by systems, equipment or devices satisfactory to the Owner.

END OF SECTION 230500

SECTION 230510 - MECHANICAL/ELECTRICAL GENERAL REQUIREMENTS (RTUs)

PART 1 - GENERAL

1.1 SUMMARY

A. This Section specifies requirements for the following Scope of Work:
   1. Remove and reinstall existing rooftop mechanical units.
   2. Mechanical disconnection, extension, shortening, and/or reconnection shall be performed in accordance with the International Mechanical Code.
   3. Electrical disconnection, extension, shortening, and/or reconnection shall be performed in accordance with the National Electrical Code.
   4. Plumbing work shall be performed in accordance with the International Plumbing Code.
   5. Details, not shown or specified but necessary for proper installation and operation shall be included within the work as though specified herein.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 GENERAL

A. Mechanical, electrical, and associated work shall be performed by licensed tradesman and shall comply with the applicable code requirements.

B. Wherever possible match the existing mechanical and electrical components; replace in kind when made necessary by roofing operations.

C. Lengthening and installation of additional connections for ducts, conduits, control wiring, condensate pipes and similar mechanical and electrical work made necessary by roof replacement work shall be performed by the Contractor.

D. Handle, store, and protect equipment and materials to prevent damage before and during installation.

E. Remove and reinstall lightning protection system as required to replace roof.
   1. Alternate No. 1: Recertify system upon reinstallation.

END OF SECTION 230510

SECTION 233113 - METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Rectangular ducts and fittings.
2. Sheet metal materials.
3. Sealants and gaskets.
4. Hangers and supports.

B. Related Sections:
1. Section 233300 "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.2 PERFORMANCE REQUIREMENTS

A. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:
1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
10. Hangers and supports, including methods for duct and building attachment and vibration isolation.

1.4 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.

B. Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:
1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
   1. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
   1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

D. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.3 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Two-Part Tape Sealing System:
   1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
   2. Sealant: Modified styrene acrylic.
   3. Water resistant.
   4. Mold and mildew resistant.
   5. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive and negative.
   6. Service: Indoor and outdoor.
   7. Service Temperature: Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).
   8. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.

C. Water-Based Joint and Seam Sealant:
   1. Application Method: Brush on.
   2. Solids Content: Minimum 65 percent.
   3. Shore A Hardness: Minimum 20.
   4. Water resistant.
   5. Mold and mildew resistant.
   6. VOC: Maximum 75 g/L (less water).
   7. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive and negative.
   8. Service: Indoor or outdoor.
   9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.
2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

2.4 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1 (Table 5-1M), "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

F. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

G. Trapeze and Riser Supports:
1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install ducts with fewest possible joints.

D. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

E. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

F. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

F. except as allowed by applicable building codes and authorities having jurisdiction.

3.3 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
   1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
   2. Outdoor, Supply-Air Ducts: Seal Class A.
   3. Outdoor, Exhaust Ducts: Seal Class C.
   4. Outdoor, Return-Air Ducts: Seal Class C.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."

B. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1 (Table 5-1M), "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches (610 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.

C. Hangers Exposed to View: Threaded rod and angle or channel supports.

D. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet (5 m).

E. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Section 233300 "Air Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 DUCT CLEANING

A. Clean new duct system(s) before testing, adjusting, and balancing.

B. Use service openings for entry and inspection.
   1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Section 233300 "Air Duct Accessories" for access panels and doors.
   2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
   3. Remove and reinstall ceiling to gain access during the cleaning process.

C. Clean the following components by removing surface contaminants and deposits:
   1. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
   2. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
   3. Coils and related components.
   4. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
   5. Supply-air ducts, dampers, actuators, and turning vanes.
   6. Dedicated exhaust and ventilation components and makeup air systems.

D. Mechanical Cleaning Methodology:
   1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
   2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.

3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.7 START UP

A. Air Balance: Perform "Testing, Adjusting, and Balancing for HVAC." (TAB)

3.8 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet.

B. Supply Ducts:
1. Ducts Connected to Fan Coil Units, and Terminal Units:
   a. Pressure Class: Positive 2-inch wg (500 Pa).
2. Ducts Connected to Constant-Volume Air-Handling Units:
   a. Pressure Class: Positive 2-inch wg (500 Pa).
3. Ducts Connected to Variable-Air-Volume Air-Handling Units:
   a. Pressure Class: Positive 4-inch wg (1000 Pa).
4. Ducts Connected to Equipment Not Listed Above:
   a. Pressure Class: Positive 2-inch wg (500 Pa).

C. Return Ducts:
1. Ducts Connected to Fan Coil Units, Heat Pumps, and Terminal Units:
   a. Pressure Class: Positive or negative 2-inch wg (500 Pa).
2. Ducts Connected to Air-Handling Units:
   a. Pressure Class: Positive or negative 2-inch wg (500 Pa).
3. Ducts Connected to Equipment Not Listed Above:
   a. Pressure Class: Positive or negative 2-inch wg (500 Pa).

D. Exhaust Ducts:
1. Ducts Connected to Fans Exhausting (ASHRAE 62.1, Class 1 and 2) Air:
   a. Pressure Class: Negative 2-inch wg (500 Pa).
2. Ducts Connected to Air-Handling Units:
   a. Pressure Class: Positive or negative 2-inch wg (500 Pa).
3. Ducts Connected to Equipment Not Listed Above:
   a. Pressure Class: Positive or negative 2-inch wg (500 Pa).

E. Outdoor-Air (Not Filtered, Heated, or Cooled) Ducts:
1. Ducts Connected to Fan Coil Units, Heat Pumps, and Terminal Units:

a. Pressure Class: Positive or negative 2-inch wg (500 Pa).

2. Ducts Connected to Air-Handling Units:
   a. Pressure Class: Positive or negative 2-inch wg (500 Pa).
3. Ducts Connected to Equipment Not Listed Above:
   a. Pressure Class: Positive or negative 2-inch wg (500 Pa).

F. Elbow Configuration:
1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
   a. Velocity 1000 fpm (5 m/s) or Lower:
      1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
      2) Mitered Type RE 4 without vanes.
   b. Velocity 1000 to 1500 fpm (5 to 7.6 m/s):
      1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
      2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
      3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
   c. Velocity 1500 fpm (7.6 m/s) or Higher:
      1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
      2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
      3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."
2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."
   a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
   b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
   c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

G. Branch Configuration:
1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
   a. Rectangular Main to Rectangular Branch: 45-degree entry.
   b. Rectangular Main to Round Branch: Spin in.
2. Round: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.
   a. Velocity 1000 fpm (5 m/s) or Lower: 90-degree tap.
   b. Velocity 1000 to 1500 fpm (5 to 7.6 m/s): Conical tap.
   c. Velocity 1500 fpm (7.6 m/s) or Higher: 45-degree lateral.

END OF SECTION 233113

SECTION 233300 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Manual volume dampers.
   2. Control dampers.
   3. Smoke dampers.
   4. Flange connectors.
   5. Turning vanes.
   6. Duct-mounted access doors.
   7. Flexible connectors.
   8. Duct accessory hardware.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.
   1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
      a. Special fittings.
      b. Manual volume damper installations.
      c. Control-damper installations.
      d. Fire-damper and smoke-damper installations, including sleeves; and duct-mounted access doors.
      e. Wiring Diagrams: For power, signal, and control wiring.
      f. Duct liner

1.3 CLOSEOUT SUBMITTALS

A. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
   1. Exposed-Surface Finish: Mill phosphatized.

B. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

C. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.3 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:
   1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   2. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
      a. Air Balance Inc.; a division of Mestek, Inc.
      b. American Warming and Ventilating; a division of Mestek, Inc.
      c. Flexmaster U.S.A., Inc.
      d. McGill AirFlow LLC.
      e. Nailor Industries Inc.
      f. Pottorff.
      g. Ruskin Company.
      h. Trox USA Inc.
      i. Vent Products Company, Inc.

   3. Suitable for horizontal or vertical applications.
   4. Frames:
      a. Mitered and welded corners.
      b. Flanges for attaching to walls and flangeless frames for installing in ducts.
   5. Blades:
      a. Multiple or single blade.
      b. Parallel- or opposed-blade design.
      c. Stiffen damper blades for stability.
   6. Bearings:
      a. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
   7. Tie Bars and Brackets: Galvanized steel.

B. Jackshaft:

1. Material: Galvanized-steel pipe rotating within pipe-bearing assembly mounted on supports at each mullion and at each end of multiple-damper assemblies.
2. Length and Number of Mountings: As required to connect linkage of each damper in multiple-damper assembly.

C. Damper Hardware:
1. Zinc-plated, die-cast core with dial and handle made of 3/32-inch- (2.4-mm-) thick zinc-plated steel, and a 3/4-inch (19-mm) hexagon locking nut.
2. Include center hole to suit damper operating-rod size.
3. Include elevated platform for insulated duct mounting.

2.4 CONTROL DAMPERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
1. American Warming and Ventilating; a division of Mestek, Inc.
2. Arrow United Industries; a division of Mestek, Inc.
3. Cesco Products; a division of Mestek, Inc.
4. Greenheck Fan Corporation.
5. Lloyd Industries, Inc.
6. McGill AirFlow LLC.
7. Metal Form Manufacturing, Inc.
8. Nailor Industries Inc.
9. NCA Manufacturing, Inc.
10. Pottorff.
11. Ruskin Company.
12. Vent Products Company, Inc.
13. Young Regulator Company.

C. Blades:
1. Blade Edging: Inflatable seal blade edging, or replaceable rubber seals.

D. Blade Axles: 1/2-inch- (13-mm-) diameter; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.
1. Operating Temperature Range: From minus 40 to plus 200 deg F (minus 40 to plus 93 deg C).

E. Bearings:
1. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
2. Thrust bearings at each end of every blade.

2.5 SMOKE DAMPERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
   1. Air Balance Inc.; a division of Mestek, Inc.
   2. Cesco Products; a division of Mestek, Inc.
   3. Greenheck Fan Corporation.
   4. Nailor Industries Inc.
   5. Pottorff.
   6. Ruskin Company.

C. General Requirements: Label according to UL 555S by an NRTL.

D. Smoke Detector: Integral, factory wired for single-point connection.

E. Rated pressure and velocity to exceed design airflow conditions.

F. Mounting Sleeve: Factory-installed, galvanized sheet steel; length to application.

G. Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 230513 "Common Motor Requirements for HVAC Equipment."
   1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
   2. Controllers, Electrical Devices, and Wiring: Provide for electrical devices and connections.
   3. Permanent-Split-Capacitor or Shaded-Pole Motors: With oil-immersed and sealed gear trains.
   4. Spring-Return Motors: Equip with an integral spiral-spring mechanism where indicated. Enclose entire spring mechanism in a removable housing designed for service or adjustments. Size for running torque rating of 150 in. x lbf (17 N x m) and breakaway torque rating of 150 in. x lbf (17 N x m).
   5. Outdoor Motors and Motors in Outdoor-Air Intakes: Equip with O-ring gaskets designed to make motors weatherproof. Equip motors with internal heaters to permit normal operation at minus 40 deg F (minus 40 deg C).
   6. Nonspring-Return Motors: For dampers larger than 25 sq. ft. (2.3 sq. m), size motor for running torque rating of 150 in. x lbf (17 N x m) and breakaway torque rating of 300 in. x lbf (34 N x m).

2.6 FLANGE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
   1. Ductmate Industries, Inc.
   2. Nexus PDQ; Division of Shilco Holdings Inc.
   3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

C. Description: factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

D. Material: Galvanized steel.

E. Gage and Shape: Match connecting ductwork.

2.7 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Elgen Manufacturing.
4. METALAIRE, Inc.
5. SEMCO Incorporated.
6. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

C. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.

D. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

E. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."

2.8 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
1. American Warming and Ventilating; a division of Mestek, Inc.
2. Cesco Products; a division of Mestek, Inc.
3. Ductmate Industries, Inc.
4. Elgen Manufacturing.
5. Flexmaster U.S.A., Inc.
6. Greenheck Fan Corporation.
7. McGill AirFlow LLC.
8. Nailor Industries Inc.
9. Pottorff.
10. Ventfabrics, Inc.
11. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

C. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2 (7-2M), "Duct Access Doors and Panels"
   1. Door:
      a. Double wall, rectangular.
      b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
      c. Vision panel.
      d. Hinges and Latches: 1-by-1-inch (25-by-25-mm)butt or piano hinge and cam latches.
      e. Fabricate doors airtight and suitable for duct pressure class.
   2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.

D. Pressure Relief Access Door:
   1. Door and Frame Material: Galvanized sheet steel.
   2. Door: Metal thickness applicable for duct pressure class.
   3. Operation: Open outward for positive-pressure ducts and inward for negative-pressure ducts.
   4. Doors close when pressures are within set-point range.
   5. Hinge: Continuous piano.
   6. Latches: Cam.
   7. Seal: Neoprene or foam rubber.
   8. Insulation Fill: 1-inch- (25-mm-) thick, fibrous-glass or polystyrene-foam board.

2.9 DUCT ACCESS PANEL ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
   1. Ductmate Industries, Inc.
   2. Flame Gard, Inc.
   3. 3M.

C. Labeled according to UL 1978 by an NRTL.

D. Fasteners: Panel fasteners shall not penetrate duct wall.

E. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F (1093 deg C).

F. Minimum Pressure Rating: 10-inch wg (2500 Pa), positive or negative.

2.10 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide comparable product by one of the following:
   1. Ductmate Industries, Inc.
   2. Duro Dyne Inc.
   3. Elgen Manufacturing.
   4. Ventfabrics, Inc.
   5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

C. Materials: Flame-retardant or noncombustible fabrics.

D. Coatings and Adhesives: Comply with UL 181, Class 1.

E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
   1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).
   2. Tensile Strength: 480 lbf/inch (84 N/mm) in the warp and 360 lbf/inch (63 N/mm) in the filling.
   3. Service Temperature: Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).

F. Outdoor System, Flexible Connector Fabric: Glass fabric double coated with weatherproof, synthetic rubber resistant to UV rays and ozone.
   1. Minimum Weight: 24 oz./sq. yd. (810 g/sq. m).
   2. Tensile Strength: 530 lbf/inch (93 N/mm) in the warp and 440 lbf/inch (77 N/mm) in the filling.
   3. Service Temperature: Minus 50 to plus 250 deg F (Minus 45 to plus 121 deg C).

2.11 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
   1. Install steel volume dampers in steel ducts.

D. Set dampers to fully open position before testing, adjusting, and balancing.

E. Install test holes at fan inlets and outlets and elsewhere as indicated.

F. Install smoke dampers according to UL listing.

G. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
   1. At outdoor-air intakes and mixed-air plenums.
   2. At drain pans and seals.
   3. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
   4. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
   5. At each change in direction and at maximum 50-foot (15-m) spacing.
   6. Upstream and downstream from turning vanes.
   7. Control devices requiring inspection.
   8. Elsewhere as indicated.

H. Install access doors with swing against duct static pressure.

I. Access Door Sizes:
   1. One-Hand or Inspection Access: 8 by 5 inches (200 by 125 mm).
   2. Two-Hand Access: 12 by 6 inches (300 by 150 mm).
   3. Head and Hand Access: 18 by 10 inches (460 by 250 mm).
   4. Head and Shoulders Access: 21 by 14 inches (530 by 355 mm).
   5. Body Access: 25 by 14 inches (635 by 355 mm).
   6. Body plus Ladder Access: 25 by 17 inches (635 by 430 mm).

J. Install duct test holes where required for testing and balancing purposes.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:
   1. Operate dampers to verify full range of movement.
   2. Inspect locations of access doors and verify that purpose of access door can be performed.
   3. Operate fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
   4. Inspect turning vanes for proper and secure installation.

END OF SECTION 233300