



CITY OF WOONSOCKET, RHODE ISLAND

INVITATION TO BID FOR:

"REPLACEMENT OF OPERATIONS BUILDING ROOF" – BID# 5800

For the WOONSOCKET WASTEWATER TREATMENT PLANT

Specifications are available at the Finance Department, **Office of Purchasing**, City of Woonsocket, 169 Main Street, Woonsocket, Rhode Island 02895 between the hours of 8:30 AM and 4:00 PM, Monday through Friday.

Sealed bids will be received by the City of Woonsocket in the Finance Department, Office of Purchasing, City Hall, 169 Main Street, Woonsocket, Rhode Island until **2:00 P.M. on Wednesday, May 24, 2017**, and then publicly opened and read aloud by the Finance Director in the **Office of Purchasing**, City Hall, 169 Main Street, Woonsocket, Rhode Island at **2:00 P.M.**

There will be a prebid meeting on Wednesday, May 17, 2017 @ 10:00 AM at the Wastewater Treatment plant located at 11 Cumberland Hill Road.

EACH BID SHOULD BE CLEARLY MARKED ON THE OUTSIDE OF THE ENVELOPE:
"REPLACEMENT OF THE OPERATIONS BUILDING ROOF".

A Certified Check or Bid Bond in the amount of one thousand dollars (\$1,000), payable to the City of Woonsocket, must accompany each proposal. The Certified Check or Bid Bonds will be returned to all but the successful bidder upon execution of the contract. The Certified Check or Bid Bond of the successful bidder will be returned upon acceptance of a Performance and Payment Bond by the City.

A Performance and Payment Bond of twenty thousand dollars (\$20,000), with a satisfactory surety company, will be required of the successful bidder.

Individuals requesting interpreter services for the hearing impaired should call the Finance Director at 401-762-6400 seventy-two (72) hours in advance of the bid opening.

Responses will be evaluated on the basis of the relative merits of the bid in addition to the price. The City of Woonsocket reserves the right to reject any and all responses, or parts thereof, to waive any irregularity in the responses received and to accept the responses or parts thereof deemed to be most favorable to **THE BEST INTEREST OF THE CITY.**

The Finance Department, through its Director, reserves the right to accept or reject any or all bids or proposals; to waive any technicality to any bid or part thereof submitted; to accept any bid or option or comparison thereof; to contract in part or in whole; and to accept the bid deemed to be in the best interest of the City of Woonsocket.

No bidder may withdraw its bid within sixty (60) days after the actual time and date of the bid opening thereof.

Contact Jonathan R. Pratt, P.E., Woonsocket City Engineer, at (401) 767-9220 with any questions.

Published: May 11, 2017


Christine Chamberland, Finance Director

**CITY OF WOONSOCKET
RHODE ISLAND
FINANCE DEPARTMENT**

CONTRACT DOCUMENTS

For

**“REPLACEMENT OF OPERATIONS BUILDING ROOF,
WOONSOCKET WASTEWATER TREATMENT PLANT”**

DEPARTMENT OF PUBLIC WORKS

MAY.....2017

**CITY OF WOONSOCKET
RHODE ISLAND
FINANCE DEPARTMENT**

TECHNICAL SPECIFICATIONS

SECTION 1

GENERAL PROVISIONS:

Wherever in this agreement the word 'Engineer' is used, it shall be and is mutually understood to refer to the City Engineer of the City of Woonsocket, acting either directly or through any assistant having general charge of the work, or through any assistant or inspector having immediate charge of the work, or through any assistant or inspector having immediate charge of a portion thereof, limited by the particular duties entrusted to them.

Whenever the word 'Contractor' is used herein, it shall be and is mutually understood to refer to the party or parties of the second part to this agreement, or the legal representative of said party or parties.

The prices specified in the proposal shall include the supply and erection in a good, sound, substantial and workmanlike manner, of all the items required for the completion of the whole work, and all the items shown on the plans and described in these specifications; also all labor, workmanship, tools and materials necessary and best adapted to the efficient, prompt and safe execution of both permanent and temporary works.

Successful bidder must mobilize a crew to begin work within fourteen (14) calendar days after being awarded requested work.

Work hours are from 7 am to 4 pm Monday through Friday, excluding holidays. Any work by a contractor that is necessary after normal work hours will be billed following the Engineering Division policy in the 'Permit Manual' A copy of the manual can be obtained on the following web site http://www.ci.woonsocket.ri.us/perm_sched.htm.

SECTION 2

TECHNICAL:

Any deviations from the original specifications shall be noted by the bidder.

The City of Woonsocket will be responsible for:

- Providing an approved project manual and specifications
- Providing access to the site
- Providing timely project inspections
- Processing payment requests within a reasonable period of time

Bidder will be responsible for the following items:

- Obtain all Local and/or State permits required to perform required work
- Provide and maintain proper insurance for the duration of the project
- Supply Certified Payroll(s).
- Provide, as part of the bid prices, all safety barrels, cones, construction signs and barricades as needed or as directed
- Provide, as part of the bid prices, all labor, equipment and tools necessary to properly install a new roof system per the specifications

-Be responsible for all injury to all existing utilities and other structures met with in the prosecution of the work, and shall be liable for damages to the public or private property resulting there from.

-Move all construction debris so that a free and clean site can be maintained during and after construction operations each day

-Provide, as part of the bid prices, dust control as directed

-Repair all damaged landscape areas and any adjacent paved or grassed areas

-Obtain necessary police details for traffic control and safety. The City will only reimburse police detail cost at the standard detail rate. It is the responsibility of the contractor to schedule and or cancel the police detail within an acceptable time period as to not accrue unnecessary cost. This is a reimbursement; therefore the contractor must pay the police invoice before invoicing the City.

SECTION 3

PLANS FURNISHED:

Any approved plans and a copy of these specifications are to be kept constantly at the work by the contractor or his authorized foreman.

No deviation from the approved plans or specification will be allowed, unless authorized in writing.

SECTION 4

SUB-CONTRACTORS:

No portion of the work shall be sub-let to any sub-contractor without first giving the Engineering Division due notice in writing of such intention. No sub-contractor shall be employed who is unsatisfactory to the City Engineer.

SECTION 5

COMPETENT WORKMEN/LICENSES:

The contractor shall employ only competent and efficient laborers, operators and tradesmen for every kind of work, and whenever, in the opinion of the City Engineer, any person is unfit to perform their task, or does their work contrary to directions, or conducts themselves improperly, the contractor must discharge that person immediately and not employ that person again on the work.

All equipment operators and workers performing work at the proposed location shall hold the appropriate State of Rhode Island licenses for their responsibilities.

An OSHA ten (10) hour construction safety program is required for all on-site employees.

All required licenses and/or certificates for work being performed shall be in the possession of the person(s) while performing the work.

SECTION 6

SAFETY:

All Federal, State and Local safety regulations shall be followed.

The contractor shall assume responsibility for risks and casualties of every description, for loss or injury to persons and property arising out of the nature of the work, from the action of the elements or from any unforeseen or unusual difficulty.

SECTION 7

WORK TO BE LEFT CLEAN:

The work area and the adjacent areas affected by the progress of the work shall be kept clean and all rubbish, surplus materials and unneeded equipment shall be removed. All damage to said areas shall be repaired immediately so as to inconvenience the general public and the property owners as little as possible. All damage and repairs shall be the sole responsibility of the Contractor.

Material and/or debris from the Contractor's operations, which have washed into, flowed into or have been placed in water courses, ditches, gutters, drains, catch basins, pavement areas or anywhere else, shall be removed entirely and satisfactorily disposed of during the progress of the work and the ditches, gutters, drains, catch basins, pavement areas, etc. shall be kept in a clean and neat condition, thereafter. The Contractor shall restore or replace, whenever ordered by the Engineer, any public or private property damaged by his work, equipment or employees to a condition at least equal to the condition existing immediately prior to the beginning of his operations. The Contractor shall save harmless the City from any damage claims caused by his operations.

SECTION 8
WARRANTY:

The contractor or his sureties will be held liable for keeping in perfect repair, adjustment and good order, the whole of the work to be constructed under this contract, and for other damages that may occur by reason of the construction.

Neither the final certificate of payment nor any provision of the Contract Documents nor partial or entire occupancy of the premises shall constitute acceptance of the work specified in the Contract Documents or relieve the Contractor of liability with respect to any express warranties or responsibility for faulty workmanship. The Contractor shall remedy any defects in the work and pay for any damage to other work, resulting from his operations. The City shall give notice of observed defects with reasonable promptness.

SECTION 9
INSURANCE REQUIREMENTS:

The successful bidder shall furnish to the City, prior to issuance of the contract, certificates of minimum insurance as listed below. These certificates shall contain a provision that the insurance company will notify the certificate holder, by registered mail, at least 15 days in advance of any cancellation or material change.

Workman's Compensation	Statutory	
Employers Liability	\$ 100,000	Each Accident
Automobile Liability	\$1,000,000	Combined Single Limit
Commercial General Liability	\$2,000,000	General Aggregate
	\$2,000,000	Products & Completed Operations Aggregate
	\$1,000,000	Personal & Advertising Injury
	\$1,000,000	Each Occurrence
	\$ 100,000	Fire Damage (Any one fire)
	\$ 5,000	Medical Expenses (Any one person)

SECTION 10
METHOD OF PAYMENT:

Payment shall be made within 60 working days after receipt of an invoice and a registrar of certified payroll of all employees performing said work. No payment shall be made for items not ordered or for cancelled items, nor for necessary incidental items considered by the City of Woonsocket to be included in the unit price bid.

ROOFING PROJECT MANUAL

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SPECIFICATIONS

**City of Woonsocket – Woonsocket Waste Water Treatment Plant
Operations Building
11 Cumberland Hill Road
Woonsocket, RI 02895**

Roof Areas: Operations Building - Low Slope Roof Section

Pre-Bid Date: Wednesday, May 17, 2017 @ 10:00 AM

Bid Due Date: Wednesday, May 24, 2017 @ 2:00 PM

THIS DOCUMENT MUST REMAIN INTACT - DO NOT DETACH

SECTION 00313
BID PROPOSAL FORM

Date: _____

To: Christine Chamberland, Finance Director

Email: cchamberland@woonsocketri.org

For: Woonsocket Waste Water Treatment Plant - Roof Replacement – Operations Building

From:

The undersigned hereby proposes to furnish labor and materials necessary for re-roofing in full compliance with these contract documents. The undersigned, as bidder, declares; that the parties in this contract proposal as principals are named herein; that this proposal is made without collusion with any other person, firm or corporation; that no officer or agent of the Owner is directly or indirectly interested in this proposal; that he has carefully examined the location of the proposed work, the annexed proposed form of contract, the contract drawings, the specifications and other Contract Documents therein referred to; and he proposes and agrees that if the proposal is accepted, he will contract with the Owner in the form of the Contract attached hereby to construct completely, in the manner and time prescribed, the items bid upon, including all work incidental to such items as well as those in all addenda issued prior to the date of opening of proposals, according to the contract drawings and specifications, and that he will accept in full payment therefore the following sum:

Proposed System, manufacturer and description:

Mod-Bit
The Garland Co., Cleveland, OH

Note: Bid amounts shall be both written in words and shown in figures.

A – BASE BID: OPS ROOF – 30 YEAR WARRANTY

	\$
Words	Figures

B – ALTERNATE 1: OPS ROOF – 40 YEAR WARRANTY

	\$
Words	Figures

C – ALTERNATE 2: CONNECTOR ROOF

	\$
Words	Figures

Owner / Officer Signature _____
Title _____
Address _____
City, State, Zip _____
Email _____
Phone _____
Fax _____
(AFFIX CORPORATE SEAL)

The bidder hereby acknowledges receipt of the following addenda:

Addendum No. _____ Dated _____

Addendum No. _____ Dated _____

Addendum No. _____ Dated _____

* * * END OF SECTION 00313 - BID FORM * * *

SECTION 01010

SUMMARY OF WORK

1. PART 1 - GENERAL

1.1. RELATED DOCUMENTS:

- A. Documents affecting work of this Section include, but are not necessarily limited to, General Requirements, bidding documents, and drawings.

1.2. DESCRIPTION:

- A. Furnish and install labor, roofing materials, insulation, flashings, and incidentals on the following designated roof areas; **Woonsocket Waste Water Treatment Plant, Operations Building, Low Slope Roof Section, 11 Cumberland Hill Rd, Woonsocket, RI 02895.**
- B. Roof work includes:
 - 1 Refer to specification sections for additional information and installation guidelines.
 - 2 Remove existing gravel, roofing, insulation, flashing and related metal components down to the existing vapor barrier on concrete deck and dispose of properly.
 - 3 Adhere one (1) ply of ASTM D4601 Type II Base Sheet to existing vapor barrier in cold process adhesive.
 - 4 Adhere two (2) base layers of 2.2" polyisocyanurate, tapered polyisocyanurate (1/4" slope) with minimum thickness of 1/2", and 1/2" Securock to the tectum deck per the specified insulation adhesive. Insulation adhesive beads to be applied at 12" o.c.
 - 5 Adhere one (1) ply of base sheet over the entire substrate in specified adhesive at two and one half (2.5) gallons per square. (using a weighted roller and 1/8" notched squeegee)
 - 6 Adhere one (1) ply of mineral surfaced cap sheet over the entire substrate in specified adhesive at two and one half (2.5) gallons per square. (using a weighted roller and 1/8" notched squeegee)
 - 7 At all base flashings, apply two (2) plies of specified membrane (base & cap).
 - 8 Raise curbs to match new insulation height, achieving an 8" minimum flashing height.
 - 9 Furnish and install new wood blocking to match new insulation height.
 - 10 Install new two-piece fascia and metal components with .040 Kynar coated aluminum, to include but not limited to: counter flashing and fascia. Owner to select standard color.
 - 11 Furnish and install new drain assemblies at existing locations. The contractor shall be responsible to provide all scupper accessories.
 - 12 Remove radio antenna.
 - 13 Remove large HVAC unit and infill that area.
 - 14 Reuse existing lightning and reattach in cold adhesive.
 - 15 Remove existing chimney and all attachments. Flash the curb and cap with .040 metal.
 - 16 It is the contractor's responsibility to verify measurements and tapered insulation plan.
 - 17 Prep, prime, and paint all plumbing/heat stacks with aluminum paint.

- 18 All roof areas will be secured in a watertight condition each day before the Contractor vacates the site. There will be no exceptions!
- 19 Unless otherwise noted, contractor shall provide and pay for all labor, materials, equipment, tools, construction machinery, water, heat, utilities, transportation and other facilities and services necessary for proper execution and completion of the work as required by The Contract Documents.

1.3. INTENT OF THE SPECIFICATIONS:

- A. The intent of these specifications is to describe the materials and methods of construction required for the performance of the work. In general, it is intended that the drawings shall delineate the detailed extent of the work. When there is a discrepancy between drawings, referenced specifications, and standards and this specification, this specification shall govern.

1.4. PROTECTION:

- A. The Contractor shall use every available precaution to provide for the safety of property owner, visitors to the site, and all connected with the work under the specification.
- B. All existing facilities both above and below ground shall be protected and maintained free of damage. Existing facilities shall remain operating during the period of construction unless otherwise permitted. All access roadways must remain open to traffic unless otherwise permitted.
- C. Barricades shall be erected to fence off all construction areas from operations personnel.
- D. Safety Requirements
 - 1 All application, material handling, and associated equipment shall conform to and be operated in conformance with OSHA safety requirements.
 - 2 Contractor to provide Owner with a detailed safety plan before the start of the project.
 - 3 Comply with federal, state, local and owner fire and safety requirements.
 - 4 Advise owner whenever work is expected to be hazardous to owner employees and/or operations.
 - 5 Maintain a crewman as a floor area guard whenever roof decking is being repaired or replaced.
 - 6 Maintain proper fire extinguisher within easy access whenever power tools, roofing kettles, and torches are being used.
 - 7 ALL SAFETY REQUIREMENTS OF THE BUILDING OWNER MUST BE FOLLOWED. NO EXCEPTIONS WILL BE PERMITTED. A SAFETY ORIENTATION MEETING IS REQUIRED PRIOR TO PERFORMING ANY WORK.

1.5. HOUSEKEEPING:

- A. Keep materials neat and orderly.
- B. Remove scrap, waste, and debris from the project area.
- C. Maintenance of clean conditions while work is in progress and cleanup when work is completed shall be in strict accordance with the "General Requirements" of this contract.

* * * END OF SECTION 01010 * * *

SECTION 01015

CONTRACTOR'S USE OF PREMISES

1. PART 1 - GENERAL

1.1. RELATED DOCUMENTS:

- A. Documents affecting work of this Section include, but are not necessarily limited to, General Requirements, bidding documents and drawings.

1.2. DESCRIPTION

A. Work included:

- 1 This Section applies to situations in which the Contractor or his representatives including, but not necessarily limited to, suppliers, subcontractors, employees, and field engineers, enter upon the Owner's property.

1.3. QUALITY ASSURANCE

- A. Promptly upon award of the Contract, notify all pertinent personnel regarding requirements of this Section.
- B. Owner may require all personnel who will enter upon the Owner's property certify their awareness of and familiarity with the requirements of this Section.

1.4. TRANSPORTATION FACILITIES

- A. Provide adequate protection for curbs and sidewalks over which trucks and equipment pass to reach the job site. If any damage occurs the contractor is responsible for repairs.
- B. Contractor's vehicles:
 - 1 Require Contractor's vehicles, vehicles belonging to employees of Contractor, and all other vehicles entering upon the Owner's property in the performance of the Work of the Contract, to use only the Access Route approved in advance by the Owner.
 - 2 Do not permit such vehicles to park on any street or other area of the Owner's property except in the area approved by the Owner as "Contractor's Parking Area".

1.5. LANDSCAPING

- A. Provide adequate protection for trees, grass, shrubs, and all other landscaping during set-up or construction. If any damage occurs the contractor is responsible for repairs as designated by the Owner.

1.6. FACILITY USAGE

- A. Provide adequate protection for all interior and exterior portions of the building during set-up and construction. If any damage occurs the contractor is responsible for repairs as designated by the Owner.
- B. Restrooms and other amenities of the building will only be used with permission of the Owner. If such authorization is given, the Contractor is responsible for maintaining cleanliness and repairs as designated by the Owner.

1.7. SECURITY

- A. Restrict access of all persons entering upon the Owner's property to the Access Route and to the actual site of the work.

* * * END OF SECTION 01015 * * *

SECTION 01151
APPLICATIONS FOR PAYMENT

1. PART 1 - GENERAL

1.1. RELATED DOCUMENTS:

- A. Documents affecting work of this Section include, but are not necessarily limited to, General Requirements, bidding documents, and drawings.

1.2. DESCRIPTION

- A. Work included:

- 1 Comply with procedures described in this Section when applying for progress payment and final payment under Contract.

1.3. QUALITY ASSURANCE

- A. Prior to start of construction, secure Designated Owner's representative's approval of the schedule of values required to be submitted.
- B. During progress of the Work, modify the schedule of values as approved by Designated Owner's representative to reflect changes in the Contract Sum due to Change Orders or other modifications of Contract.
- C. Base requests for payment on the approved schedule of values.

1.4. SUBMITTALS

- A. Formal submittal: Unless otherwise directed by Designated Owner's representative:
 - 1 Make an informal submittal of a request for payment by filling in, with erasable pencil, pertinent portions of AIA Document G702, "Application and Certificate for Payment," plus continuation sheet or sheets.
 - 2 Sign and notarize Application and Certificate for Payment.
 - 3 Submit original and three (3) copies of Application and Certificate for payment, plus four identical copies of continuation sheet or sheets, to Designated Owner's representative.
 - 4 Designated Owner's representative will compare formal submittal with approved informal submittal and, when approved, will sign Application and Certificate for Payment, will make required copies, and will distribute:
 - a One copy to Contractor;
 - b Two copies to Owner;

1.5. MATERIAL PAYMENT PROCEDURE

- A. Material payment will be processed upon delivery of materials to the job site, issuance of an invoice by the Contractor and approval by the Owner's Representative. All suppliers and subcontractors must be paid in full and a Waiver of Lien by major suppliers and subcontractors issued prior to any subsequent payments being made to the contractor.
- B. In the absence of a letter of credit, performance, payment or materials and labor bond a waiver of lien agreement conditioned upon payment by joint check shall be performed by the contractor, owner, and materials manufacturer for this project.

- C. Once all work has been completed, and final inspection has been made, Contractor may invoice the Owner for 90% of the remaining labor and the materials, which were provided by Contractor. The owner will make payment of the remaining 10% once the warranty has been issued.

* * * END OF SECTION 01151 * * *

SECTION 01153

CHANGE ORDER PROCEDURE

1. PART 1 - GENERAL

1.1. RELATED DOCUMENTS:

- A. Documents affecting work of this Section include, but are not necessarily limited to, General Requirements, bidding documents and drawings.

1.2. DESCRIPTION

A. Work included:

- 1 Make such changes in the Work, in the Contract Sum, in the Contract Time of Completion, or any combination thereof, as are described in written Change Orders signed by the Owner and the Designated Owner's representative and issued after execution of the Contract, in accordance with the provisions of this Section.

1.3. QUALITY ASSURANCE

- A. Include within the Contractor's quality assurance program such measures as are needed to assure familiarity of the Contractor's staff and employees with these procedures for processing Change Order data.

1.4. SUBMITTALS

- A. Make submittals directly to the Designated Owner's representative at his normal place of business.
- B. Submit the number of copies called for under the various items listed in this Section.

1.5. PRODUCT HANDLING

- A. Maintain a "Register of Bulletins and Change Orders" at the job site, accurately reflecting current status of all pertinent data.
- B. Make the Register available to the Designated Owner's representative for review at his request.

1.6. PROCESSING CHANGES INITIATED BY THE OWNER

- A. Should the Owner contemplate making a change in the Work or a change in the Contract Time of Completion, the Designated Owner's representative will issue a "Bulletin" to the Contractor.
 - 1 Bulletins will be dated and will be numbered in sequence.
 - 2 The Bulletin will describe the contemplated change, and will carry one of the following instructions to the Contractor:
 - a Make the described change in the Work at no change in the Contract Sum and no change in the Contract Time of Completion;
 - b Promptly advise the Designated Owner's representative as to credit or cost proposed for the described change. This is not an authorization to proceed with the change.

- B. If the Contractor has been directed by the Designated Owner's representative to promptly advise him as to credit or cost proposed for the described change, the Contractor shall:
 - 1 Analyze the described change and its impact on costs and time;
 - 2 Secure the required information and forward it to the Designated Owner's representative for review;
 - 3 Meet with the Designated Owner's representative as required to explain costs and, when appropriate, determine other acceptable ways to achieve the desired objective;
 - 4 Alert pertinent personnel and subcontractors as to the impending change and, to the maximum extent possible, avoid such work as would increase the Owner's cost for making the change, advising the Designated Owner's representative in writing when such avoidance no longer is practicable.

1.7. PROCESSING CHANGES INITIATED BY THE CONTRACTOR

- A. Should the Contractor discover a discrepancy among the Contract Documents or other cause for suggesting a change in the Work, a change in the Contract Sum, or a change in the Contract Time of Completion, he shall notify the Designated Owner's representative as required by pertinent provisions of the Contract Documents.
- B. Upon agreement by the Designated Owner's representative that there is reasonable cause to consider the Contractor's proposed change, the Designated Owner's representative will issue a Bulletin in accordance with the provisions described in Article 1.6 above.

1.8. PROCESSING BULLETINS

- A. Make written reply to the Designated Owner's representative in response to each Bulletin.
 - 1 State proposed change in the Contract Sum, if any.
 - 2 State proposed change in the Contract Time of Completion, if any.
 - 3 Clearly describe other changes in the Work required by the proposed change, or desirable therewith, if any.
 - 4 Include full backup data such as subcontractor's letter of proposal or similar information.
 - 5 Submit this response in single copy.
- B. When cost or credit for the change has been agreed upon by the Owner and the Contractor the Designated Owner's representative will issue a "Change Order" to the Contractor.

1.9. PROCESSING CHANGE ORDERS

- A. Change Orders will be dated and will be numbered in sequence.
- B. The Change Order will describe the change or changes, will refer to the Bulletin or Bulletins involved, and will be signed by the Owner and the Designated Owner's representative.
- C. The Designated Owner's representative will issue three copies of each Change Order to the Contractor.
 - 1 The Contractor promptly shall sign all three copies and return two copies to the Designated Owner's representative.
 - 2 The Designated Owner's representative will retain one signed copy in his file and will forward one signed copy to the Owner.

- D. Should the Contractor disagree with the stipulated change in Contract Sum or change in Contract Time of Completion, or both:
- 1 The Contractor promptly shall return two copies of the Change Order, unsigned by him, to the Designated Owner's representative with a letter signed by the Contractor and stating the reason or reasons for the Contractor's disagreement.
 - 2 The Contractor's disagreement with the Change Order shall not in any way relieve the Contractor of his responsibility to proceed with the change as ordered and to seek settlement of the dispute under pertinent provisions of the Contract Documents.

* * * END OF SECTION 01153 * * *

SECTION 01400

QUALITY CONTROL

1. PART 1 - GENERAL

1.1. RELATED DOCUMENTS:

- A. Documents affecting work of this Section include, but are not necessarily limited to, General Requirements, bidding documents, and drawings.

1.2. QUALITY CONTROL

A. Contractor shall:

- 1 Be experienced in hot multi-ply roofing and modified bitumen roofing.
- 2 Be acceptable to the owner and roofing material manufacturer/supplier.

B. Roofing manufacturer shall:

- 1 Be an Associate Member in good standing with the National Roofing Contractors Association (NRCA).
- 2 Be recognized in the roofing, waterproofing, and moisture survey industry.
- 3 Be approved by the Owner.
- 4 Material manufacturer/supplier must supply a representative to perform periodic inspections throughout the course of the project. Written reports must be submitted to the owner's representative and copies to the contractor.
- 5 Material supplier providing the roofing warranty shall be ISO 9001: 2000 Certified.
 - a Certificate of Registration shall have listed: Design, Manufacturer, and Distribution in the Scope of Approval and/or Activity.

- C. Any deficiencies noted during inspections must be corrected by the contractor and approved in writing by the material manufacturer/supplier's representative.

1.3. FIELD QUALITY CONTROL

- A. Dimensions in the construction documents are approximate and are used to describe the scope of work.
- B. The contractor shall field measure (in US measurement) all roof areas to verify the dimensions to order adequate material quantities to complete the work specified in these documents.
- C. Any discrepancies found by the contractor during the bid process must be submitted in writing to the owner's representative. The start of the project is notice to the owner that the contractor has verified all field dimensions and material quantities to complete the project.

1.4. RANDOM SAMPLING

- A. During the course of work, owner/owner's representative may secure samples of materials being used from containers at the job site and submit them to an independent laboratory for comparison to specified material.
- B. If test results prove that a material is not functionally equal to specified material:

- 1 Contractor shall pay for all testing.
- 2 Owner will charge Contractor a penalty up to 20 percent of contract price when all work has been completed before test results become known.
- 3 Owner will charge Contractor a penalty in proportion to amount of work completed before test results become known. Remaining work shall be completed with specified materials.

2. PART 2 - PRODUCTS

2.1. GENERAL

- A. Comply with Quality Control, References, Specification, and Manufacturer's data. Where conflict may exist, more stringent requirements govern.
- B. Provide primary products, including each type of roofing sheet (felt), bitumen, base flashings, miscellaneous flashing materials, and sheet metal components from a single manufacturer, which has produced that type of product successfully for not less than three (3) years. Provide secondary products (insulation, mechanical fasteners, lumber, etc.) only as recommended by the manufacturer of the primary products for use with roofing system specified.

3. PART 3 - EXECUTION

3.1. SUBMITTALS

- A. Provide building owner's representative a letter from the roof material manufacturer indicating that applicator is approved to install their products and will provide warranty for this installation.

* * * END OF SECTION 01400 * * *

SECTION 01421

ROOFING INSPECTION SERVICES

1. PART 1 - GENERAL

1.1. RELATED DOCUMENTS:

- A. Documents affecting work of this Section include, but are not necessarily limited to, General Requirements, bidding documents, and drawings.

1.2. DESCRIPTION

A. Work included:

- 1 Provide roofing inspection services as specified herein and as needed for a complete and proper installation.

1.3. SUBMITTALS

- A. Secure the designated Owner's representative's advance approval of the date and time for roof substrata inspection and pre-roofing meeting.

- 1 Notify the roofing inspection service, the roofing contractor, and other interested parties, and secure their agreement to attend.
- 2 At least three (3) calendar days prior to the prerooting meeting, notify the designated Owner's representative of the names of persons expected to attend.

B. Records:

- 1 Maintain a complete and legible file, in chronological order, containing a copy of each report, certificate, and other communication received relative to the work of this Section.
- 2 Upon completion of the work of this Section, deliver a copy of the complete file to the designated Owner's representative.

2. PART 2 - PRODUCTS

2.1. ROOFING INSPECTION SERVICES

- A. For the work of this Section, retain the roofing inspection services of a company approved in advance by the designated Owner's representative.

3. PART 3 - EXECUTION

3.1. PRE-ROOFING MEETING

- A. Not less than three nor more than ten calendar days prior to the scheduled start of roofing installation, conduct a roofing substrata inspection and pre-roofing meeting at the job site.
 - 1 Designated Owner's representative will be chairperson of the meeting, will take minutes of the meeting, and will record all agreements reached as a result of the inspection and meeting.
 - 2 Visually inspect all substrata upon which roofing is scheduled to be applied.

- a Determine general acceptability, and determine areas requiring further preparation.
 - b Determine acceptable remedies for unacceptable areas.
- 3 Discuss proposed schedule for installation of the roofing, and reach agreement as to dates of start and finish of installation of the roofing.
- 4 Discuss proposed methods for installation of the roofing, and equipment and personnel to be used.
- 5 Discuss inspection methods to be used, reports to be issued by the roofing inspector, responsibilities and limits of responsibilities of the roofing inspector, and potential problems arising from use of methods not agreed to in the pre-roofing meeting.

3.2. INSPECTION DURING ROOFING INSTALLATION

- A. Verify that materials delivered to the job site are those approved by the designated Owner's representative for use on this Work.
- B. Visually observe installation of roofing including, but not necessarily limited to:
 - 1 Check kettle temperatures, and verify that bitumens are not heated beyond temperatures recommended by the manufacturer of the approved roofing system materials.
 - 2 At least three times daily, check temperatures of bitumens as delivered to the roof deck and verify that temperatures of bitumens are within the range recommended by the manufacturer of the approved roofing system materials.
 - 3 Verify use of installation procedures agreed upon in the pre-roofing meeting.
 - 4 Call attention of the contractor's representative on the job to unacceptable methods and unacceptable results.
 - 5 Report to the Contractor and to the designated Owner's representative if the contractor fails to correct unacceptable methods or unacceptable results.
- C. Prior to application of final surfacing, make test cuts as required by the designated Owner's representative.
 - 1 Except as otherwise approved by the designated Owner's representative, make the test cuts 12" square and through all layers of the roofing that are then in place.
 - 2 By precise weighing of identical 12" square pieces of felt, determine the amount of bitumens applied in the one sq. ft sample.
 - 3 Verify that the contractor provides proper patching of areas where test cuts were made.
 - 4 Include within the daily report a statement of weights (and corresponding adequacy or inadequacy of roofing) at test cuts.
- D. Make Final visual inspection of the entire roofing installation.
 - 1 Compile a list of items required to be revised or replaced.
 - 2 Deliver a copy of the list to the contractor's representative on the job and to others as appropriate.
 - 3 Verify proper revision or replacement of all items on the list.

3.3. REPORTS

- A. Make daily written reports of roofing inspection activities, delivering copies to the roofing contractor and others as agreed in the pre-roofing meeting.
- B. Upon completion of the roofing installation, compile a comprehensive report covering activities performed under this Section, and deliver a copy of the report to the:
 - 1 Designated Owner's representative;
 - 2 Owner;
 - 3 Roofing contractor; and
 - 4 Others as agreed in the project meetings.

3.4. LIMITS OF ROOFING INSPECTOR'S RESPONSIBILITIES

- A. During progress of the roofing installation, the roofing inspector is required to:
 - 1 Make visual observations and compile reports described in this Section;
 - 2 Advise the roofing contractor's representative on the job as to unacceptable methods and unacceptable results when so observed by the roofing inspector.
- B. In connection with the roofing installation, "unacceptable methods and unacceptable results" mean methods and results other than:
 - 1 Those recommended by the manufacturer of the approved roofing system materials.
 - 2 Those required by pertinent regulations of governmental agencies having jurisdiction;
 - 3 Those required by these Specifications; and
 - 4 Those agreed upon in the pre-roofing meeting.
- C. The roofing inspector is not empowered to:
 - 1 Act for, or in lieu of, representatives of the governmental agencies having jurisdiction;
 - 2 Give directions to the Contractor or workmen on the job;
 - 3 Revise any part of the Contract Documents; or
 - 4 Approve any change in the methods agreed upon in the pre-roofing meeting.
- D. Failure of the roofing inspector to observe unacceptable methods or unacceptable results during progress of the Work will not absolve the Contractor from his responsibility to complete the Work in accordance with the specified requirements and the agreed methods.

* * * END OF SECTION 01421 * * *

SECTION 01600

MATERIAL AND EQUIPMENT

1. PART 1 - GENERAL

1.1. RELATED DOCUMENTS:

- A. Documents affecting work of this Section include, but are not necessarily limited to, General Requirements, bidding documents, and drawings.

1.2. DELIVERY, STORAGE AND HANDLING

A. Delivery of Materials

- 1 Deliver materials to the job-site in new, dry, unopened, and well-marked containers showing product and manufacturer's name.
- 2 Deliver materials in sufficient quantity to allow continuity of work.

B. Storage of Materials

- 1 Store bitumen and ply sheets in dry area protected from water or extreme humidity.
- 2 Store ply sheets on ends only where possible; on sloped roofs, store flat parallel to joists. Discard rolls which have been flattened, creased, or otherwise damaged.
- 3 Stack insulation on pallets.
- 4 Remove plastic packing shrouds. Cover all stored materials with canvas tarpaulin top to bottom. Secure tarpaulin.
- 5 Rooftop storage: Disperse material on roof to avoid structure overloading.

C. Material Handling

- 1 Handle all materials on site to avoid bending, tearing, or other damage during transportation and installation.
- 2 Material handling equipment shall be selected and operated so as not to damage existing construction or applied roofing. Do not operate or situate material handling equipment in locations that will hinder smooth flow of vehicular or pedestrian traffic.

D. Environmental Requirements

- 1 Do not work in rain, snow, or in presence of water.

* * * END OF SECTION 01600 * * *

SECTION 01700

CONTRACT CLOSE-OUT

1. PART 1 - GENERAL

1.1. RELATED DOCUMENTS:

- A. Documents affecting work of this Section include, but are not necessarily limited to, General Requirements, bidding documents, and drawings.

1.2. DESCRIPTION

- A. Work included:

- 1 Provide an orderly and efficient transfer of the completed Work to the Owner.

1.3. QUALITY ASSURANCE

- A. Prior to requesting inspection by the Project Manager, use adequate means to assure that the Work is completed in accordance with the specified requirements and is ready for the requested inspection.

1.4. PROCEDURES

- A. Substantial Completion:

- 1 All roofing materials and components are in place and water tight according to specifications with alternates approved by Designated Owner's representative and Building Owner.
 - 2 Roofing Contractor will notify designated Owner's representative of substantial completion. Within a reasonable time after receipt of notification, the designated Owner's representative will inspect to determine the status of completion.
 - 3 Should the designated Owner's representative determine that the Work is not substantially complete:
 - a The Designated Owner's representative will promptly notify the Contractor, giving the reasons therefore.
 - b Roofing Contractor will remedy the deficiencies and notify the Designated Owner's representative when ready for reinspection.
 - c The Designated Owner's representative will reinspect the Work.

- B. Final Completion:

- 1 Designated Owner's representative will prepare and submit a written statement at final completion.
 - 2 Certify that:
 - a Contract Documents have been reviewed;
 - b Work has been inspected for compliance with the Contract Documents;
 - c Work has been completed in accordance with the Contract Documents;
 - d Equipment and systems have been tested as required, and are operational;

- e Work is completed and ready for final inspection.
- 3 The Designated Owner's representative will make an inspection to verify the status of completion.
- 4 Should the Designated Owner's representative determine that the Work is incomplete or defective:
 - a The Designated Owner's representative will promptly notify the Contractor, in writing, listing the incomplete or defective work.
 - b Remedy the deficiencies promptly, and notify the Designated Owner's representative when ready for reinspection.
- 5 When the Designated Owner's representative determines that the Work is acceptable under the Contract Documents, he will request the Contractor to make close-out submittals.
- C. Close-out submittals include, but are not necessarily limited to:
 - 1 Project Record Documents described in Section 01720, if part of the specification;
 - 2 Operation and maintenance data for items so listed in other pertinent Sections of these Specifications, and for other items when so directed by the Project Manager;
 - 3 Warranties and bonds;
 - 4 Evidence of payment and release of liens;
 - 5 List of subcontractors, service organizations, and principal vendors, including names, addresses, and telephone numbers where they can be reached for emergency service at all times including nights, weekends, and holidays.
- D. Final adjustment of accounts:
 - 1 Submit a final statement of accounting to the Project Manager, showing all adjustments to the Contract Sum.
 - 2 If so required, the Designated Owner's representative will prepare a final Change Order showing adjustments to the Contract Sum which were not made previously by Change Orders.

1.5. INSTRUCTION

- A. Instruct the Owner's personnel in proper operation and maintenance of systems, equipment, and similar items which were provided as part of the Work.

* * * END OF SECTION 01700 * * *

SECTION 02050

SELECTIVE DEMOLITION AND SALVAGE

1. PART 1 GENERAL

1.1. RELATED DOCUMENTS:

- A. Documents affecting work of this Section include, but are not necessarily limited to, General Requirements, bidding documents, and drawings.

1.2. DEMOLITION AND SALVAGE

A. SUMMARY

- 1 This portion of the specification governs the demolition, salvaging (to the extent specified by building owner), and disposal of materials resulting from the demolition.

B. APPLICABLE ROOF SECTIONS:

- 1 Roof Areas to be covered under this section:

2. PART 2 - PRODUCTS (NOT APPLICABLE)

3. PART 3 - EXECUTION

3.1. DEMOLITION

- A. Demolition operations shall be performed in such a manner that no damage to existing facilities or injury to persons will result from the performance of the Work.
- B. The contractor shall review and visually survey areas marked for demolition before beginning demolition.
- C. The use of equipment or wrecking devices shall be subject to the approval of the building owner; however, such approval does not relieve the contractor of responsibilities described above.

3.2. PREPARATION

A. Protection:

- 1 Contractor shall be responsible for protection of property during the course of work. Lawns, shrubbery, paved areas, and buildings shall be protected from damage. Repair damage at no extra cost to owner.
- 2 Multi-ply roofing, flashings, and insulation shall be installed and sealed in a watertight manner on the same day of installation or before arrival of inclement weather.
- 3 At the start of each workday, drains within the daily work area shall be plugged. Plugs are to be removed at the end of each workday or before arrival of inclement weather.
- 4 At the end of each working day, partial installation shall be sealed with water stops along the edges to prevent water entry.
- 5 Preparation work shall be limited to those areas that can be covered with installed roofing material on the same day or before the arrival of inclement weather.

- 6 Provide at the site, prior to commencing removal of debris, a dumpster or dump truck to be located where directed by the owner. Construct an enclosed chute from the roof for removal of debris from the roof area. Protect building surfaces at chute/set-up areas with tarpaulin. Remove dumpster from premises when full and empty at approved dumping or refuse area. Deliver empty dumpster to site for further use. Upon job completion, dumpster/chute shall be removed from the premises. Spilled or scattered debris shall be cleaned up immediately. Removed material to be disposed from the roof as it accumulates.
 - 7 Arrange the work sequence to avoid use of newly constructed roofing for storage, walking surface, and equipment movement. Move equipment and ground storage areas as work progresses.
- B. Surface Preparation
- 1 Clean roof of loose gravel and dirt with a closed vacuum system.
 - 2 Designated roof materials are to be removed.
 - 3 Remove designated roofing and insulation.
 - 4 Remove all base flashings.
 - 5 Remove vapor retarder from concrete deck only if it is not fully adhered.
 - 6 Remove metal counter flashings as required.
 - 7 Remove, cut off, metal wall panels or other wall coverings as required for access to flashings.
 - 8 Remove unused equipment as designated by building owner's representative.
 - 9 Dispose of all materials unless designated by building owner's representative for re-installation or salvage.
 - 10 Sweep roof deck clean. Dirt, gravel, and foreign materials within the flutes of metal deck is not acceptable.

3.3. HAZARDOUS MATERIALS

- A. Meet all rules and regulations pertaining to the handling and disposal of roof materials which contain hazardous materials.

3.4. SALVAGE

- A. Material as specified and recovered from demolition operations shall remain the property of the building owner. With the owner's permission, other materials shall become the property of the contractor. Material salvaged for the building owner shall be placed in storage areas designated by the building owner. Material that is not salvaged for the building owner shall be removed from the site or discarded in an on-site disposal area designated by the building owner.

* * * END OF SECTION 02050 * * *

SECTION 07220
ROOF INSULATION

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes roof insulation over the properly prepared deck substrate.
- B. Related Sections:
 - 1. Section 07050 – Common Work Procedures for Thermal and Moisture Protection.
 - 2. Section 07600 – Sheet Metal Flashing and Trim.

1.3 REFERENCES

- A. American Society for Testing and materials (ASTM):
 - 1. ASTM A167 Standard Specification for Stainless and Heat-Resisting Chromium Nickel Steel Plate, Sheet and Strip.
 - 2. ASTM A653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process.
 - 3. ASTM B29 Standard Specification for Refined Lead.
 - 4. ASTM B32 Standard Specification for Solder Metal.
 - 5. ASTM C165 Standard Test Method for Measuring Compressive Properties of Thermal Insulation.
 - 6. ASTM C208 Standard Specification for Cellulosic Fiber Insulation Board.
 - 7. ASTM C209 Standard Test Method for Cellulosic Fiber Insulating Board.
 - 8. ASTM C272 Standard Test Method for Water Absorption of Core Materials for Structural Sandwich Constructions.
 - 9. ASTM C1396 Standard Specification for Gypsum Wallboard.
 - 10. ASTM C518 Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - 11. ASTM C578 Standard Specification for Perlite Thermal Insulation Board.
 - 12. ASTM C728 Standard Test Methods for Fire Test of Roof Coverings.
 - 13. ASTM C1289 Standard Specification for Faced Rigid Polyisocyanurate Thermal Insulation.
 - 14. ASTM D5 Standard Test Method for Penetration of Bituminous Materials.
 - 15. ASTM D36 Standard Test Method for Softening Point of Bitumen (Ring and Ball Apparatus).
 - 16. ASTM D312 Standard Specification for Asphalt Used in Roofing.
 - 17. ASTM D412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension.
 - 18. ASTM D1621 Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
 - 19. ASTM D1622 Standard Test Method for Apparent Density of Rigid Cellular Plastics.
 - 20. ASTM D1863 Standard Specification for Mineral Aggregate Used on Built-Up Roofs.

21. ASTM D2126 Standard Test Method for Response off Rigid Cellular Plastics to Thermal Humid Aging.
 22. ASTM D2178 Standard Specification for Asphalt Glass Felts used in Roofing and Waterproofing.
 23. ASTM D4601 Standard Specification for Asphalt-Coated Glass Fiber Base Sheet Used in Roofing.
 24. ASTM D5147 Standard Sampling and Testing Modified Bituminous Sheet Material.
- B. Cast Iron Soil Pipe Institute, Washington, D.C. (CISPI)
 - C. Factory Mutual Research (FM):
 1. Roof Assembly Classifications.
 - D. National Roofing Contractors Association (NRCA):
 1. Roofing and Waterproofing Manual.
 - E. Underwriters Laboratories, Inc. (UL):
 1. Fire Hazard Classifications.
 - F. Warnock Hersey (WH):
 1. Fire Hazard Classifications.
 - G. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
 - H. Southern Pine Inspection Bureau, Pensacola, Florida (SPIB)
 - I. Insulation Board, Polyisocyanurate (FS HH-I-1972)

1.4 SUBMITTALS

- A. Product Data: Provide manufacturer's specification data sheets for each product in accordance with Division 01 Section Submittal Procedures
- B. Provide approval letters from insulation manufacturer for use of their insulation within this particular roofing system type.
- C. Provide a sample of each insulation type.
- D. Shop Drawings
 1. Submit manufacturer's shop drawings indicating complete installation details of tapered insulation system, including identification of each insulation block, sequence of installation, layout, drain locations, roof slopes, thicknesses, crickets and saddles.
 2. Shop drawing shall include: Outline of roof, location of drains, complete board layout of tapered insulation components, thickness and the average "R" value for the completed insulation system.
- E. Certification
 1. Submit roof manufacturer's certification that insulation fasteners furnished are acceptable to roof manufacturer.
 2. Submit roof manufacturer's certification that insulation furnished is acceptable to roofing manufacturer as a component of roofing system and is eligible for roof manufacturer's system warranty.

1.5 QUALITY ASSURANCE

- A. Fire Classification, ASTM E-108.
- B. Manufacturer's Certificate: Certify that roof system furnished is approved by Factory Mutual, Underwriters Laboratories, Warnock Hersey or approved third party testing facility in accordance with ASTM E108, Class A for external fire and meets local or nationally recognized building codes.
- C. Manufacturer's Certificate: Certify that the roof system is adhered/fastened properly to meet or exceed the requirements of FM.
- D. Pre-installation meeting: Refer to Division 07 roofing specifications for pre-installation meeting requirements.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to site with seals and labels intact, in manufacturer's original containers, dry and undamaged.
- B. Store all insulation materials in a manner to protect them from the wind, sun and moisture damage prior to and during installation. Any insulation that has been exposed to any moisture shall be removed from the project site.
- C. Keep materials enclosed in a watertight, ventilated enclosure (i.e. tarpaulins).
- D. Store materials off the ground. Any warped, broken or wet insulation boards shall be removed from the site.

PART 2 – PRODUCTS

2.1 PRODUCTS, GENERAL

- A. Basis of Design: Materials, manufacturer's product designations, and/or manufacturer's names specified herein shall be regarded as the minimum standard of quality required for work of this Section. Comply with all manufacturer and contractor/fabricator quality and performance criteria specified in Part 1.
- B. Substitutions: Products proposed as equal to the products specified in this Section shall be submitted in accordance with Bidding Requirements and Division 01 provisions. Any substitutions must be submitted to the Architect ten (10) days prior to bid date.
 - 1. Proposals shall be accompanied by a copy of the manufacturer's standard specification section. That specification section shall be signed and sealed by a professional engineer licensed in the state in which the installation is to take place. Substitution requests containing specifications without licensed engineer certification shall be rejected for non-conformance.
 - 2. Include a list of three (3) projects of similar type and extent, located within a one hundred mile radius from the location of the project. In addition, the three projects must be at least five (5) years old and be available for inspection by the Architect, Owner or Owner's Representative.
 - 3. Equivalency of performance criteria, warranty terms, submittal procedures, and contractual terms will constitute the basis of acceptance.
 - 4. The Owner's decision regarding substitutions will be considered final. Unauthorized substitutions will be rejected.

2.2 INSULATION MATERIALS

- A. Thermal Insulation Properties and Approved Insulation Boards.
 - 1. Rigid Polyisocyanurate Roof Insulation; ASTM C1289:
 - a. Qualities: Rigid, closed cell polyisocyanurate foam core bonded to heavy duty glass fiber mat facers.
 - b. Board Size: Four by four feet (4' x 4')
 - c. Thickness: Two layers - 2.2"
 - d. Compliances: UL, WH or FM
 - e. Manufacturer: Commercial Innovations, Inc., Cleveland, OH
 - 2. Tapered Polyisocyanurate Roof Insulation; ASTM C1289:
 - a. Qualities: Factory Tapered, closed cell polyisocyanurate foam core bonded to heavy duty glass fiber mat facers.
 - b. Board Size: Four by four feet (4' x 4')
 - c. Thickness: Minimum ½" inch
 - d. Tapered Slope: ¼":12"
 - e. Tapered Crickets/Saddles: ½":12"
 - f. Compliances: UL, WH or FM
 - g. Manufacturer: Commercial Innovations, Inc., Cleveland, OH
 - 3. Securock Roof Board
 - a. Qualities: Nonstructural, noncombustible, homogenous composition panel.
 - b. Board Size: Four by four feet (4' x 4').
 - c. Thickness: ½"
 - d. Compliances: UL, WH or FM
 - e. Manufacturer: USG

2.3 RELATED MATERIALS

- A. Fiber Cant and Tapered Edge Strips: Performed rigid insulation units of sizes/shapes indicated, matching insulation board or of perlite or organic fiberboard, as per the approved manufacturer.
 - 1. Acceptable Manufacturers:
 - a. Commercial Innovations, Inc.
 - b. Johns Manville
 - c. GAF
 - d. Approved Equivalent
- B. Fasteners: Corrosion resistant TruFast Twin-Loc (TWL-1800) Fastener as recommended by roof membrane manufacturer.
 - 1. Factory Mutual Tested and Approved with three (3) inches coated disc for I-90 rating, length required to penetrate gypsum deck 1.8 inch.
- C. Roof Deck Insulation Adhesive: Insul-Lock HR - Dual-component, high rise foam adhesive as recommended by insulation manufacturer and approved by FM indicated ratings.
 - 1. Tensile Strength (ASTM D412).....250 psi
 - 2. Density (ASTM D1875).....8.5 lbs./gal.
 - 3. Viscosity (ASTM D2556).....22,000 to 60,000 cP.
 - 4. 2" Peel Strength (ASTM D903).....17 lb/in.
 - 5. 3" Flexibility (ASTM D816).....Pass @ -70°F

PART 3 – EXECUTION

3.1 EXECUTION, GENERAL

- A. Comply with requirements of Division 01 Section "Common Execution Requirements."

3.2 INSPECTOR OF SURFACES

- A. Roofing contractor shall be responsible for preparing an adequate substrate to receive insulation.
 - 1. Verify that work which penetrates roof deck has been completed.
 - 2. Verify that wood nailers are properly and securely installed.
 - 3. Examine surfaces for defects, rough spots, ridges, depressions, foreign material, moisture, and unevenness.
 - 4. Do not proceed until defects are corrected.
 - 5. Do not apply insulation until substrate is sufficiently dry.
 - 6. Broom clean substrate immediately prior to application.
 - 7. Use additional insulation to fill depressions and low spots that would otherwise cause ponding water.

3.3 INSTALLATION

- A. Attachment with Mechanical Fasteners
 - 1. Approved base sheet shall be mechanically attached to the deck with the approved mechanical fastening system. As a minimum, the amount of fasteners shall be in accordance with manufacturer's recommendation.
 - 2. Spacing pattern of fasteners shall be as per manufacturer's recommendations to meet the FM requirements.
 - 3. Minimum penetration into deck shall be as recommended by the fastener manufacturer.
- B. Attachment with Insulation Adhesive
 - 1. Ensure all surfaces are clean, dry, free of dirt, debris, oils, loose or embedded gravel, unadhered coatings, deteriorated membrane and other contaminants that may inhibit adhesion.
 - 2. Apply insulation adhesive directly to the substrate using a ribbon pattern with one half (1/2) inch wide beads 12 inches o.c., using either the manual applicator or an automatic applicator, at a rate of one (1) gallon per one hundred (100) square feet per cartridge.
 - 3. Immediately place insulation and recovery boards into wet adhesive. Do not slide boards into place. Do not allow the adhesive to skin over before installing insulation boards.
 - 4. Briefly step each board into place to ensure contact with the adhesive. Temporary weights must be utilized to ensure proper adhesion. Substrates with irregular surfaces may prevent the insulation board from making positive contact with the adhesive. Relief cuts may be required to ensure proper contact.
 - 5. All boards shall be cut and fitted where the roof deck intersects a vertical surface. The boards shall be cut to fit a minimum of one quarter (1/4) inch away from the vertical surface.

3.4 CLEANING

- A. Remove debris and cartons from roof deck. Leave insulation clean and dry, ready to receive roofing membrane.

3.5 CONSTRUCTION WASTE MANAGEMENT

- A. Remove and properly dispose of waste products generated during installation.
Comply with requirements of authorities having jurisdiction.

END OF SECTION

SECTION 07550
POLYURETHANE MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 GENERAL

1.1 RELATED SECTIONS

- A. Section 05300 - Concrete Roof Deck.
- B. Section 06100 - Rough Carpentry.
- C. Section 06114 - Wood Blocking and Curbing: Wood nailers and cant strips.
- D. Section 07220 - Insulation Board: Insulation and fastening.
- E. Section 07620 - Sheet Metal Flashing and Trim: Weather protection for base flashings.
- F. Section 07710 - Manufactured Roof Specialties: Counter flashing gravel stops, and fascia.

1.2 REFERENCES

- A. ASTM D 41 - Standard Specification for Asphalt Primer Used in Roofing, Damproofing, and Waterproofing.
- B. ASTM D 312 - Standard Specification for Asphalt used in Roofing.
- C. ASTM D 451 - Standard Test Method for Sieve Analysis of Granular Mineral Surfacing for Asphalt Roofing Products.
- D. ASTM D 1079 Standard Terminology Relating to Roofing, Waterproofing and Bituminous Materials.
- E. ASTM D 1227 Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing.
- F. ASTM D 1863 Standard Specification for Mineral Aggregate Used as a Protective Coating for Roofing.
- G. ASTM D 2822 Standard Specification for Asphalt Roof Cement.
- H. ASTM D 2824 Standard Specification for Aluminum-Pigmented Asphalt Roof Coating.
- I. ASTM D 4601 Standard Specification for Asphalt Coated Glass Fiber Base Sheet Used in Roofing.
- J. ASTM D 5147 Standard Test Method for Sampling and Testing Modified Bituminous Sheet Materials.
- K. ASTM D 6162 Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements.
- L. ASTM D 6163 Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements.
- M. ASTM D 6164 - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements.

- N. ASTM D 6757 - Standard Specification for Underlayment Felt Containing Inorganic Fibers Used in Steep-Slope Roofing.
- O. ASTM E 108 - Standard Test Methods for Fire Test of Roof Coverings
- P. Factory Mutual Research (FM): Roof Assembly Classifications.
- Q. National Roofing Contractors Association (NRCA): Roofing and Waterproofing Manual.
- R. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) - Architectural Sheet Metal Manual.
- S. Underwriters Laboratories, Inc. (UL): Fire Hazard Classifications.
- T. Warnock Hersey (WH): Fire Hazard Classifications.
- U. ANSI-SPRI ES-1 Wind Design Standard for Edge Systems used with Low Slope Roofing Systems.
- V. ASCE 7-05, Minimum Design Loads for Buildings and Other Structures
- W. UL - Fire Resistance Directory.

1.3 FM Approvals - Roof Coverings and/or RoofNav assembly database.DESIGN / PERFORMANCE REQUIREMENTS

- A. Perform work in accordance with all federal, state and local codes.
- B. Exterior Fire Test Exposure: Roof system shall achieve a UL, FM or WH Class rating for roof slopes indicated on the Drawings as follows:
 - 1. Factory Mutual Class A Rating.
 - 2. Underwriters Laboratory Class A Rating.
 - 3. Warnock Hersey Class A Rating.
- C. Design Requirements:
 - 1. Uniform Wind Uplift Load Capacity
 - a. Installed roof system shall withstand negative (uplift) design wind loading pressures complying with the following criteria.
 - 1) Design Code: ASCE 7, Method 2 for Components and Cladding.
 - 2) Importance Category:
 - a) I.
 - b) II.
 - c) III.
 - d) IV
 - 3) Importance Factor of:
 - a) 0.77
 - b) 1.0
 - c) 1.15
 - d) 2.0
 - 4) Wind Speed: 140 mph
 - 5) Ultimate Pullout Value: N/A pounds per each of the fastener
 - 6) Exposure Category:
 - a) B.
 - b) C.
 - c) D.
 - 7) Design Roof Height: 15.00 feet.
 - 8) Minimum Building Width: 40.00 feet.
 - 9) Roof Pitch: 0.25 :12.

- 10) Roof Area Design Uplift Pressure:
 - a) Zone 1 - Field of roof 25.6 psf
 - b) Zone 2 - Eaves, ridges, hips and rakes 43.0 psf
 - c) Zone 3 - Corners 64.7 psf
2. Snow Load: ____ psf.
3. Live Load: 20 psf, or not to exceed original building design.
4. Dead Load:
 - a. Installation of new roofing materials shall not exceed the dead load capacity of the existing roof structure.

1.4 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 1. Preparation instructions and recommendations.
 2. Storage and handling requirements and recommendations.
 3. Installation instructions.
- C. Shop Drawings: Submit shop drawings including installation details of roofing, flashing, fastening, insulation and vapor barrier, including notation of roof slopes and fastening patterns of insulation and base modified bitumen membrane, prior to job start.
- D. Design Pressure Calculations: Submit design pressure calculations for the roof area in accordance with ASCE 7 and local Building Code requirements. Include a roof system attachment analysis report, certifying the system's compliance with applicable wind load requirements before Work begins.
- E. Verification Samples: For each modified bituminous membrane ply product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.
- F. Manufacturer's Certificates: Provide to certify products meet or exceed specified requirements.
- G. Test Reports: Submit test reports, prepared by an independent testing agency, for all modified bituminous sheet roofing, indicating compliance with ASTM D5147. Testing must be performed at 77 deg. F. Tests at 0 deg. F will not be considered.
- H. Manufacturer's Fire Compliance Certificate: Certify that the roof system furnished is approved by Factory Mutual (FM), Underwriters Laboratories (UL), Warnock Hersey (WH) or approved third party testing facility in accordance with ASTM E108, Class A for external fire and meets local or nationally recognized building codes.
- I. Closeout Submittals: Provide manufacturer's maintenance instructions that include recommendations for periodic inspection and maintenance of all completed roofing work. Provide product warranty executed by the manufacturer. Assist Owner in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance on roofing and associated work.

1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with NRCA Roofing and Waterproofing Manual.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified with documented ISO 9001 certification and minimum of twelve years of documented experience and must not have been in Chapter 11 bankruptcy during the last five years.

- C. Installer Qualifications: Company specializing in performing Work of this section with minimum five years documented experience and a certified Pre-Approved Garland Contractor.
- D. Installer's Field Supervision: Maintain a full-time Supervisor/Foreman on job site during all phases of roofing work while roofing work is in progress.
- E. Product Certification: Provide manufacturer's certification that materials are manufactured in the United States and conform to requirements specified herein, are chemically and physically compatible with each other, and are suitable for inclusion within the total roof system specified herein.
- F. Source Limitations: Obtain all components of roof system from a single manufacturer. Secondary products that are required shall be recommended and approved in writing by the roofing system Manufacturer. Upon request of the Architect or Owner, submit Manufacturer's written approval of secondary components in list form, signed by an authorized agent of the Manufacturer.

1.6 PRE-INSTALLATION MEETINGS

- A. Convene minimum two weeks prior to commencing Work of this section.
- B. Review installation procedures and coordination required with related Work.
- C. Inspect and make notes of job conditions prior to installation:
 - 1. Record minutes of the conference and provide copies to all parties present.
 - 2. Identify all outstanding issues in writing designating the responsible party for follow-up action and the timetable for completion.
 - 3. Installation of roofing system shall not begin until all outstanding issues are resolved to the satisfaction of the Architect.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products in manufacturer's unopened packaging with labels intact until ready for installation.
- B. Store all roofing materials in a dry place, on pallets or raised platforms, out of direct exposure to the elements until time of application. Store materials at least 4 inches above ground level and covered with "breathable" tarpaulins.
- C. Stored in accordance with the instructions of the manufacturer prior to their application or installation. Store roll goods on end on a clean flat surface except store KEE-Stone FB 60 rolls flat on a clean flat surface. No wet or damaged materials will be used in the application.
- D. Store at room temperature wherever possible, until immediately prior to installing the roll. During winter, store materials in a heated location with a 50 degree F (10 degree C) minimum temperature, removed only as needed for immediate use. Keep materials away from open flame or welding sparks.
- E. Avoid stockpiling of materials on roofs without first obtaining acceptance from the Architect/Engineer.
- F. Adhesive storage shall be between the range of above 40 degree F (4 degree C) and below 80 degree F (27 degree C). Area of storage shall be constructed for flammable storage.

1.8 COORDINATION

- A. Coordinate Work with installing associated metal flashings as work of this section proceeds.

1.9 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.10 WARRANTY

- A. Upon completion of the work, provide the Manufacturer's written and signed Edge-To-Edge NDL System Warranty, warranting that, if a leak develops in the roof during the term of this warranty, due either to defective material or defective workmanship by the installer, the manufacturer shall provide the Owner, at the Manufacturer's expense, with the labor and material necessary to return the defective area to a watertight condition, including Manufacturer's metal components. There is no additional cost for the warranty.
 - 1. Warranty Period:
 - a. 40 years from date of acceptance.
- B. Installer is to guarantee all work against defects in materials and workmanship for a period indicated following final acceptance of the Work.
 - 1. Warranty Period:
 - a. 2 years from date of acceptance.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: The Garland Company, Inc Or approved equal; 3800 E. 91st St.; Cleveland, OH 44105; Phone: 401-500-2901; Email: dwall@garlandind.com; Web: <http://www.garlandco.com>

2.2 COLD APPLIED 2-PLY ROOF SYSTEM

- A. Vapor Retarder (Ply) Sheet: One ply bonded to the prepared substrate with Vapor Retarder Adhesive:
 - 1. HPR Tri-Base Premium
- B. Vapor Retarder Adhesive:
 - 1. Millennium Hurricane Force 1-Part Membrane Adhesive
- C. Base (Ply) Sheet: One ply bonded to the prepared substrate with Interply Adhesive:
- D. Modified Cap (Ply) Sheet: One ply bonded to the prepared substrate with Interply Adhesive:
- E. Interply Adhesive: (1 and 2)
- F. Flashing Base Ply: One ply bonded to the prepared substrate with Interply Adhesive:
- G. Flashing Cap (Ply) Sheet: One ply bonded to the prepared substrate with Interply Adhesive:
- H. Flashing Ply Adhesive:

2.3 ACCESSORIES:

- A. Roof Insulation: In accordance with Section 07220.

2.4 EDGE TREATMENT AND ROOF PENETRATION FLASHINGS

- A. Pitch pans, Rain Collar 24 gauge stainless or 20oz (567gram) copper. All joints should be

welded/soldered watertight. See details for design.

- B. Drain Flashings should be 4lb (1.8kg) sheet lead formed and rolled.
- C. Plumbing stacks should be 4lb (1.8kg) sheet lead formed and rolled.
- D. Liquid Flashing - Tuff-Flash: An asphaltic-polyurethane, low odor, liquid flashing material designed for specialized details unable to be waterproofed with typical modified membrane flashings.
 - 1. Tensile Strength, ASTM D 412: 400 psi
 - 2. Elongation, ASTM D 412: 300%
 - 3. Density @77 deg. F 8.5 lb/gal typical
- E. Fabricated Flashings: Fabricated flashings and trim are specified in Section 07620.
 - 1. Fabricated flashings and trim shall conform to the detail requirements of SMACNA "Architectural Sheet Metal Manual" and/or the CDA Copper Development Association "Copper in Architecture - Handbook" as applicable.
- F. Manufactured Roof Specialties: Manufactured copings, fascia, gravel stops, control joints, expansion joints, joint covers and related flashings and trim are specified in Section 07710.
 - 1. Manufactured roof specialties shall conform to the detail requirements of SMACNA "Architectural Sheet Metal Manual" and/or the NRCA "Roofing and Waterproofing Manual" as applicable.
- G. Flashing Boot - Rubbertite Flashing Boot: Neoprene pipe boot for sealing single or multiple pipe penetrations adhered in approved adhesives as recommended and furnished by the membrane manufacturer.
- H. Vents and Breathers: Heavy gauge aluminum and fully insulated vent that allows moisture and air to escape but not enter the roof system as recommended and furnished by the membrane manufacturer.
- I. Pitch pans, Rain Collar 24 gauge stainless or 20oz (567gram) copper. All joints should be welded/soldered watertight. See details for design.
- J. Drain Flashings should be 4lb (1.8kg) sheet lead formed and rolled.
- K. Plumbing stacks should be 4lb (1.8kg) sheet lead formed and rolled.
- L. Liquid Flashing - Tuff-Flash: An asphaltic-polyurethane, low odor, liquid flashing material designed for specialized details unable to be waterproofed with typical modified membrane flashings.
 - 1. Tensile Strength, ASTM D 412: 400 psi
 - 2. Elongation, ASTM D 412: 300%
 - 3. Density @77 deg. F 8.5 lb/gal typical
- M. Fabricated Flashings: Fabricated flashings and trim are specified in Section 07620.
 - 1. Fabricated flashings and trim shall conform to the detail requirements of SMACNA "Architectural Sheet Metal Manual" and/or the CDA Copper Development Association "Copper in Architecture - Handbook" as applicable.
- N. Manufactured Roof Specialties: Manufactured copings, fascia, gravel stops, control joints, expansion joints, joint covers and related flashings and trim are specified in Section 07710.
 - 1. Manufactured roof specialties shall conform to the detail requirements of SMACNA "Architectural Sheet Metal Manual" and/or the NRCA "Roofing and Waterproofing Manual" as applicable.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Inspect and approve the deck condition, slopes and fastener backing if applicable, parapet walls, expansion joints, roof drains, stack vents, vent outlets, nailers and surfaces and elements.
- C. Verify that work penetrating the roof deck, or which may otherwise affect the roofing, has been properly completed.
- D. If substrate preparation and other conditions are the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. General: Clean surfaces thoroughly prior to installation.
 - 1. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
 - 2. Fill substrate surface voids that are greater than 1/4 inch wide with an acceptable fill material.
 - 3. Roof surface to receive roofing system shall be smooth, clean, free from loose gravel, dirt and debris, dry and structurally sound.
 - 4. Wherever necessary, all surfaces to receive roofing materials shall be power broom and vacuumed to remove debris and loose matter prior to starting work.
 - 5. Do not apply roofing during inclement weather. Do not apply roofing membrane to damp, frozen, dirty, or dusty surfaces.
 - 6. Fasteners and plates for fastening components mechanically to the substrate shall provide a minimum pull-out capacity of 300 lbs. (136 k) per fastener. Base or ply sheets attached with cap nails require a minimum pullout capacity of 40 lb. per nail.
 - 7. Prime decks where required, in accordance with requirements and recommendations of the primer and deck manufacturer.

3.3 INSTALLATION - GENERAL

- A. Install modified bitumen membranes and flashings in accordance with manufacturer's instructions and with the recommendations provided by the National Roofing Contractors Association's Roofing & Waterproofing Manual, the Asphalt Roofing Manufacturers Association, and applicable codes.
- B. General: Avoid installation of modified bitumen membranes at temperatures lower than 40-45 degrees F. When work at such temperatures unavoidable use the following precautions:
 - 1. Take extra care during cold weather installation and when ambient temperatures are affected by wind or humidity, to ensure adequate bonding is achieved between the surfaces to be joined. Use extra care at material seam welds and where adhesion of the applied product to the appropriately prepared substrate as the substrate can be affected by such temperature constraints as well.
 - 2. Unrolling of cold materials, under low ambient conditions must be avoided to prevent the likelihood of unnecessary stress cracking. Rolls must be at least 40 degrees F at the time of application. If the membrane roll becomes stiff or difficult to install, it must be replaced with roll from a heated storage area.
- C. Commence installation of the roofing system at the lowest point of the roof (or roof area), working up the slope toward the highest point. Lap sheets shingle fashion so as to constantly shed water
- D. All slopes greater than 2:12 require back-nailing to prevent slippage of the ply sheets. Use

ring or spiral-shank 1 inch cap nails, or screws and plates at a rate of 1 fastener per ply (including the membrane) at each insulation stop. Place insulation stops at 16 ft o.c. for slopes less than 3:12 and 4 feet o.c. for slopes greater than 3:12. On non-insulated systems, nail each ply directly into the deck at the rate specified above. When slope exceeds 2:12, install all plies parallel to the slope (strapping) to facilitate backnailing. Install 4 additional fasteners at the upper edge of the membrane when strapping the plies.

3.4 INSTALLATION COLD APPLIED ROOF SYSTEM

- A. Vapor Retarder Ply: Install in vapor retarder adhesive applied at the rate required by the manufacturer. Shingle sheets uniformly over the prepared substrate to achieve the number of plies specified. Shingle in proper direction to shed water on each large area of roofing.
1. Lap ply sheet ends 8 inches. Stagger end laps 12 inches minimum.
 2. Solidly bond to the base layers with specified cold adhesive at the rate of 1.5 to 2 gallons per 100 square feet.
 3. Roll must push a puddle of adhesive in front of it with adhesive slightly visible at all side laps. Care should be taken to eliminate air entrapment under the membrane.
 4. Install subsequent rolls of modified across the roof as above with a minimum of 4 inch side laps and 8 inch staggered end laps. Lay modified membrane in the same direction as the base layers but the laps shall not coincide with the laps of the base layers.
 5. Allow cold adhesive to set for 5 to 10 minutes before installing the top layer of modified membrane.
 6. Extend membrane 2 inches beyond top edge of all cants in full moppings of the cold adhesive as shown on the Drawings.
- B. Base Ply: Cut base ply sheets into 18 foot lengths and allow plies to relax before installing. Install in interply adhesive applied at the rate required by the manufacturer. Shingle sheets uniformly over the prepared substrate to achieve the number of plies specified. Shingle in proper direction to shed water on each large area of roofing.
1. Lap ply sheet ends 8 inches. Stagger end laps 12 inches minimum.
 2. Solidly bond to the base layers with specified cold adhesive at the rate of 2 to 2-1/2 gallons per 100 square feet.
 3. Roll must push a puddle of adhesive in front of it with adhesive slightly visible at all side laps. Care should be taken to eliminate air entrapment under the membrane.
 4. Install subsequent rolls of modified across the roof as above with a minimum of 4 inch side laps and 8 inch staggered end laps. Lay modified membrane in the same direction as the base layers but the laps shall not coincide with the laps of the base layers.
 5. Allow cold adhesive to set for 5 to 10 minutes before installing the top layer of modified membrane.
 6. Extend membrane 2 inches beyond top edge of all cants in full moppings of the cold adhesive as shown on the Drawings.
- C. Modified Cap Ply(s): Cut cap ply sheets into 18 foot lengths and allow plies to relax before installing. Install in interplay adhesive applied at the rate required by the manufacturer. Shingle sheets uniformly over the prepared substrate to achieve the number of plies specified. Shingle in proper direction to shed water on each large area of roofing.
1. Lap ply sheet ends 8 inches. Stagger end laps 12 inches minimum.
 2. Solidly bond to the base layers with specified cold adhesive at the rate of 2 to 2-1/2 gallons per 100 square feet.
 3. Roll must push a puddle of adhesive in front of it with adhesive slightly visible at all side laps. Care should be taken to eliminate air entrapment under the membrane.
 4. Install subsequent rolls of modified across the roof as above with a minimum of 4 inch side laps and 8 inch staggered end laps. Lay modified membrane in the same direction as the underlayers but the laps shall not coincide with the laps of the base

- layers.
 5. Allow cold adhesive to set for 5 to 10 minutes before installing the top layer of modified membrane.
 6. Extend membrane 2 inches beyond top edge of all cants in full moppings of the cold adhesive as shown on the Drawings.
- D. Fibrous Cant Strips: Provide non-combustible perlite or glass fiber cant strips at all wall/curb detail treatments where angle changes are greater than 45 degrees. Cant may be set in approved cold adhesives, hot asphalt or mechanically attached with approved plates and fasteners.
- E. Wood Blocking, Nailers and Cant Strips: Provide wood blocking, nailers and cant strips as specified in Section 06114.
1. Provide nailers at all roof perimeters and penetrations for fastening membrane flashings and sheet metal components.
 2. Wood nailers should match the height of any insulation, providing a smooth and even transition between flashing and insulation areas.
 3. Nailer lengths should be spaced with a minimum 1/8 inch gap for expansion and contraction between each length or change of direction.
 4. Nailers and flashings should be fastened in accordance with Factory Mutual "Loss Prevention Data Sheet 1- 49, Perimeter Flashing" and be designed to be capable of resisting a minimum force of 200 lbs/lineal foot in any direction.
- F. Metal Work: Provide metal flashings, counter flashings, parapet coping caps and thru-wall flashings as specified in Section 07620 or Section 07710. Install in accordance with the SMACNA "Architectural Sheet Metal Manual" or the NRCA Roofing Waterproofing manual.
- G. Termination Bar: Provide a metal termination bar or approved top edge securement at the terminus of all flashing sheets at walls and curbs. Fasten the bar a minimum of 8 inches (203 mm) o/c to achieve constant compression. Provide suitable, sealant at the top edge if required.
- H. Flashing Base Ply: Install flashing sheets by the same application method used for the base ply.
1. Seal curb, wall and parapet flashings with an application of mastic and mesh on a daily basis. Do not permit conditions to exist that will allow moisture to enter behind, around or under the roof or flashing membrane.
 2. Prepare all walls, penetrations, expansion joints and where shown on the Drawings to be flashed with required primer at the rate of 100 square feet per gallon. Allow primer to dry tack free.
 3. Adhere to the underlying base ply with specified flashing ply adhesive unless otherwise specified. Nail off at a minimum of 8 inches (203 mm) o.c. from the finished roof at all vertical surfaces.
 4. Solidly adhere the entire flashing ply to the substrate. Secure the tops of all flashings that are not run up and over curb through termination bar fastened at 6 inches (152 mm) O.C. and sealed at top.
 5. Seal all vertical laps of flashing ply with a three-course application of trowel-grade mastic and fiberglass mesh.
 6. Coordinate counter flashing, cap flashings, expansion joints and similar work with modified bitumen roofing work as specified.
 7. Coordinate roof accessories, miscellaneous sheet metal accessory items, including piping vents and other devices with the roofing system work.
 8. Secure the top edge of the flashing sheet using a termination bar only when the wall surface above is waterproofed, or nailed 4 inches on center and covered with an acceptable counter flashing.
- I. Flashing Cap Ply: Install flashing cap sheets by the same application method used for the

base ply.

1. Seal curb, wall and parapet flashings with an application of mastic and mesh on a daily basis. Do not permit conditions to exist that will allow moisture to enter behind, around or under the roof or flashing membrane.
2. Prepare all walls, penetrations, expansion joints and where shown on the Drawings to be flashed with required primer at the rate of 100 square feet per gallon. Allow primer to dry tack free.
3. Adhere to the underlying base flashing ply with specified flashing ply adhesive unless otherwise specified. Nail off at a minimum of 8 inches (203 mm) o.c. from the finished roof at all vertical surfaces.
4. Coordinate counter flashing, cap flashings, expansion joints and similar work with modified bitumen roofing work as specified.
5. Coordinate roof accessories, miscellaneous sheet metal accessory items with the roofing system work.
6. All stripping shall be installed prior to flashing cap sheet installation.
7. Heat and scrape granules when welding or adhering at cut areas and seams to granular surfaces at all flashings.
8. Secure the top edge of the flashing sheet using a termination bar only when the wall surface above is waterproofed, or nailed 4 inches on center and covered with an acceptable counter flashing.

3.5 INSTALLATION EDGE TREATMENT AND ROOF PENETRATION FLASHING

A. Pre-Manufactured Metal Edge System:

1. Position base plies of the built-up and/or modified roofing membrane over the roof edge covering nailers completely, fastening 8 inches (203 mm) on center. Install membrane and cap sheet with proper material and procedure according to manufacturer's recommendations.
2. Cant Dam: Install Cant Dam overlapping Cant a minimum of 1 inch. Fasten Cant Dam through the top of nailer and outside face in accordance with ANSI/SPRI ES-1 test report.
3. BUR or Modified Flashing: Prime Cant Dam at a rate of 100 square feet per gallon and allow to dry.
4. Strip in Cant Dam with base flashing membrane extending 6 inches (152 mm) into roof field, followed with a cap sheet extending 9 inches into the roof field. Install membrane and cap sheet with proper material and procedure according to manufacturer's recommendations.
5. Fascia Cover: Install fascia cover with splice plate under one end by pressing downward firmly until "snap" occurs and cover is engaged along entire length of miter. Field cut where necessary with fine tooth saw.
6. Sealant is to be placed between splice plates on metal edge pieces.
7. Install a second ply of modified flashing ply in bitumen over the base flashing ply, 9 inches (228 mm) on to the field of the roof.

B. Equipment Support:

1. Minimum curb height is 8 inches (203 mm) above finished roof height. Prime vertical at a rate of 100 square feet per gallon and allow to dry.
2. Set cant in bitumen. Run all field plies over cant a minimum of 2 inches (50 mm).
3. Install base flashing ply covering curb set in bitumen with 6 inches (152 mm) on to field of the roof.
4. Install a second ply of modified flashing ply in bitumen over the base flashing ply, 9 inches (228 mm) on to the field of the roof. Attach top of membrane to top of curb and nail at 8 inches (203 mm) o.c. Apply a three-course application of mastic and mesh at all vertical seams and allow to cure and aluminize.
5. Install pre-manufactured cover. Fasten sides at 24 inches (609 mm) o.c. with fasteners and neoprene washers. Furnish all joint cover laps with butyl tape between

- metal covers.
 - 6. Set equipment on neoprene pad and fasten as required by equipment manufacturer.
- C. Curb Detail/Air Handling Station:
- 1. Minimum curb height is 8 inches (203 mm) above finished roof height. Prime vertical at a rate of 100 square feet per gallon and allow to dry.
 - 2. Set cant in bitumen. Run all field plies over cant a minimum of 2 inches (50 mm).
 - 3. Install base flashing ply covering curb set in bitumen with 6 inches (152 mm) on to field of the roof.
 - 4. Install a second ply of modified flashing ply in bitumen over the base flashing ply, 9 inches (228 mm) on to the field of the roof. Apply a three-course application of mastic and mesh at all vertical seams and allow to cure and aluminize.
 - 5. Install pre-manufactured counterflashing with fasteners and neoprene washers or per manufacturer's recommendations.
 - 6. Set equipment on neoprene pad and fasten as required by equipment manufacturer.
- D. Exhaust Fan:
- 1. Minimum curb height is 8 inches (203 mm) above finished roof height. Prime vertical at a rate of 100 square feet per gallon and allow to dry.
 - 2. Set cant in bitumen. Run all plies over cant a minimum of 2 inches (50 mm).
 - 3. Install base flashing ply covering curb with 6 inches (152 mm) on to field of the roof.
 - 4. Install a second ply of modified flashing ply installed over the base flashing ply, 9 inches (228 mm) on to field of the roof. Attach top of membrane to top of wood curb and nail at 8 inches (203 mm) o.c. Apply a three-course application of mastic and mesh at all vertical seams and allow to cure and aluminize.
 - 5. Install metal exhaust fan over the wood nailers and flashing to act as counterflashing. Fasten per manufacturer's recommendation.
- E. Roof Drain:
- 1. Plug drain to prevent debris from entering plumbing.
 - 2. Taper insulation to drain minimum of 24 inches (609 mm) from center of drain.
 - 3. Run roof system plies over drain. Cut out plies inside drain bowl.
 - 4. Set lead/copper flashing (30 inch square minimum) in 1/4 inch bed of mastic. Run lead/copper into drain a minimum of 2 inches (50 mm). Prime lead/copper at a rate of 100 square feet per gallon and allow to dry.
 - 5. Install base flashing ply (40 inch square minimum) in bitumen.
 - 6. Install modified membrane (48 inch square minimum) in bitumen.
 - 7. Install clamping ring and assure that all plies are under the clamping ring.
 - 8. Remove drain plug and install strainer.
- F. Plumbing Stack:
- 1. Minimum stack height is 12 inches (609 mm).
 - 2. Run roof system over the entire surface of the roof. Seal the base of the stack with elastomeric sealant.
 - 3. Prime flange of new sleeve. Install properly sized sleeves set in 1/4 inch (6 mm) bed of roof cement.
 - 4. Install base flashing ply in bitumen.
 - 5. Install membrane in bitumen.
 - 6. Caulk the intersection of the membrane with elastomeric sealant.
 - 7. Turn sleeve a minimum of 1 inch (25 mm) down inside of stack.
- G. Heat Stack:
- 1. Minimum stack height is 12 inches (609 mm).
 - 2. Run roof system over the entire surface of the roof. Seal the base of the stack with elastomeric sealant.
 - 3. Prime flange of new sleeve. Install properly sized sleeves set in 1/4 inch (6 mm) bed of roof cement.

4. Install base flashing ply in bitumen.
 5. Install modified membrane in bitumen.
 6. Caulk the intersection of the membrane with elastomeric sealant.
 7. Install new collar over cape. Weld collar or install stainless steel draw band.
- H. Pitch Pocket:
1. Run all plies up to the penetration.
 2. Place the pitch pocket over the penetration and prime all flanges.
 3. Strip in flange of pitch pocket with one ply of base flashing ply. Extend 6 inches (152 mm) onto field of roof.
 4. Install second layer of modified membrane extending 9 inches (228 mm) onto field of the roof.
 5. Fill pitch pocket half full with non-shrink grout. Let this cure and top off with pourable sealant.
 6. Caulk joint between roof system and pitch pocket with roof cement.

3.6 PROTECTION

- A. Provide traffic ways, erect barriers, fences, guards, rails, enclosures, chutes and the like to protect personnel, roofs and structures, vehicles and utilities.
- B. Protect exposed surfaces of finished walls with tarps to prevent damage.
- C. Plywood for traffic ways required for material movement over existing roofs shall be not less than 5/8 inch (16 mm) thick.
- D. In addition to the plywood listed above, an underlayment of minimum 1/2 inch (13 mm) recover board is required on new roofing.
- E. Special permission shall be obtained from the Manufacturer before any traffic shall be permitted over new roofing.

3.7 FIELD QUALITY CONTROL

- A. Inspection: Provide manufacturer's daily field observations and a final inspection upon completion of the Work.
 1. Warranty shall be issued upon manufacturer's acceptance of the installation.
 2. Daily field observations shall be performed by a Technical Representative employed full-time by the manufacturer and whose primary job description is to assist, inspect and approve roofing installations for the manufacturer.
 3. Daily roofing progress reports must include; photographic documentation of work in-progress and written statements of compliance with details/shop drawings, weather conditions, and any discrepancies found during inspection.
 4. Progress reports must be published to an online database accessible to the Owner/Architect.
 5. Provide a final report from the Technical Representative, certifying that the roofing system has been satisfactorily installed according to the project specifications, approved details and good general roofing practice.

3.8 SCHEDULES

- A. Base (Ply) Sheet:
 1. 80 mil SBS (Styrene-Butadiene-Styrene) rubber modified roofing base sheet reinforced with a fiberglass scrim, performance requirements according to ASTM D 5147.
 - a. Tensile Strength, ASTM D 5147
 - 1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 100 lbf/in XD 100 lbf/in

- 2) 50mm/min. @ 23 +/- 2 deg. C MD 17.5 kN/m XD 17.5 kN/m
 - b. Tear Strength, ASTM D 5147
 - 1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 110 lbf XD 110 lbf
 - 2) 50mm/min. @ 23 +/- 2 deg. C MD 489 N XD 489 N
 - c. Elongation at Maximum Tensile, ASTM D 5147
 - 1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 4 % XD 4 %
 - 2) 50mm/min @ 23 +/- 2 deg. C MD 4 % XD 4 %
 - d. Low Temperature Flexibility, ASTM D 5147, Passes -20 deg. F (-28.8 deg. C)
- B. Polyurethane Modified Cap (Ply) Sheet:
- 1. 145 mil mineral surfaced, polyurethane modified roofing membrane with fire retardant characteristics, and dual fiberglass reinforced scrim. ASTM D 6163, Type III Grade G
 - a. Tensile Strength, ASTM D 5147
 - 1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 205 lbf/in XD 215 lbf/in
 - 2) 50 mm/min. @ 23 +/- 2 deg. C MD 36.0 kN/m XD 38 kN/m
 - b. Tear Strength, ASTM D 5147
 - 1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 300 lbf XD 300 lbf
 - 2) 50 mm/min. @ 23 +/- 2 deg. C MD 1334 N XD 1334 N
 - c. Elongation at Maximum Tensile, ASTM D 5147
 - 1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 4.7% XD 5.0%
 - 2) 50 mm/min. @ 23 +/- 2 deg. C MD 4.7% XD 5.0%
 - d. Low Temperature Flexibility, ASTM D 5147, Passes 0 deg. F (-18 deg. C)
- C. Interply Adhesive:
- 1. Rubberized, polymer modified cold process asphalt roofing bitumen V.O.C. compliant ASTM D 3019. Performance Requirements:
 - a. Non-Volatile Content ASTM D 4479 70%
 - b. Density ASTM D1475 8.9 lbs./gal.
 - c. Viscosity Stormer ASTM D562 400-500 grams
 - d. Flash Point ASTM D 93 100 deg. F min. (37 deg. C)
 - e. Slope: up to 3:12
- D. Flashing Base Ply:
- 1. 80 mil SBS (Styrene-Butadiene-Styrene) rubber modified roofing base sheet reinforced with a fiberglass scrim, performance requirements according to ASTM D 5147.
 - a. Tensile Strength, ASTM D 5147
 - 1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 100 lbf/in XD 100 lbf/in
 - 2) 50mm/min. @ 23 +/- 2 deg. C MD 17.5 kN/m XD 17.5 kN/m
 - b. Tear Strength, ASTM D 5147
 - 1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 110 lbf XD 110 lbf
 - 2) 50mm/min. @ 23 +/- 2 deg. C MD 489 N XD 489 N
 - c. Elongation at Maximum Tensile, ASTM D 5147
 - 1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 4 % XD 4 %
 - 2) 50mm/min @ 23 +/- 2 deg. C MD 4 % XD 4 %
 - d. Low Temperature Flexibility, ASTM D 5147
 - 1) Passes -20 deg. F (-28.8 deg. C)
- E. Flashing Ply Adhesive:
- 1. Flashing Adhesive: Brush grade flashing adhesive.
 - a. Non-Volatile Content ASTM D 4479 70 min.
 - b. Density ASTM D 1475 8.6 lbs./gal. (1kg/l)
 - c. Flash Point ASTM D 93 100 deg. F (37 deg. C)
- F. Surfacing:
- 1. Flashing Cap (Ply) Sheet:
 - a. 145 mil mineral surfaced, polyurethane modified roofing membrane with fire

retardant characteristics, and dual fiberglass reinforced scrim. ASTM D 6163, Type III Grade G

- 1) Tensile Strength, ASTM D 5147
 - a) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 205 lbf/in XD 215 lbf/in
 - b) 50 mm/min. @ 23 +/- 2 deg. C MD 36.0 kN/m XD 39 kN/m
- 2) Tear Strength, ASTM D 5147
 - a) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 300 lbf XD 300 lbf
 - b) 50 mm/min. @ 23 +/- 2 deg. C MD 1334 N XD 1334 N
- 3) Elongation at Maximum Tensile, ASTM D 5147
 - a) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 4.7% XD 5.0%
 - b) 50 mm/min. @ 23 +/- 2 deg. C MD 4.7% XD 5.0%
- 4) Low Temperature Flexibility, ASTM D 5147, Passes 0 deg. F (-18 deg. C)

END OF SECTION

SECTION 07550
SBS MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Cold Applied 2-Ply SBS Modified Roofing

1.2 RELATED SECTIONS

- A. Section 05300 - Concrete Roof Deck.
- B. Section 06100 - Rough Carpentry.
- C. Section 06114 - Wood Blocking and Curbing: Wood nailers and cant strips.
- D. Section 07220 - Insulation Board: Insulation and fastening.
- E. Section 07620 - Sheet Metal Flashing and Trim: Weather protection for base flashings.
- F. Section 07710 - Manufactured Roof Specialties: Counter flashing gravel stops, and fascia.

1.3 REFERENCES

- A. ASTM D 41 - Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.
- B. ASTM D 312 - Standard Specification for Asphalt used in Roofing.
- C. ASTM D 451 - Standard Test Method for Sieve Analysis of Granular Mineral Surfacing for Asphalt Roofing Products.
- D. ASTM D 1079 Standard Terminology Relating to Roofing, Waterproofing and Bituminous Materials.
- E. ASTM D 1227 Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing.
- F. ASTM D 1863 Standard Specification for Mineral Aggregate Used as a Protective Coating for Roofing.
- G. ASTM D 2822 Standard Specification for Asphalt Roof Cement.
- H. ASTM D 2824 Standard Specification for Aluminum-Pigmented Asphalt Roof Coating.
- I. ASTM D 4601 Standard Specification for Asphalt Coated Glass Fiber Base Sheet Used in Roofing.
- J. ASTM D 5147 Standard Test Method for Sampling and Testing Modified Bituminous Sheet Materials.
- K. ASTM D 6162 Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements.
- L. ASTM D 6163 Standard Specification for Styrene Butadiene Styrene (SBS) Modified

- a) B.
- b) C
- c) D.
- 7) Design Roof Height: 15.00 feet.
- 8) Minimum Building Width: 40.00 feet.
- 9) Roof Pitch: 0.25 :12.
- 10) Roof Area Design Uplift Pressure:
 - a) Zone 1 - Field of roof 25.6 psf
 - b) Zone 2 - Eaves, ridges, hips and rakes 43.0 psf
 - c) Zone 3 - Corners 64.7 psf
- 2. Snow Load: ____ psf.
- 3. Live Load: 20 psf, or not to exceed original building design.
- 4. Dead Load:
 - a. Installation of new roofing materials shall not exceed the dead load capacity of the existing roof structure.

1.5 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation instructions.
- C. Shop Drawings: Submit shop drawings including installation details of roofing, flashing, fastening, insulation and vapor barrier, including notation of roof slopes and fastening patterns of insulation and base modified bitumen membrane, prior to job start.
- D. Design Pressure Calculations: Submit design pressure calculations for the roof area in accordance with ASCE 7 and local Building Code requirements. Include a roof system attachment analysis report, certifying the system's compliance with applicable wind load requirements before Work begins.
- E. Verification Samples: For each modified bituminous membrane ply product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, color, and patterns.
- F. Manufacturer's Certificates: Provide to certify products meet or exceed specified requirements.
- G. Test Reports: Submit test reports, prepared by an independent testing agency, for all modified bituminous sheet roofing, indicating compliance with ASTM D5147. Testing must be performed at 77 deg. F. Tests at 0 deg. F will not be considered.
- H. Manufacturer's Fire Compliance Certificate: Certify that the roof system furnished is approved by Factory Mutual (FM), Underwriters Laboratories (UL), Warnock Hersey (WH) or approved third party testing facility in accordance with ASTM E108, Class A for external fire and meets local or nationally recognized building codes.
- I. Closeout Submittals: Provide manufacturer's maintenance instructions that include recommendations for periodic inspection and maintenance of all completed roofing work. Provide product warranty executed by the manufacturer. Assist Owner in preparation and submittal of roof installation acceptance certification as may be necessary in connection with fire and extended coverage insurance on roofing and associated work.

1.6 QUALITY ASSURANCE

Bituminous Sheet Materials Using Glass Fiber Reinforcements.

- M. ASTM D 6164 - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements.
- N. ASTM D 6757 - Standard Specification for Underlayment Felt Containing Inorganic Fibers Used in Steep-Slope Roofing.
- O. ASTM E 108 - Standard Test Methods for Fire Test of Roof Coverings
- P. Factory Mutual Research (FM): Roof Assembly Classifications.
- Q. National Roofing Contractors Association (NRCA): Roofing and Waterproofing Manual.
- R. Sheet Metal and Air Conditioning Contractors National Association, Inc. (SMACNA) - Architectural Sheet Metal Manual.
- S. Underwriters Laboratories, Inc. (UL): Fire Hazard Classifications.
- T. Warnock Hersey (WH): Fire Hazard Classifications.
- U. ANSI-SPRI ES-1 Wind Design Standard for Edge Systems used with Low Slope Roofing Systems.
- V. ASCE 7-05, Minimum Design Loads for Buildings and Other Structures
- W. UL - Fire Resistance Directory.

1.4 FM Approvals - Roof Coverings and/or RoofNav assembly database.

DESIGN / PERFORMANCE REQUIREMENTS

- A. Perform work in accordance with all federal, state and local codes.
- B. Exterior Fire Test Exposure: Roof system shall achieve a UL, FM or WH Class rating for roof slopes indicated on the Drawings as follows:
 - 1. Factory Mutual Class A Rating.
 - 2. Underwriters Laboratory Class A Rating.
 - 3. Warnock Hersey Class A Rating.
- C. Design Requirements:
 - 1. Uniform Wind Uplift Load Capacity
 - a. Installed roof system shall withstand negative (uplift) design wind loading pressures complying with the following criteria.
 - 1) Design Code: ASCE 7, Method 2 for Components and Cladding.
 - 2) Importance Category:
 - a) I.
 - b) II.
 - c) III.
 - d) IV.
 - 3) Importance Factor of:
 - a) 0.77
 - b) 1.0
 - c) 1.15
 - d) 2.0
 - 4) Wind Speed: 140 mph
 - 5) Ultimate Pullout Value: N/A pounds per each of the fastener
 - 6) Exposure Category:

- A. Perform Work in accordance with NRCA Roofing and Waterproofing Manual.
- B. Manufacturer Qualifications: Company specializing in manufacturing products specified with documented ISO 9001 certification and minimum of twelve years of documented experience and must not have been in Chapter 11 bankruptcy during the last five years.
- C. Installer Qualifications: Company specializing in performing Work of this section with minimum five years documented experience and a certified Pre-Approved Garland Contractor.
- D. Installer's Field Supervision: Maintain a full-time Supervisor/Foreman on the job site during all phases of roofing work while roofing work is in progress.
- E. Product Certification: Provide manufacturer's certification that materials are manufactured in the United States and conform to requirements specified herein, are chemically and physically compatible with each other, and are suitable for inclusion within the total roof system specified herein.
- F. Source Limitations: Obtain all components of the roof system from a single manufacturer. Secondary products that are required shall be recommended and approved in writing by the roofing system Manufacturer. Upon request of the Architect or Owner, submit Manufacturer's written approval of secondary components in list form, signed by an authorized agent of the Manufacturer.

1.7 PRE-INSTALLATION MEETINGS

- A. Convene minimum two weeks prior to commencing Work of this section.
- B. Review installation procedures and coordination required with related Work.
- C. Inspect and make notes of job conditions prior to installation:
 - 1. Record minutes of the conference and provide copies to all parties present.
 - 2. Identify all outstanding issues in writing designating the responsible party for follow-up action and the timetable for completion.
 - 3. Installation of the roofing system shall not begin until all outstanding issues are resolved to the satisfaction of the Architect.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and store products in manufacturer's unopened packaging with labels intact until ready for installation.
- B. Store all roofing materials in a dry place, on pallets or raised platforms, out of direct exposure to the elements until time of application. Store materials at least 4 inches above ground level and covered with "breathable" tarpaulins.
- C. Stored in accordance with the instructions of the manufacturer prior to their application or installation. Store roll goods on end on a clean flat surface except store KEE-Stone FB 60 rolls flat on a clean flat surface. No wet or damaged materials will be used in the application.
- D. Store at room temperature wherever possible, until immediately prior to installing the roll. During winter, store materials in a heated location with a 50 degree F (10 degree C) minimum temperature, removed only as needed for immediate use. Keep materials away from open flame or welding sparks.
- E. Avoid stockpiling of materials on roofs without first obtaining acceptance from the Architect/Engineer.

- F. Adhesive storage shall be between the range of above 40 degree F (4 degree C) and below 80 degree F (27 degree C). Area of storage shall be constructed for flammable storage.

1.9 COORDINATION

- A. Coordinate Work with installing associated metal flashings as work of this section proceeds.

1.10 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.11 WARRANTY

- A. Upon completion of the work, provide the Manufacturer's written and signed Edge-To-Edge NDL System Warranty, warranting that, if a leak develops in the roof during the term of this warranty, due either to defective material or defective workmanship by the installer, the manufacturer shall provide the Owner, at the Manufacturer's expense, with the labor and material necessary to return the defective area to a watertight condition, including Manufacturer's metal components. There is no additional cost for the warranty.
 - 1. Warranty Period:
 - a. 30 years from the date of acceptance.
- B. Installer is to guarantee all work against defects in materials and workmanship for a period indicated following final acceptance of the Work.
 - 1. Warranty Period:
 - a. 2 years from the date of acceptance.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Basis of Design: The Garland Company, Inc or approved equal.; 3800 E. 91st St.; Cleveland, OH 44105; Phone: 401-500-2901; Email: dwall@garlandind.com; Web: <http://www.garlandco.com>

2.2 COLD APPLIED 2-PLY ROOF SYSTEM - STRESSPLY

- A. Vapor Retarder (Ply) Sheet: One ply bonded to the prepared substrate with Vapor Retarder Adhesive:
 - 1. HPR Tri-Base Premium
- B. Vapor Retarder Adhesive:
 - 1. Millennium Hurricane Force 1-Part Membrane Adhesive
- C. Base (Ply) Sheet: One ply bonded to the prepared substrate with Interply Adhesive:
- D. Modified Cap (Ply) Sheet: One ply bonded to the prepared substrate with Interply Adhesive:
- E. Interply Adhesive: (1 and 2)
- F. Flashing Base Ply: One ply bonded to the prepared substrate with Interply Adhesive:
- G. Flashing Cap (Ply) Sheet: One ply bonded to the prepared substrate with Interply Adhesive:
 - 1. StressPly Plus FR Mineral:
- H. Flashing Ply Adhesive:

1. Weatherking Flashing Adhesive:

2.3 ACCESSORIES:

- A. Roof Insulation: In accordance with Section 07220.

2.4 EDGE TREATMENT AND ROOF PENETRATION FLASHINGS

- A. Pitch pans, Rain Collar 24 gauge stainless or 20 oz. (567gram) copper. All joints should be welded/soldered watertight. See details for design.
- B. Drain Flashings should be 4 lb. (1.8kg) sheet lead, formed and rolled.
- C. Plumbing stacks should be 4 lb. (1.8kg) sheet lead, formed and rolled.
- D. Liquid Flashing - Tuff-Flash: An asphaltic-polyurethane, low odor, liquid flashing material designed for specialized details unable to be waterproofed with typical modified membrane flashings.
 1. Tensile Strength, ASTM D 412: 400 psi
 2. Elongation, ASTM D 412: 300%
 3. Density @77 deg. F 8.5 lb/gal typical
- E. Fabricated Flashings: Fabricated flashings and trim are specified in Section 07620.
 1. Fabricated flashings and trim shall conform to the detail requirements of SMACNA "Architectural Sheet Metal Manual" and/or the CDA Copper Development Association "Copper in Architecture - Handbook" as applicable.
- F. Manufactured Roof Specialties: Manufactured copings, fascia, gravel stops, control joints, expansion joints, joint covers and related flashings and trim are specified in Section 07710.

PART 3 Manufactured roof specialties shall conform to the detail requirements of SMACNA "Architectural Sheet Metal Manual" and/or the NRCA "Roofing and Waterproofing Manual" as applicable.

EXECUTION

3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Inspect and approve the deck condition, slopes and fastener backing if applicable, parapet walls, expansion joints, roof drains, stack vents, vent outlets, nailers, and surfaces and elements.
- C. Verify that work penetrating the roof deck, or which may otherwise affect the roofing, has been properly completed.
- D. If substrate preparation and other conditions are the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

- A. General: Clean surfaces thoroughly prior to installation.
 1. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
 2. Fill substrate surface voids that are greater than 1/4 inch wide with an acceptable fill material.
 3. Roof surface to receive roofing system shall be smooth, clean, free from loose gravel,

- dirt and debris, dry and structurally sound.
4. Wherever necessary, all surfaces to receive roofing materials shall be power broom and vacuumed to remove debris and loose matter prior to starting work.
 5. Do not apply roofing during inclement weather. Do not apply roofing membrane to damp, frozen, dirty, or dusty surfaces.
 6. Fasteners and plates for fastening components mechanically to the substrate shall provide a minimum pull-out capacity of 300 lbs. (136 k) per fastener. Base or ply sheets attached with cap nails require a minimum pullout capacity of 40 lb. per nail.
 7. Prime decks where required, in accordance with requirements and recommendations of the primer and deck manufacturer.

3.3 INSTALLATION - GENERAL

- A. Install modified bitumen membranes and flashings in accordance with manufacturer's instructions and with the recommendations provided by the National Roofing Contractors Association's Roofing & Waterproofing Manual, the Asphalt Roofing Manufacturers Association, and applicable codes.
- B. General: Avoid installation of modified bitumen membranes at temperatures lower than 40-45 degrees F. When work at such temperatures unavoidable use the following precautions:
 1. Take extra care during cold weather installation and when ambient temperatures are affected by wind or humidity, to ensure adequate bonding is achieved between the surfaces to be joined. Use extra care at material seam welds and where adhesion of the applied product to the appropriately prepared substrate as the substrate can be affected by such temperature constraints as well.
 2. Unrolling of cold materials, under low ambient conditions must be avoided to prevent the likelihood of unnecessary stress cracking. Rolls must be at least 40 degrees F at the time of application. If the membrane roll becomes stiff or difficult to install, it must be replaced with roll from a heated storage area.
- C. Commence installation of the roofing system at the lowest point of the roof (or roof area), working up the slope toward the highest point. Lap sheets shingle fashion so as to constantly shed water
- D. All slopes greater than 2:12 require back-nailing to prevent slippage of the ply sheets. Use ring or spiral-shank 1 inch cap nails, or screws and plates at a rate of 1 fastener per ply (including the membrane) at each insulation stop. Place insulation stops at 16 ft o.c. for slopes less than 3:12 and 4 feet o.c. for slopes greater than 3:12. On non-insulated systems, nail each ply directly into the deck at the rate specified above. When slope exceeds 2:12, install all plies parallel to the slope (strapping) to facilitate backnailing. Install 4 additional fasteners at the upper edge of the membrane when strapping the plies.

3.4 INSTALLATION COLD APPLIED ROOF SYSTEM

- A. Vapor Retarder Ply: Install in vapor retarder adhesive applied at the rate required by the manufacturer. Shingle sheets uniformly over the prepared substrate to achieve the number of plies specified. Shingle in proper direction to shed water on each large area of roofing.
 1. Lap ply sheet ends 8 inches. Stagger end laps 12 inches minimum.
 2. Solidly bond to the base layers with specified cold adhesive at the rate of 1.5 to 2 gallons per 100 square feet.
 3. Roll must push a puddle of adhesive in front of it with adhesive slightly visible at all side laps. Care should be taken to eliminate air entrapment under the membrane.
 4. Install subsequent rolls of modified across the roof as above with a minimum of 4 inch side laps and 8 inch staggered end laps. Lay modified membrane in the same direction as the base layers but the laps shall not coincide with the laps of the base layers.
 5. Allow cold adhesive to set for 5 to 10 minutes before installing the top layer of

- modified membrane.
6. Extend membrane 2 inches beyond top edge of all cants in full moppings of the cold adhesive as shown on the Drawings.
- B. Base Ply: Cut base ply sheets into 18 foot lengths and allow plies to relax before installing. Install in interply adhesive applied at the rate required by the manufacturer, shingle sheets uniformly over the prepared substrate to achieve the number of plies specified. Shingle in the proper direction to shed water on each large area of roofing.
1. Lap ply sheet ends 8 inches. Stagger end laps 12 inches minimum.
 2. Solidly bond to the base layers with specified cold adhesive at the rate of 2 to 2-1/2 gallons per 100 square feet.
 3. Roll must push a puddle of adhesive in front of it with adhesive slightly visible at all side laps. Care should be taken to eliminate air entrapment under the membrane.
 4. Install subsequent rolls of modified across the roof as above with a minimum of 4 inch side laps and 8 inch staggered end laps. Lay modified membrane in the same direction as the base layers but the laps shall not coincide with the laps of the base layers.
 5. Allow cold adhesive to set for 5 to 10 minutes before installing the top layer of modified membrane.
 6. Extend membrane 2 inches beyond top edge of all cants in full moppings of the cold adhesive as shown on the Drawings.
- C. Modified Cap Ply(s): Cut cap ply sheets into 18 foot lengths and allow plies to relax before installing. Install in interplay adhesive applied at the rate required by the manufacturer. Shingle sheets uniformly over the prepared substrate to achieve the number of plies specified. Shingle in proper direction to shed water on each large area of roofing.
1. Lap ply sheet ends 8 inches. Stagger end laps 12 inches minimum.
 2. Solidly bond to the base layers with specified cold adhesive at the rate of 2 to 2-1/2 gallons per 100 square feet.
 3. Roll must push a puddle of adhesive in front of it with adhesive slightly visible at all side laps. Care should be taken to eliminate air entrapment under the membrane.
 4. Install subsequent rolls of modified across the roof as above with a minimum of 4 inch side laps and 8 inch staggered end laps. Lay modified membrane in the same direction as the underlayers but the laps shall not coincide with the laps of the base layers.
 5. Allow cold adhesive to set for 5 to 10 minutes before installing the top layer of modified membrane.
 6. Extend membrane 2 inches beyond top edge of all cants in full moppings of the cold adhesive as shown on the Drawings.
- D. Fibrous Cant Strips: Provide non-combustible perlite or glass fiber cant strips at all wall/curb detail treatments where angle changes are greater than 45 degrees. Cant may be set in approved cold adhesives, hot asphalt or mechanically attached with approved plates and fasteners.
- E. Wood Blocking, Nailers and Cant Strips: Provide wood blocking, nailers and cant strips as specified in Section 06114.
1. Provide nailers at all roof perimeters and penetrations for fastening membrane flashings and sheet metal components.
 2. Wood nailers should match the height of any insulation, providing a smooth and even transition between flashing and insulation areas.
 3. Nailer lengths should be spaced with a minimum 1/8 inch gap for expansion and contraction between each length or change of direction.
 4. Nailers and flashings should be fastened in accordance with Factory Mutual "Loss Prevention Data Sheet 1- 49, Perimeter Flashing" and be designed to be capable of resisting a minimum force of 200 lbs/lineal foot in any direction.

- F. Metal Work: Provide metal flashings, counter flashings, parapet coping caps and thru-wall flashings as specified in Section 07620 or Section 07710. Install in accordance with the SMACNA "Architectural Sheet Metal Manual" or the NRCA Roofing Waterproofing manual.
- G. Termination Bar: Provide a metal termination bar or approved top edge securement at the terminus of all flashing sheets at walls and curbs. Fasten the bar a minimum of 8 inches (203 mm) o/c to achieve constant compression. Provide suitable, sealant at the top edge if required.
- H. Flashing Base Ply: Install flashing sheets by the same application method used for the base ply.
 - 1. Seal curb, wall and parapet flashings with an application of mastic and mesh on a daily basis. Do not permit conditions to exist that will allow moisture to enter behind, around or under the roof or flashing membrane.
 - 2. Prepare all walls, penetrations, expansion joints and where shown on the Drawings to be flashed with required primer at the rate of 100 square feet per gallon. Allow primer to dry tack free.
 - 3. Adhere to the underlying base ply with specified flashing ply adhesive unless otherwise specified. Nail off at a minimum of 8 inches (203 mm) o.c. from the finished roof at all vertical surfaces.
 - 4. Solidly adhere the entire flashing ply to the substrate. Secure the tops of all flashings that are not run up and over curb through termination bar fastened at 6 inches (152 mm) O.C. and sealed at top.
 - 5. Seal all vertical laps of flashing ply with a three-course application of trowel-grade mastic and fiberglass mesh.
 - 6. Coordinate counter flashing, cap flashings, expansion joints and similar work with modified bitumen roofing work as specified.
 - 7. Coordinate roof accessories, miscellaneous sheet metal accessory items, including piping vents and other devices with the roofing system work.
 - 8. Secure the top edge of the flashing sheet using a termination bar only when the wall surface above is waterproofed, or nailed 4 inches on center and covered with an acceptable counter flashing.
- I. Flashing Cap Ply: Install flashing cap sheets by the same application method used for the base ply.
 - 1. Seal curb, wall and parapet flashings with an application of mastic and mesh on a daily basis. Do not permit conditions to exist that will allow moisture to enter behind, around or under the roof or flashing membrane.
 - 2. Prepare all walls, penetrations, expansion joints and where shown on the Drawings to be flashed with required primer at the rate of 100 square feet per gallon. Allow primer to dry tack free.
 - 3. Adhere to the underlying base flashing ply with specified flashing ply adhesive unless otherwise specified. Nail off at a minimum of 8 inches (203 mm) o.c. from the finished roof at all vertical surfaces.
 - 4. Coordinate counter flashing, cap flashings, expansion joints and similar work with modified bitumen roofing work as specified.
 - 5. Coordinate roof accessories, miscellaneous sheet metal accessory items with the roofing system work.
 - 6. All stripping shall be installed prior to flashing cap sheet installation.
 - 7. Heat and scrape granules when welding or adhering at cut areas and seams to granular surfaces at all flashings.
 - 8. Secure the top edge of the flashing sheet using a termination bar only when the wall surface above is waterproofed, or nailed 4 inches on center and covered with an acceptable counter flashing.

3.5 INSTALLATION EDGE TREATMENT AND ROOF PENETRATION FLASHING

- A. Pre-Manufactured Metal Edge System:
1. Position base plies of the built-up and/or modified roofing membrane over the roof edge covering nailers completely, fastening 8 inches (203 mm) on center. Install membrane and cap sheet with proper material and procedure according to manufacturer's recommendations.
 2. Cant Dam: Install Cant Dam overlapping Cant a minimum of 1 inch. Fasten Cant Dam through the top of nailer and outside face in accordance with ANSI/SPRI ES-1 test report.
 3. BUR or Modified Flashing: Prime Cant Dam at a rate of 100 square feet per gallon and allow to dry.
 4. Strip in Cant Dam with base flashing membrane extending 6 inches (152 mm) into roof field, followed with a cap sheet extending 9 inches into the roof field. Install membrane and cap sheet with proper material and procedure according to manufacturer's recommendations.
 5. Fascia Cover: Install fascia cover with splice plate under one end by pressing downward firmly until "snap" occurs and cover is engaged along entire length of miter. Field cut where necessary with fine tooth saw.
 6. Sealant is to be placed between splice plates on metal edge pieces.
 7. Install a second ply of modified flashing ply in bitumen over the base flashing ply, 9 inches (228 mm) on to the field of the roof.
- B. Equipment Support:
1. Minimum curb height is 8 inches (203 mm) above finished roof height. Prime vertical at a rate of 100 square feet per gallon and allow to dry.
 2. Set cant in bitumen. Run all field plies over cant a minimum of 2 inches (50 mm).
 3. Install base flashing ply covering curb set in bitumen with 6 inches (152 mm) on to field of the roof.
 4. Install a second ply of modified flashing ply in bitumen over the base flashing ply, 9 inches (228 mm) on to the field of the roof. Attach top of membrane to top of curb and nail at 8 inches (203 mm) o.c. Apply a three-course application of mastic and mesh at all vertical seams and allow to cure and aluminize.
 5. Install pre-manufactured cover. Fasten sides at 24 inches (609 mm) o.c. with fasteners and neoprene washers. Furnish all joint cover laps with butyl tape between metal covers.
 6. Set equipment on neoprene pad and fasten as required by equipment manufacturer.
- C. Curb Detail/Air Handling Station:
1. Minimum curb height is 8 inches (203 mm) above finished roof height. Prime vertical at a rate of 100 square feet per gallon and allow to dry.
 2. Set cant in bitumen. Run all field plies over cant a minimum of 2 inches (50 mm).
 3. Install base flashing ply covering curb set in bitumen with 6 inches (152 mm) on to field of the roof.
 4. Install a second ply of modified flashing ply in bitumen over the base flashing ply, 9 inches (228 mm) on to the field of the roof. Apply a three-course application of mastic and mesh at all vertical seams and allow to cure and aluminize.
 5. Install pre-manufactured counterflashing with fasteners and neoprene washers or per manufacturer's recommendations.
 6. Set equipment on neoprene pad and fasten as required by equipment manufacturer.
- D. Exhaust Fan:
1. Minimum curb height is 8 inches (203 mm) above finished roof height. Prime vertical at a rate of 100 square feet per gallon and allow to dry.
 2. Set cant in bitumen. Run all plies over cant a minimum of 2 inches (50 mm).
 3. Install base flashing ply covering curb with 6 inches (152 mm) on to field of the roof.
 4. Install a second ply of modified flashing ply installed over the base flashing ply, 9 inches (228 mm) on to field of the roof. Attach top of membrane to top of wood curb

and nail at 8 inches (203 mm) o.c. Apply a three-course application of mastic and mesh at all vertical seams and allow to cure and aluminize.

5. Install metal exhaust fan over the wood nailers and flashing to act as counterflashing. Fasten per manufacturer's recommendation.

E. Roof Drain:

1. Plug drain to prevent debris from entering plumbing.
2. Taper insulation to drain minimum of 24 inches (609 mm) from center of drain.
3. Run roof system plies over drain. Cut out plies inside drain bowl.
4. Set lead/copper flashing (30 inch square minimum) in 1/4 inch bed of mastic. Run lead/copper into drain a minimum of 2 inches (50 mm). Prime lead/copper at a rate of 100 square feet per gallon and allow to dry.
5. Install base flashing ply (40 inch square minimum) in bitumen.
6. Install modified membrane (48 inch square minimum) in bitumen.
7. Install clamping ring and assure that all plies are under the clamping ring.
8. Remove drain plug and install strainer.

F. Plumbing Stack:

1. Minimum stack height is 12 inches (609 mm).
2. Run roof system over the entire surface of the roof. Seal the base of the stack with elastomeric sealant.
3. Prime flange of new sleeve. Install properly sized sleeves set in 1/4 inch (6 mm) bed of roof cement.
4. Install base flashing ply in bitumen.
5. Install membrane in bitumen.
6. Caulk the intersection of the membrane with elastomeric sealant.
7. Turn sleeve a minimum of 1 inch (25 mm) down inside of stack.

G. Heat Stack:

1. Minimum stack height is 12 inches (609 mm).
2. Run roof system over the entire surface of the roof. Seal the base of the stack with elastomeric sealant.
3. Prime flange of new sleeve. Install properly sized sleeves set in 1/4 inch (6 mm) bed of roof cement.
4. Install base flashing ply in bitumen.
5. Install modified membrane in bitumen.
6. Caulk the intersection of the membrane with elastomeric sealant.
7. Install new collar over cape. Weld collar or install stainless steel draw band.

H. Pitch Pocket:

1. Run all plies up to the penetration.
2. Place the pitch pocket over the penetration and prime all flanges.
3. Strip in flange of pitch pocket with one ply of base flashing ply. Extend 6 inches (152 mm) onto field of roof.
4. Install second layer of modified membrane extending 9 inches (228 mm) onto field of the roof.
5. Fill pitch pocket half full with non-shrink grout. Let this cure and top off with pourable sealant.
6. Caulk joint between roof system and pitch pocket with roof cement.

3.6 PROTECTION

- A. Provide traffic ways, erect barriers, fences, guards, rails, enclosures, chutes and the like to protect personnel, roofs and structures, vehicles and utilities.
- B. Protect exposed surfaces of finished walls with tarps to prevent damage.

- C. Plywood for traffic ways required for material movement over existing roofs shall be not less than 5/8 inch (16 mm) thick.
- D. In addition to the plywood listed above, an underlayment of minimum 1/2 inch (13 mm) recover board is required on new roofing.
- E. Special permission shall be obtained from the Manufacturer before any traffic shall be permitted over new roofing.

3.7 FIELD QUALITY CONTROL

- A. Inspection: Provide manufacturer's daily field observations and a final inspection upon completion of the Work.
 - 1. Warranty shall be issued upon manufacturer's acceptance of the installation.
 - 2. Daily field observations shall be performed by a Technical Representative employed full-time by the manufacturer and whose primary job description is to assist, inspect and approve roofing installations for the manufacturer.
 - 3. Daily roofing progress reports must include; photographic documentation of work in-progress and written statements of compliance with details/shop drawings, weather conditions, and any discrepancies found during inspection.
 - 4. Progress reports must be published to an online database accessible to the Owner/Architect.
 - 5. Provide a final report from the Technical Representative, certifying that the roofing system has been satisfactorily installed according to the project specifications, approved details and good general roofing practice.

3.8 SCHEDULES

- A. Base (Ply) Sheet:
 - 1. 80 mil SBS (Styrene-Butadiene-Styrene) rubber modified roofing base sheet reinforced with a fiberglass scrim, performance requirements according to ASTM D 5147.
 - a. Tensile Strength, ASTM D 5147
 - 1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 100 lbf/in XD 100 lbf/in
 - 2) 50mm/min. @ 23 +/- 2 deg. C MD 17.5 kN/m XD 17.5 kN/m
 - b. Tear Strength, ASTM D 5147
 - 1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 110 lbf XD 110 lbf
 - 2) 50mm/min. @ 23 +/- 2 deg. C MD 489 N XD 489 N
 - c. Elongation at Maximum Tensile, ASTM D 5147
 - 1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 4 % XD 4 %
 - 2) 50mm/min @ 23 +/- 2 deg. C MD 4 % XD 4 %
 - d. Low Temperature Flexibility, ASTM D 5147, Passes -20 deg. F (-28.8 deg. C)
- B. Modified Cap (Ply) Sheet:
 - 1. 155 mil SBS (Styrene-Butadiene-Styrene) mineral surfaced, rubber modified roofing membrane reinforced with a fiberglass and polyester composite scrim. ASTM D 6162, Type III Grade G
 - a. Tensile Strength, ASTM D 5147
 - 1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 310 lbf/in XD 310 lbf/in
 - 2) 50 mm/min. @ 23 +/- 2 deg. C MD 54.25 kN/m XD 54.25 kN/m
 - b. Tear Strength, ASTM D 5147
 - 1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 500 lbf XD 500 lbf
 - 2) 50 mm/min. @ 23 +/- 2 deg. C MD 2224 N XD 2224 N
 - c. Elongation at Maximum Tensile, ASTM D 5147
 - 1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 3.5% XD 3.5%
 - 2) 50 mm/min. @ 23 +/- 2 deg. C MD 3.5% XD 3.5%
 - d. . C)

- C. Interply Adhesive:
1. Rubberized, polymer modified cold process asphalt roofing bitumen V.O.C. compliant ASTM D 3019. Performance Requirements:
 - a. Non-Volatile Content ASTM D 4479 70%
 - b. Density ASTM D1475 8.9 lbs./gal.
 - c. Viscosity Stormer ASTM D562 400-500 grams
 - d. Flash Point ASTM D 93 100 deg. F min. (37 deg. C)
 - e. Slope: up to 3:12
- D. Flashing Base Ply:
1. 80 mil SBS (Styrene-Butadiene-Styrene) rubber modified roofing base sheet reinforced with a fiberglass scrim, performance requirements according to ASTM D 5147.
 - a. Tensile Strength, ASTM D 5147
 - 1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 100 lbf/in XD 100 lbf/in
 - 2) 50mm/min. @ 23 +/- 2 deg. C MD 17.5 kN/m XD 17.5 kN/m
 - b. Tear Strength, ASTM D 5147
 - 1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 110 lbf XD 110 lbf
 - 2) 50mm/min. @ 23 +/- 2 deg. C MD 489 N XD 489 N
 - c. Elongation at Maximum Tensile, ASTM D 5147
 - 1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 2.5 % XD 2.5 %
 - 2) 50mm/min @ 23 +/- 2 deg. C MD 2.5 % XD 2.5 %
 - d. Low Temperature Flexibility, ASTM D 5147
 - 1) Passes -20 deg. F (-28.8 deg. C)
- E. Flashing Ply Adhesive:
1. Brush grade flashing adhesive.
 - a. Non-Volatile Content ASTM D 4479 70 min.
 - b. Density ASTM D 1475 8.6 lbs./gal. (1kg/l)
 - c. Flash Point ASTM D 93 100 deg. F (37 deg. C)
- F. Surfacing:
1. Flashing Cap Ply::155 mil SBS (Styrene-Butadiene-Styrene) mineral surfaced, rubber modified roofing membrane reinforced with a fiberglass and polyester composite scrim. ASTM D 6162, Type III Grade G
 - a. Tensile Strength, ASTM D 5147
 - 1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 310 lbf/in XD 310 lbf/in
 - 2) 50 mm/min. @ 23 +/- 2 deg. C MD 54.25 kN/m XD 54.25 kN/m
 - b. Tear Strength, ASTM D 5147
 - 1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 500 lbf XD 500 lbf
 - 2) 50 mm/min. @ 23 +/- 2 deg. C MD 2224 N XD 2224 N
 - c. Elongation at Maximum Tensile, ASTM D 5147
 - 1) 2 in/min. @ 73.4 +/- 3.6 deg. F MD 3.5% XD 3.5%
 - 2) 50 mm/min. @ 23 +/- 2 deg. C MD 3.5% XD 3.5%
 - d. Low Temperature Flexibility, ASTM D 5147, Passes -30 deg. F (-34 deg. C)
 2. 50 mm/min. @ 23 +/- 2 deg. C MD 4.7% XD 5.0%
 - 1) Low Temperature Flexibility, ASTM D 5147, Passes -15 deg. F (-26 deg. C)

END OF SECTION

SECTION 07600

SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED SECTIONS

- A. Division 6 Section "Rough Carpentry" for wood nailers, cants, curbs, and blocking and for wood-based, structural-use roof deck panels.
- B. Division 7 Section "Roof Insulation"
- C. Division 7 Section "Modified Bituminous Membrane Roofing"

1.2 REFERENCES

- A. American Society for Testing and Materials (ASTM)
 - 1. ASTM A653 Standard Specification for Steel Sheet, Zinc-Coated (galvanized) or Zinc-Iron Alloy-Coated (galvannealed) by the Hot-Dip Process.
 - 2. ASTM A792 Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy Coated by the Hot-Dip Process.
 - 3. ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - 4. ASTM B221 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - 5. ASTM D692 Standard Specification for Coarse Aggregate for Bituminous Paving Mixtures.
 - 6. ASTM B32 Solder Metal
 - 7. ASTM B486 Paste Solder
 - 8. ASTM D226 Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing
 - 9. ASTM D486 Asphalt Roof Cement, Asbestos-free
- B. American National Standards Institute and Single Ply Roofing Institute (ANSI/SPRI)
 - 1. ANSI/SPRI ES-1 Testing and Certification Listing of Pre-Manufactured Fabricated Edge Metal and Pre-Manufactured Metal Coping Cap.
- C. Warnock Hersey International, Inc., Middleton, WI (WH)
- D. Factory Mutual Research Corporation (FMRC)
- E. Underwriters Laboratories (UL)
- F. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
 - 1. 1993 Edition Architectural Sheet Metal Manual
- G. National Roofing Contractors Association (NRCA)

1. Roofing and Waterproofing Manual
- H. American Society of Civil Engineers (ASCE)
 1. ASCE 7-05 Minimum Design Loads for Buildings and Other Structures.
- I. FS QQ-L-201 - Specification for Lead Sheet
- J. FS O-F-506 - Flux, Soldering, Paste and Liquid

1.4 SUBMITTALS

- A. Submit under provisions of this specification.
- B. Product Data: Provide manufacturer's specification data sheets for each product.
- C. Submit two samples, 12 x 12 inch in size illustrating typical external corner, internal corner, valley, junction to vertical dissimilar surface, material and finish.
- D. Shop Drawings
 1. For manufactured and ANSI/SPRI approved pre-manufactured metal edge fascia and pre-manufactured metal coping cap system, and all other sheet metal fabrications.
 2. Shop drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashing, termination's, and installation details.
 3. Indicate type, gauge and finish of metal.
- E. Sample Warranty
 1. Provide an unexecuted copy of the warranty specified for this Project, identifying the terms and conditions required of the Manufacturer and the Owner. Warranty shall be provided from one manufacturer and part of a total Edge-to-Edge roof warranty that includes the polyurethane modified membrane roof system and pre-fabricated metal edge system.
- F. Certification
 1. Submit roof manufacturer's certification that metal fasteners furnished are acceptable to roof manufacturer.
- G. Manufacturer's Product Data
 1. Metal material characteristics and installation recommendations.
 2. Submit color chart prior to material ordering and/or fabrication so that equivalent colors to those specified can be approved.

1.5 QUALITY ASSURANCE

- A. Reference Standards

1. Comply with details and recommendations of SMACNA Manual for workmanship, methods of joining, anchorage, provisions for expansion, etc.
- B. If required, fabricator/installer shall submit work experience and evidence of adequate financial Responsibility. The owner's representative reserves the right to inspect fabrication facilities in determining qualifications.
- C. Successful contractor must obtain all components of roof system from a single manufacturer including any roll good materials if required. Any secondary products that are required, which cannot be supplied by the specified manufacturer, must be recommended and approved in writing by primary manufacturer prior to bid submittal.
- D. Manufacturer shall have in place a documented, standardized method for maintaining quality control such as ISO-9001 approval.
- E. The roof material manufacturer shall conduct all required daily inspections of work in progress as described herein and shall furnish written documentation of all such inspections.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in manufacturer's original, unopened containers or packages with labels intact and legible.
- B. Stack pre-formed and pre-finished material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
- C. Prevent contact with materials which may cause discoloration or staining.

1.7 JOB CONDITIONS

- A. Determine that work of other trades will not hamper or conflict with necessary fabrication and storage requirements for pre-formed metal roofing system.
- B. Protection:
 1. Provide protection or avoid traffic on completed roof surfaces.
 2. Do not overload roof with stored materials.
 3. Support no roof-mounted equipment directly on the roofing system.
- C. Ascertain that work of other trades which penetrates the roof or is to be made watertight by the roof, is in place and approved prior to installation of roofing.

1.8 DESIGN AND PERFORMANCE CRITERIA

- A. ANSI/SPRI ES-1 (Pre-manufactured Metal Edge Fascia System)
 1. ANSI/SPRI ES-1 test reports must be submitted for specific project wind uplift requirements per Section 1.16 Design and Performance Criteria within Modified Bituminous Membrane Roofing specification.
- B. Thermal expansion and contraction:

1. Completed metal edge fascia and cant dam system shall be capable of withstanding unlimited thermal expansion and contraction of components caused by changes in temperature without buckling, producing excess stress on structure, anchors or fasteners, or reducing performance ability.

1.9 WARRANTIES

A. Material Manufacturer's Warranty

1. Pre-finished metal material shall require a written 20-year non-prorated warranty covering fade, chalking and film integrity. The material shall not show a color change greater than 5 NBS color units per ASTM D-2244 or chalking excess of 8 units per ASTM D-659. If either occurs material shall be replaced per warranty, at no cost to the Owner.
2. Warranty shall include the modified roof system, pre-manufactured metal edge fascia system, flashings and the transition between all systems, and shall be an Edge-to-Edge roof warranty; provided by ONE manufacturer.

B. Contractor's Warranty

1. The Contractor shall provide the Owner with a notarized written warranty assuring that all sheet metal work including caulking and fasteners to be watertight and secure for a period of two (2) years from the date of final acceptance of the building. Warranty shall include all materials and workmanship required to repair any leaks that develop.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Pre-Manufactured Metal Edge System: R-Mer Edge Snap-On Fascia; The Garland Co., Cleveland, OH.

1. Fascia shall be .040" Kynar coated aluminum. Cant Dam shall be 22 ga. galvanized and continuous for the entire roof edge.
2. All submittals for approved equals shall conform to Sections 1.5 Quality Assurance and 1.8 Design & Performance Criteria.
3. Provide a manufacturer's Edge-to-Edge roof warranty. Warranted materials shall be free of defects in material and workmanship for five years after shipment. The manufacturer will also furnish their standard decorative finish warranty.
4. Fascia extenders, expansion joints, drip edge, gutters, downspouts, scuppers, brackets and any other accessories shall be fabricated from 0.040" aluminum with Kynar finish or approved equal.
5. Color to be selected by Architect from manufacturer's standard color range.

B. Pitch pockets and soil stack sleeves shall be 20 oz. copper, and have all corners soldered, and a continuous 4" wide minimum deck flange at corners.

C. Miscellaneous Metals and Flashings:

1. Surface Mounted Counterflashings: Kynar finished Aluminum, 0.040 inch thick.
2. Equipment Slip Flashing: Mill finished Aluminum, 0.040 inch thick.

3. Flat Stock - Custom Fabricated Trim: Kynar finished Aluminum, 0.040 inch thick.
4. Solder for Stainless Steel: ASTM B 32, Grade Sn60, used with an acid flux of type recommended by stainless-steel sheet manufacturer; use a noncorrosive rosin flux over tinned surfaces.
5. Solder for Copper: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead.
6. Fasteners: Same metal as sheet metal flashing or other noncorrosive metal as recommended by sheet metal manufacturer. Match finish of exposed heads with material being fastened. Exposed fasteners shall have a neoprene or other suitable weatherproofing washer.
7. Asphalt Mastic: SSPC-Paint 12, solvent-type asphalt mastic, nominally free of sulfur and containing no asbestos fibers, compounded for 15-mil dry film thickness per coat.
8. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.
9. Sealing Tape: Pressure sensitive, 100 percent solids, polyisobutylene compound sealing tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape.
10. Adhesives: Type recommended by flashing sheet metal manufacturer for waterproof and weather-resistant seaming and adhesive application of flashing sheet metal.
11. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of Work, matching or compatible with material being installed; noncorrosive; size and thickness required for performance.
12. Roofing Cement: ASTM D 4586, Type I, asbestos free, asphalt based.
13. Zinc-Coated Steel Sheet: ASTM A526, 0.20% copper, 26 gage (0.0179"); designation G90 hot-dip galvanized, mill phosphatized.
14. Stainless Steel Sheet: Type 302/304, ASTM A167, 26 gage, (0.0217"), annealed except dead soft where fully concealed by other work, 2D (dull) finish.
15. Copper Sheet: ASTM B370, 20 oz., temper H00 (cold-rolled).
16. Lead-Coated Copper Sheet: ASTM B101. Type I, Class A (12-15 1 lb. of lead coating per 100 sq. ft.), 17.1 oz. (0.022").
17. Zinc Alloy Sheet: Zinc with 0.6% copper and 0.14% titanium; 0.27" thick (21 gauge); standard (soft) temper, mill finish.

2.2 RELATED MATERIALS

- A. Metal Primer: Zinc chromate type.
- B. Plastic Cement: ASTM D 4586
- C. Sealant: As required by material manufacturer.

- D. Lead: Federal Specification QQ-L-201, Grade B, four (4) lbs/sq. ft. - 30" x 30" minimum.
- E. Solder: ANSI/ASTM B32; 95/05 type.
- F. Flux: FS O-F-506.
- G. Underlayment: Ply of specified base flashing modified membrane or approved equal.
- H. Fasteners:
 - 1. Nails and Fasteners: Non-ferrous metal or hot dipped galvanized fasteners complying with ASTM A153 and connectors complying with ASTM A653, Class G185; Type 304 or Type 316 stainless steel fasteners and connectors shall be used with new generation of pressure-treated wood; except that hard copper nails shall be used with copper; aluminum or stainless steel nails shall be used with aluminum; and stainless steel nails shall be used with stainless steel. Fasteners shall be self-clinching type of penetrating type as recommended by the manufacturer of the wood blocking/nailer material. Nails and fasteners shall be flush-driven through flat metal discs of not less than one (1) inch diameter. Omit metal discs when one-piece composite nails or fasteners with heads not less than one (1) inch diameter are used.
 - 2. Fastening shall conform to ANSI/SPRI ES-1 and/or Factory Mutual 1-90 requirements or as stated on section details, whichever is more stringent and per the manufacturer's requirements.
- I. Metal Termination Bars:
 - 1. Shall be heavy flat bar aluminum unless otherwise recommended by membrane manufacturers.
 - 2. Material shall be .125" x 1" (minimum) aluminum conforming to ASTM B-221, mill finish. Bars shall have holes for fasteners at 6" o.c. maximum.

PART 3 - EXECUTION

3.1 PROTECTION

- A. Isolate contact areas of dissimilar metals with heavy asphalt or other approved coating, specifically made to stop electrolytic action.

3.2 GENERAL

- A. Install work watertight, without waves, warps, buckles, fastening stress, or distortion, allowing for expansion and contraction.
- B. Fastening of metal to walls and wood blocking shall comply with ANSI-SPRI ES-1, SMACNA Architectural Sheet Metal Manual, Factory Mutual 1-90 wind uplift specifications and/or manufacturer's recommendations whichever is of the highest standard.
- C. All accessories or other items essential to the completeness of sheet metal installation, whether specifically indicated or not, shall be provided and of the same material as item to which applied.

- D. Pre-manufactured metal edge fascia system's continuous cant dam shall be secured to the top and side of the wood blocking or wall.
- E. Metal fascia extenders shall be secured to wall or wood blocking at the bottom edge with a continuous cleat. Cleats shall be at least one gauge heavier than the metal it secures. Both pieces shall be secured at 6" on center.

3.3 INSPECTION

- A. Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, cant strips and reglets are in place, and nailing strips located.
- B. Verify membrane termination and base flashings are in place, sealed, and secure.
- C. Beginning of installation means acceptance of existing conditions.
- D. Field measure site conditions prior to fabricating work.

3.4 SHOP FABRICATED SHEET METAL

- A. Installing Contractor shall be responsible for determining if the sheet metal systems are in general conformance with roof manufacturer's recommendations.
- B. Metal work shall be shop fabricated to configurations and forms in accordance with recognized sheet metal practices.
- C. Hem exposed edges.
- D. Angle bottom edges of exposed vertical surfaces to form drip.
- E. All corners for sheet metal shall be lapped with adjoining pieces fastened and set in sealant.
- F. Joints for pre-manufactured metal edge fascia system, and metal edge fascia extenders shall be formed with a 3/8" opening between sections. The joints of the metal edge fascia system and the metal edge fascia extenders shall be offset a minimum of twelve (12) inches. The joint openings shall be backed by an internal drainage plate formed to the profile of fascia piece. The pre-manufactured metal edge fascia system and metal fascia extenders shall be embedded in two rows of butyl sealant over the internal drainage plate. The internal drainage plate shall be embedded in two rows of butyl sealant over the continuous cant dam and fastened through the opening between the sections and loose locked to the drip edges.
- G. Joints for counterflashings shall be overlapped a minimum of 3", and counterflashings shall extend 4" below the roof flashing termination bar.
- H. Install sheet metal to comply with ANSI/SPRI, SMACNA and NRCA standards, and per the manufacturer's instructions.

END OF SECTION 07600