



Milwaukee
Water Works

Safe, Abundant Drinking Water.

City of Milwaukee
Department of Public Works
Milwaukee Water Works

Specifications for

Official Notice No. 95-1-2015

Linnwood Treatment Plant

WP-321: LINNWOOD ROOF REPLACEMENTS



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GENERAL REQUIREMENTS

- PART 1 DEPARTMENT OF PUBLIC WORKS – GENERAL SPECIFICATIONS
 (NOTE: The Department of Public Works General Specifications applies to all contracts. These specifications are in a separate booklet but are part of these contract documents.)
- PART 2 SPECIFIC OFFICIAL NOTICE AND GENERAL OFFICIAL NOTICE
 The Specific Official Notice as it appears in The Daily Reporter and the General Official Notice are part of these contract documents.
- PART 3 SPECIFICATIONS
 WP-321: LINNWOOD ROOF REPLACEMENTS

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JOB REQUIREMENTS

WP-321: LINNWOOD ROOF REPLACEMENTS

JR-1 **FORM OF BID**

Contractor shall submit a lump sum bid for furnishing the complete job in accordance with plans and specifications.

JR-2 **JOB LOCATION**

The Linnwood Treatment Plant is located at 3000 North Lincoln Memorial Drive, Milwaukee, WI 53211.

JR-3 **GENERAL DESCRIPTION OF WORK**

The work to be performed under the provisions of this contract and as set forth in these documents consists of the supply and installation of all materials, labor, supervision, inspection, and rentals for all work involved and described below:

Chemical Building Roof Replacements

The project consists of the complete removal and disposal of the existing built-up roofing system for the Linnwood Water Treatment Plant Chemical Building, which consists of seven roofs (Roofs “H”, “J1”, “J2”, “P”, “S”, “T” and “V”), and the furnishing and installation of a new hot asphalt applied built-up roofing system.

Service Building Roof Replacement

The project consists of the complete removal and disposal of the existing built-up roofing system for the Linnwood Water Treatment Plant Service Building, which consists of one roof (Roof “U”), and the furnishing and installation of a new inverted, EPDM built-up roofing system.

JR-4 **CONTRACT DRAWINGS**

The contract drawings upon which the proposal is to be based are listed hereunder:

WP-321-01	Linnwood Roof Replacements Location Map & Drawing Index
WP-321-02	Linnwood Roof Replacements Roof Plan and Details – Chemical Building
WP-321-03	Linnwood Roof Replacements Roof Plan and Details – Service Building
WP-321-04	Linnwood Roof Replacements Roof Details

The above drawings are general in nature and are intended to indicate the relative locations of the equipment specified in the space provided. It shall be the responsibility of the successful bidder to verify all dimensions and ascertain the suitability of the specific equipment to be furnished in regards to the space allotted.

JR-5 REFERENCE DRAWINGS

The following reference drawings include original construction drawings. These are included here for general information only. The drawings are assumed to be accurate; however, the contractor is responsible for field verification of any dimensions essential to the work.

<u>Reference Drawing No.</u>	<u>Title</u>
WP-23-4	Water Purification Plant Chemical Building Superstructure Floor Plan at Elev. 31'-0"
WP-23-5	Water Purification Plant Chemical Building Superstructure Plan at Elev. 43'-6"
WP-23-5A	Water Purification Plant Chemical Building Superstructure Plan at Elev. 43'-6" (Revised)
WP-23-6	Water Purification Plant Chemical Building Superstructure Plans at Elev. 54'-6", 65'-0", 76'-0" & Tower Roof
WP-23-6A	Water Purification Plant Chemical Building Superstructure Plans at Elev. 54'-6", 65'-0", 76'-0" & Tower Roof (Revised)
WP-23-8	Water Purification Plant Chemical Building Superstructure Connecting Bldg. Plan at Elev's. 23'-6", 31'-0" & 32'-0"
WP-23-9	Water Purification Plant Chemical Building Superstructure Connecting Bldg. Basement & Roof Plan
WP-23-9B	Water Purification Plant Chemical Building Superstructure Connecting Bldg. Basement & Roof Plan (Revised)
WP-23-21	Water Purification Plant Chemical Building Superstructure Main Aisle Sections & Elev. in Connecting Bldg.
WP-23-29	Water Purification Plant Chem. and Bldg. Superstructures General Concrete Plans - Roof Elevations and Drainage
WP-23-32	Water Purification Plant Chemical Bldg. Superstructure Concrete Floor Plan - Elevation 23'-6", E. Portion

WP-23-33	Water Purification Plant Chemical Building Superstructure Concrete Floor Plan – Elevation 31’-0” W. Portion
WP-23-34	Water Purification Plant Chemical Bldg. Superstructure Concrete Floor Plans - Elevations 23’-0”, 36’-0” & 42’-6”
WP-23-36	Water Purification Plant Chemical Bldg. Superstructure Concrete Floor Plans – Elevations 65’-0” & 76’-0”
WP-23-43	Water Purification Plant Chemical Building Superstructure Concrete Roof Details – Rotunda and Adjacent Slabs
WP-24-2	Water Purification Plant Service Building Superstructure Roof Plan & North Elevation
WP-24-2A	Water Purification Plant Service Building Superstructure Roof Plan & North Elevation (Revised)
WP-24-3	Water Purification Plant Service Building Superstructure Exterior Scale Details
WP-56-1	Water Purification Plant Chemical & Service Bldg. Plumbing Service Building – Floor Plans & Roof Plan
WP-56-2	Water Purification Plant Chemical & Service Bldg. Plumbing Chemical Building – Roof Drainage
WP-116-1	Linnwood Purification Plant Roof Flashing Details Chemical – Service & Adjoining Bldg’s.
WP-179-1	Linnwood Purification Plant Buildings Roof Plan
WP-179-2	Linnwood Purification Plant Existing Roof Flashing Details – Filter Building
WP-179-3	Linnwood Purification Plant Roof Flashing Details Chemical – Service & Adjoining Bldg’s.
A-3 (WP-211)	Break Room Level Plan
A-4 (WP-211)	Elevator Section
S-1 (WP-211)	Foundation, Basement, First & Second Floor, Roof Framing Plan & Section Thru. Elevator Shaft

JR-6 PRE-BID MEETING

A **MANDATORY** Pre-Bid Meeting is scheduled for **Thursday, June 25, 2015 at 10:00 a.m.** in the Linnwood Water Treatment Plant Conference Room; 3000 North Lincoln Memorial Drive, Milwaukee, WI 53211. The City of Milwaukee (City) will **ONLY** receive bids from prospective bidders who are in attendance at the **MANDATORY** Pre-Bid Meeting. The official envelope for submitting a bid will be available at the **MANDATORY** Pre-Bid Meeting. **All attendees are required to e-mail anthony.fahres@milwaukee.gov and philip.greuel@milwaukee.gov at least 24 hours in advance of the Pre-Bid Meeting to be placed on the visitor list for access to the Linnwood Water Treatment Plant.**

Site Visit: A site visit will take place at the conclusion of the **MANDATORY** Pre-Bid Meeting.

JR-7 PRE CONSTRUCTION MEETING

Within ten (10) business days after Notice to Proceed is issued, a pre-construction (pre-submittal) meeting will be held at the job site. The meeting will include discussion of design and equipment function and system operation details of the project.

JR-8 PRE-INSTALLATION MEETING

No less than ten (10) business days prior to the start of construction, a meeting will be held at the job site to discuss security requirements, scheduling of work, equipment delivery and storage, and other construction details of the project.

JR-9 JOB SCHEDULE

Within ten (10) business days after Notice to Proceed is issued, the contractor shall submit a construction/submittal schedule for approval. The schedule shall be made in sufficient detail to indicate dates of each significant operation. The schedule shall be such that the entire job will be completed within the specified completion time. **Contractor shall submit the schedule in hard copy and electronic format using Microsoft Project 2010. However, if an electronic copy cannot be provided in this format, a copy shall be transmitted electronically in a pdf format and a hard copy of any updated schedules must be provided at all progress meetings.**

The contractor shall place all orders for materials promptly after award of the contract. With submittal of the construction schedule, contractor shall include a schedule of delivery of all major materials and equipment required for the job.

The contractor shall immediately notify the City, in writing, of any problems with meeting this schedule. If the construction schedule cannot be met because of materials or equipment deliveries, the contractor shall be required to submit purchase orders and confirmations of delivery, showing the date the order was placed and the promised date of delivery.

JR-10 COMPLETION DATE

All work on this project shall be completed according to the following schedule:

No Construction Work Before:	“Notice to Proceed”
Substantial Completion:	October 30, 2015
Final Completion:	November 30, 2015

JR-11 CHARGE FOR INSPECTION

The contractor will be charged \$350.00 per day, per inspector, for each and every day inspection is required on this contract after the date allowed for completion or after such extension of time as may have been granted. This charge is further defined in Section 2.5.11 of the Department of Public Works (DPW) General Specifications.

JR-12 PROGRESS PAYMENTS

Within ten (10) business days after the Notice to Proceed is issued, the contractor shall submit to the City for approval a schedule showing the breakdown of the contract with quantities and prices as a basis for checking and computing progress estimates. The values shown in the approved breakdown shall be used for pay purposes only and shall not be used as a basis for additions to or deductions from contract work.

The contractor shall take note of the two (2) wage scales included with this bid - the Prevailing Wage Rate issued by the State of Wisconsin, and the Davis-Bacon Wage documents as issued by the U.S. Department of Labor Wage and Hour Division. The contractor is required to pay the **HIGHER** of the two (2) wage scales.

When the contractor proceeds properly and with diligence to perform and complete the work on this contract, the Commissioner of Public Works (Commissioner) may, from time to time as the work progresses, grant to the contractor an estimate of the amount already earned. In making such progress estimates, there shall be retained 5% of each progress estimate until final completion and acceptance of the work; except that after 50% of the work has been completed and the Commissioner finds that satisfactory progress is being made and all conditions complied with, the Commissioner may authorize any of the remaining progress payments to be paid in full to the contractor with no amount retained. Payment requests should be sent by U.S. mail to Carrie Lewis, Superintendent, Milwaukee Water Works, Room 409, Frank P. Zeidler Municipal Building, 841 North Broadway, Milwaukee, WI 53202.

In accordance with Charter Ordinance 7.26 as amended 6-1-72, payment for materials delivered to the work or storage site may be authorized by the Commissioner providing the following terms and conditions are met:

- A. The work is progressing properly and such materials as specified are properly stored and suitable for permanent incorporation in the work.
- B. Materials designated for pay in the next progress estimate after delivery shall be limited to fabricated or manufactured components which are assembled in final form ready for placement in the work.

- C. The following forms shall be submitted with requests for payment:
 - 1. Progress Estimate and Request for Payment for Fabricated Materials or Components Properly Stored (Field Engineer shall verify that material is as specified and properly stored).
 - 2. Certification of the contractor or his duly authorized representative.
- D. The contractor shall be responsible for the safeguarding of any such materials against loss or damage whatsoever, and in the case of any loss or damage, the contractor shall replace such lost or damaged materials at no cost to the City. The Commissioner shall reserve the right to deduct from ensuing progress estimates the value of any lost or damaged materials until the contractor restores such loss or damage.
- E. The Commissioner may limit processing progress estimates to those cases where the amount earned in any pay period for work and materials is \$5,000 or more.
- F. Any materials for which payment has been made shall not be removed from the work or storage site without the specific written approval of the Commissioner.

JR-13 AMERICAN IRON AND STEEL REQUIREMENT

All iron and steel products provided by the contractor shall be produced in the United States and shall comply with the American Iron and Steel Requirement (AIS). Contractor to provide AIS certification for all iron and steel products supplied for this contract.

JR-14 FORMAL CORRESPONDENCE

Formal correspondence shall be addressed to: Carrie M. Lewis, Superintendent, Milwaukee Water Works, 841 North Broadway, Room 409, Zeidler Municipal Building, Milwaukee, WI 53202. Formal correspondence includes:

- 1. Progress Payments
- 2. Request for Change Order
- 3. Request for extension of Completion Date
- 4. Disputes concerning Payment or Field Issues
- 5. Submittals

END OF SECTION

SECTION 01010**SUMMARY OF WORK****PART 1 SCOPE OF THE CONTRACT****1.01 WORK COVERED IN THE CONTRACT DOCUMENTS****Chemical Building Roof Replacements**

- A. This contract includes the furnishing of all equipment, labor, supervision, inspection, materials, and appurtenances for and in connection with the installation of a complete hot-applied asphalt, built-up roofing system for various roofs (Roofs "H", "J1", "J2", "P", "S", "T" and "V") of the Linnwood Water Treatment Plant Chemical Building as shown on the contract drawings and further specified herein.
- B. The work to be performed, which is detailed in the contract specifications, shall include but not be limited to the following:
1. Completely tear off the existing roofing system, including: EPDM ballasted roofing membrane, insulation, cant strips, flashing, and underlying BUR (Built-up Roof) roofing system down to the existing vapor barrier. Inspect the existing vapor barrier, fully cutting out and removing any failed or delaminated areas. Leave vapor barrier in place in areas where it is still firmly bonded to the roof deck.
 2. Remove and properly dispose of the existing wooden walkways on Roofs "P" and "S".
 3. Evaluate the condition of the concrete roof deck, and inform the City of Milwaukee (City) of all findings prior to placing the order for materials. The contractor shall notify the City in the unforeseen event that the slope of the deck is below the minimum required for proper drainage.
 4. Repair cracks: Cracks and spalling concrete larger than 1/4" must be filled. Pre-cast slab joints are to be sealed with strips of fiberglass base sheet. Also, repair any sawcuts, holes or cracking evident after removal of existing termination bar along wall perimeter.
 5. Furnish and install a complete, hot-applied asphalt BUR system, but not limited to:
 - a) Single-ply vapor barrier set in Type III asphalt.
 - b) Four-inch polyisocyanurate insulation set in Type III asphalt.

- c) Tapered insulation crickets set in Type III asphalt to ensure drainage.
 - d) One-half inch drainage board set in Type III asphalt over the bottom layers of insulation.
 - e) Six-inch fiber cant per details.
 - f) Three plies Type IV roofing felts set in Type III asphalt.
 - g) Modified bitumen cap sheet set in Type III asphalt.
 - h) Base flashing ply onto field 6-inch and wrap existing coping per detail.
 - i) Flood coat and gravel cover.
6. Furnish and install fibered aluminum coating to all remaining exposed bituminous membrane.
 7. Furnish and install counter-flashing, as detailed in the contract drawings.
 8. Furnish and install sheet metal flashing and trim, curbs, pitch pockets, and collars, where necessary.
 9. Furnish and install a non-penetrating fall protection cage for skylight on Roof "T".
 10. Furnish and install a non-penetrating safety railing system where indicated on Contract Drawing WP-321-02.
 11. Install an anchor point for tethering purposes at the northwest corner of Roof "P" and the southwest corner of Roof "S".
 12. Furnish and install connector ladders for access between Roofs "T" and "U" and between Roofs "M" and "N" (Pump building south parapet wall).
 13. Furnish and install fall protection devices on east parapet wall of Roof "K" as shown on Contract Drawing WP-321-02. This would include the furnishing and installation of a swing gate and parapet mounted safety railings.
 14. Repair and/or replace roof drains parts, as necessary.
 15. Clean and restore worksite to original condition.

Service Building Roof Replacement

- A. This contract includes the furnishing of all equipment, labor, supervision, inspection, materials, and appurtenances for and in connection with the installation of a complete inverted EPDM, BUR system for the Service Building roof (Roof "U") as shown on the contract drawings and further specified herein.
- B. The work to be performed, which is detailed in the contract specifications, shall include but not be limited to the following (Roof "U"):
1. Completely tear off the existing roofing system, including: EPDM ballasted roofing membrane, insulation, flashing, underlying BUR, lightweight fill saddles, and vapor barrier down to the existing concrete pre-cast slab deck.
 2. Evaluate the condition of the concrete roof deck, and inform the City of all findings. The contractor shall notify the City in the unforeseen event that the slope of the deck is below the minimum required for proper drainage.
 3. Repair cracks: Cracks and spalling concrete larger than ¼" must be filled. Pre-cast slab joints are to be sealed with strips of fiberglass base sheet. Also, repair any saw cuts, holes or cracking evident after removal of existing termination bar along wall perimeter.
 4. Furnish and install a complete, inverted asphalt built-up roofing system, but not limited to:
 - a) Single-ply vapor barrier set in Type III asphalt.
 - b) Tapered insulation crickets set in Type III asphalt to ensure drainage. Cover with ½" cover board.
 - c) Polyester reinforced SBR/EPDM elastomeric membrane set in polymer modified cold applied adhesive.
 - d) One-quarter inch drainage board set in Type III asphalt.
 - e) Three-inch interlocking polystyrene panels with 3/8-inch concrete lining.
 5. Furnish and install cant strips along perimeter as called for in the contract drawings.
 6. Furnish and install 3-course seal, 6-inch fiberglass mesh/polymer mastic along perimeter.

7. Furnish and install fiberated aluminum coating to all remaining exposed bituminous membrane.
8. Furnish and install counter-flashing, as detailed in the contract drawings.
9. Furnish and install sheet metal flashing and trim, curbs, pitch pockets, and collars, where necessary.
10. Furnish and install a non-penetrating safety railing system where indicated on Contract Drawing WP-321-03.
11. Repair and/or replace roof drains parts, as necessary.
12. Clean and restore worksite to original condition.

1.02 CONTRACTOR'S QUALIFICATIONS

- A. Contractor shall be certified, authorized, and trained by the roofing system manufacturer.
- B. Contractor shall be thoroughly experienced and upon request be able to provide evidence of having at least five (5) years successful experience installing inverted, hot/cold, BUR asphalt roofing systems.

1.03 CONTRACTOR'S REPRESENTATIVE

- A. The requirements of the contractor's representative are defined in Section 2.4.2 of the Department of Public Works General Specifications.

1.04 WORK HOUR RESTRICTIONS

- A. Work operations, including daily startup activities under this contract shall be limited to the period from 7:00 a.m. to 3:30 p.m. daily. Work operations shall be limited to Monday through Friday, excluding City holidays.

1.05 SPECIFICATIONS AND STANDARDS

- A. All materials, general design, design loads, allowable stresses, joint design, shop fabrication and field construction shall conform to the requirements and recommendations of the following latest standard specifications of all technical societies, organizations, associations, and codes of local and state authorities which govern the type of work specified herein:
 1. Technical society, organization, or association governing the type of work covered by this contract and listed in Section 2.1.2 of the Department of Public Works General Specifications.

2. NRCA (National Roofing Contractors Association)
 3. SSPC (Steel Structures Painting Council)
- B. The contractor shall be familiar with the requirements of the above agencies. Any conflict in the contract drawings, these specifications, the contractor's design or construction methods shall result in this contractor performing in a manner which conforms to the applicable requirements.
- C. All workmanship and installation methods shall be according to industry standards and best roofing practices including, but not limited to the aforementioned.

1.06 EXISTING AND GENERAL CONDITIONS

The roofing system on the Linnwood Chemical Building and Service Building is a ballasted, EPDM roof installed on top of a BUR system (expanded polystyrene on four-ply felt mopped with bitumen on earlier remaining wood fiberboard/perlite board plus vapor barrier) over a pre-cast concrete slab deck.

The Linnwood Service Building roof is sloped from the center, and has roof drains located at each corner (four total). The roof has lightweight concrete fill saddles in the vicinity of the east and west parapet walls.

The Linnwood Chemical building roofs are sloped toward their individual roof drains. Roof J-2 (freight elevator shaft roof) does not have a roof drain; rainwater from that roof flows onto adjacent Roof H.

PART 2 SHOP DRAWINGS

- 2.01 Within fifteen (15) business days after the Notice to Proceed, the contractor shall submit to the City for approval a minimum of four (4) copies of all shop, fabrication, assembly, and other drawings required by the specifications; all drawings of equipment and devices offered by the contractor; all drawings showing essential details of any change in design or construction proposed by the contractor; and all necessary layouts. Drawings of equipment and devices shall show sufficient detail to adequately depict the construction and operation of each item. Each shop drawing shall bear City, the name and location of the structure, job number, the name of the contractor, the date of the drawing, the date of each correction or revision, and the specification numbers and plan sheet numbers applicable thereto. The contractor shall allow a minimum of ten (10) working days for the City to review submittals, each time a drawing is submitted.
- 2.02 Three (3) revised copies of each drawing shall be submitted each time a drawing is returned to the contractor for revision. Upon final review of a drawing, six (6) copies shall be submitted to the City for record and distribution to authorized persons.

- 2.03 After review by the City, all such drawings shall become a part of the contract documents and the work or equipment shown thereby shall be furnished and installed as shown unless otherwise required by the City. No work shall be performed or equipment manufactured until drawings have been approved. The approval of drawings submitted by the contractor will be for, and will cover only general conformity to the plans and specifications and will not constitute a blanket approval of all dimensions, quantities, or details of the material or equipment shown by such drawings, nor shall such approval relieve the contractor of responsibility for errors contained therein.
- 2.04 At the completion of work and prior to final payment, the contractor shall provide the City with six (6) sets of "as-built" drawings for the completed job showing all new equipment and roofing. The contractor will be responsible for the accuracy of these drawings. Two (2) copies of the above "as-built" drawings shall be submitted in an electronic format compatible with the latest edition of MICROSTATION®.

PART 3 GUARANTEE

- 3.01 Warranties shall be submitted to the City from the manufacturer (roofing system and sheet metal) and the contractor.
- A. The contractor shall provide a five (5) year materials and workmanship warranty, which shall cover both labor and material with no dollar limitations and shall commence from the date of final acceptance of the work covered by this contract.
 - B. During the five (5) year materials and workmanship warranty period, the contractor shall make all needed repairs arising out of defective workmanship and/or materials that in the judgment of the Commissioner of Public Works (Commissioner) is deemed necessary.
 - C. The contractor shall provide manufacturer's warranties for the inverted BUR, which shall be for a period of twenty (20) years that commences from the date of manufacturer's acceptance of roofing system installation. The manufacturer's roofing system warranties shall include the following materials furnished as part of the roof construction: membrane, flashings, counter flashings, adhesives and sealants, insulation, fasteners, fastener plates, fastening bars, metal edging, metal termination bars, walkway products.
 - D. Membrane manufacturer shall provide an annual inspection, by a factory-certified inspector, for the life of the warranty.
 - E. The maximum wind speed coverage shall be peak gusts of 55 mph measured at 33 feet above ground level. Certification is required with bid submittal indicating the manufacturer has reviewed and agreed to such wind coverage.
 - F. Pro-rated system warranties shall not be accepted.

- G. Evidence of the manufacturer's warranty reserve shall be included as part of the project submittals for the City's approval.
 - H. In the case of a discrepancy or conflict between the contract documents and the manufacturer's roofing system warranty, the manufacturer's roofing system warranty shall take precedence.
- 3.02 If ,within ten (10) business days after mailing of a notice in writing to the contractor, or his agent, the said contractor shall neglect to make, or undertake with due diligence to make, the aforesaid repairs, the City is hereby authorized to make such repair at the contractor's expense; providing, however, that in case of an emergency where, in the judgment of the Commissioner, delay would cause serious loss or damage, repairs may be made without notice being sent to the contractor, and the contractor shall pay the cost thereof.

PART 4 OPERATION AND MAINTENANCE DATA AND MANUALS

- 4.01 Submit four (4) sets of manuals prior to final inspection, bound in 8-1/2 x 11-inch text pages, three D-side ring capacity expansion binders with durable plastic covers.
- 4.02 Prepare binder covers with printed title "OPERATION MAINTENANCE INSTRUCTIONS", title of project, and subject matter of binder when multiple binders are required.
- 4.03 Internally subdivided the binder contents with permanent page dividers, logically organized as described below, with tab titling clearly printed under reinforced laminated plastic tabs.
- 4.04 Contents: Prepare a table of contents for each volume, with each product or system description identified, typed on 30-pound white paper.
- 4.05 The operation and maintenance manuals shall be in addition to any instructions or parts lists packed with or attached to the equipment when delivered.
- 4.06 Manuals and other data shall be printed on heavy, first quality paper, 8 1/2 x 11-inch size with standard three-hole punching. Drawings and diagrams shall be reduced to 8 1/2 x 11-inches or 11 x 17 inches. Where reduction is not practicable, larger drawings shall be folded separately and placed in envelopes that are bound into the manuals. Each envelope shall bear suitable identification on the outside.
- 4.07 Material shall be assembled and bound in the same order as it appears in the specifications, and each volume shall have a table of contents and suitable index tabs.
- 4.08 All submittals shall be marked with contract identification, and inapplicable information shall be obliterated or deleted.

- 4.09 Directory, listing names, addresses, and telephone numbers of City, contractor, subcontractors, and major equipment suppliers.
- 4.10 Project documents and certificates, including the following:
 - A. Shop drawings and product data
 - B. Certificates
 - C. Photocopies of warranties and bonds, if required.
- 4.11 Copies will be returned after final inspection, with City's comments. Revise content of documents as required prior to final submittal.
- 4.12 Submit final volumes within ten (10) business days after receipt of City's comments.

END OF SECTION

SECTION 01039**COORDINATION AND MEETINGS****PART 1 GENERAL**1.01 INDEX

- A. Coordination
- B. Alterations
- C. Cutting and Patching
- D. Pre-construction Meeting
- E. Pre-installation Meetings
- F. Progress Meetings

1.02 COORDINATION

- A. Coordinate scheduling, submittals, and work on the various specification sections to assure efficient and orderly sequence of installation of interdependent construction elements.
- B. Verify that the City of Milwaukee (City) requirement for operating equipment is compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service such equipment.
- C. Coordinate space requirements and installation of mechanical and electrical work. Follow routing shown for pipes and conduit, as closely as practicable; place runs parallel with line of structure. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance and for repairs.
- D. Coordinate completion and clean-up of work of separate sections in preparation for substantial completion.
- E. Coordinate correction of defective work and work not in accordance with contract documents to minimize disruption of the City's activities.

1.03 ALTERATIONS

- A. Materials: As specified in product sections; match existing products and work for patching and extending work.
- B. Close openings in exterior surfaces to protect existing work from weather and extremes of temperature and humidity.
- C. Remove, cut and patch work in a manner to minimize damage and to provide a means of restoring products and finishes to original condition.
- D. Refinish visible existing surfaces to original condition.
- E. Where new work abuts or aligns with existing, perform a smooth and even transition. Patched work should match existing adjacent work in texture and appearance.
- F. When finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to the City.
- G. Patch or replace portions of existing surfaces that are damaged, lifted or discolored, or showing other imperfections.
- H. Finish surfaces as specified in individual product sections.

1.04 CUTTING AND PATCHING

- A. Employ skilled and experienced installer to perform cutting and patching.
- B. Submit written request in advance of cutting or altering elements which affects:
 - 1. Structural integrity of element.
 - 2. Integrity of weather-exposed or moisture resistant element.
 - 3. Efficiency, maintenance or safety of element.
 - 4. Visual qualities of sight-exposed elements.
 - 5. Work of City or separate contractor.

- C. Execute cutting, fitting and patching to complete work, and to:
1. Fit the several parts together, to integrate with other work.
 2. Uncover work to install or correct ill-timed work.
 3. Remove and replace defective and non-conforming work.
 4. Remove samples of installed work for testing.
 5. Provide openings in elements of work for penetrations of mechanical and electrical work.
 6. Execute work by methods which will avoid damage to other work, and provide proper surfaces to receive patching and finishing.
 7. Cut rigid materials using masonry saw or core drill.
 8. Restore work with new products in accordance with requirements of contract documents.
 9. Fit work tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
 10. Maintain integrity of wall, ceiling, deck or floor construction; completely seal voids.
 11. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for an assembly, refinish entire unit.
 12. Identify any hazardous substance or condition exposed during the work to the City.

1.05 PRE-CONSTRUCTION MEETING

- A. The City will schedule a pre-construction conference after Notice to Proceed.
- B. Attendance is required of City, contractor, roofing system manufacturer's representative and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment. Attendees are required to contact Milwaukee Water Works at (414) 286-3630 and/or (414) 286-2428 at least 24 hours in advance for placement on that day's visitor list for access to the meeting site.

C. Agenda

1. Submission of executed bonds and insurance certificates.
2. Submission of list of subcontractor, list of products, schedule of values, and progress schedule.
3. Designation of personnel representing the parties in contract.
4. Procedures and processing of field decisions, submittals, substitutions, applications for payments, proposal request, change orders and contract closeout procedures.
5. Scheduling and reports.
6. Use of premises by City and contractor.
7. Construction facilities and controls provided by City.
8. Temporary utilities and controls provided by City, if any.
9. Security and housekeeping procedures.
10. Procedures for testing.
11. Procedures for start-up of equipment.
12. Requirements for maintaining record documents.
13. Inspection and acceptance of equipment put into service during construction period.
14. Conflicts.
15. A review of contract documents shall be made, and deviations or differences shall be resolved.
16. Establish which areas on-site will be available for use as storage areas and working area.
17. Review of existing conditions including deck substrate conditions, structural loading limitations of roof deck, utility equipment to remain in service for duration of project that roof work must accommodate adequate ventilation of station, architectural elements to be reused.

1.06 PRE-INSTALLATION MEETING

- A. When determined by the City, the contractor shall convene a Pre-installation Meeting at worksite prior to commencing work.
- B. Require attendance of parties directly affecting, or affected by work of the specific section.
- C. Notify all parties four (4) days in advance of meeting date.
- D. Prepare agenda, preside at meetings, record minutes, and distribute copies within three (3) days after the meeting to participants, with one copy to the City.
- E. Review conditions of installation, preparation and installation procedures, and coordination with related work.

1.07 PROGRESS MEETINGS

- A. The City will schedule and administer meetings throughout progress of the work, as required.
- B. The City will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings, record minutes, and distribute copies within three (3) days to the City, participants, and those affected by decisions made.
- C. Attendance Required: Contractor’s general superintendent, major subcontractors and suppliers, City, as appropriate to agenda topics for each meeting.
- D. Agenda
 - 1. Review minutes of previous meeting.
 - 2. Review of work.
 - 3. Field observations, problems, solutions, and decisions.
 - 4. Review submittals, schedules.
 - 5. Maintenance of progress schedule.
 - 6. Planned progress during succeeding work period.
 - 7. Other business relating to work.

END OF SECTION

SECTION 01500**JOB SITE SECURITY, UTILITIES AND FACILITIES****PART 1 – SCOPE**1.01 INDEX

- A. PART 1 - Scope
- B. PART 2 - Security and Safety
- C. PART 3 – City of Milwaukee Permits
- D. PART 4 - Occupancy During Construction
- E. PART 5 - Electrical Power and Telephone Service
- F. PART 6 – Heat and Ventilation
- G. PART 7 – Water
- H. PART 8 - Toilet Facilities
- I. PART 9 – Deliveries

1.02 GENERAL CONDITIONS

- A. All operations shall be carried on with a minimum of damage and disturbance. All damages shall be repaired to the original condition to the satisfaction of the Water Engineering representative.
- B. All removals become the property of the contractor and shall be disposed of off-site, unless otherwise specified.

1.03 TEMPORARY VENTILATION

- A. Ventilate enclosed areas to assist cure of materials, dissipate humidity and/or prevent accumulation of dust, fumes, vapors or gases.

1.04 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas and protect existing facilities and adjacent properties from damage caused by construction operations and demolition.

- B. Protect non-owned vehicular traffic, stored materials, site and structures from damage.
- C. Utilize road plates to protect underground utilities and structures, and to minimize disturbances caused by construction traffic.

1.05 PROGRESS CLEANING

- A. Waste materials, debris and rubbish shall be removed daily after work. Maintain site in a clean and orderly condition.
- B. Clean and repair damage caused by removals or installations.
- C. Restore existing facilities used during construction to original condition.

PART 2 – SECURITY AND SAFETY

2.01 GENERAL

- A. The Milwaukee Water Works (MWW) consists of a number of facilities to treat and deliver drinking water to the City of Milwaukee (City) and surrounding suburban communities. To ensure the safety and security of drinking water, the MWW has instituted protocols for visitors and contractors to control entry to these facilities. It is essential that contractors strictly comply with the security policy outlined in the specification section.
- B. For this project, the contractor shall continuously coordinate building and site security measures, including accessing the site, with the designated Water Engineering representative or Michael Schaefer, Water Security Manager, at (414) 286-3465, or facsimile: (414) 286-2672.

2.02 SCOPE

- A. Any and all City agencies and contractors engaged for work at MWW facilities shall be required to attend a "Pre-Construction Security Briefing" before any contracted work can be initiated. At this meeting, the contractor and subcontractors shall have a detailed briefing with discussions regarding the following items:
 - 1. MWW site security policies and procedures
 - 2. Contractor and subcontractor obligations
 - 3. Permit system

2.03 POLICIES

- A. During the "Security Briefing" portion of the Pre-Construction Meeting, MWW Security staff shall provide the contractor with site polices to be reviewed by the contractor and subcontractors. These documents may include:
1. Lock-out/Tag-out Policy
 2. Confined Space Entry Procedures
 3. Evacuation Procedure for Propane, Lox, and Ammonia Releases
 4. Personal Protective Equipment Guidelines
 5. No Smoking Policy
 6. Prohibited Materials
- B. Additionally, the contractor will be provided:
1. Contact phone numbers for MWW staff
 2. On-site parking location and designated construction entrance
 3. Site security policy and procedures
- C. The contractor shall be required to review these documents and is responsible for conveying the contents of these submittals to their employees, subcontractors, and any other parties working directly or indirectly for them. These policies apply equally to all contractors. Failure to comply with established policies and procedures may result in access privileges being withdrawn.
- D. MWW staff shall provide a "walk-through" session with the contractor to review area layout and site plans as part of the orientation process and to establish the specific work areas necessary for the contractors to perform their scope of work. Topics covered in this session include site overview with hazards, Material Safety Data Sheets (MSDS), fire extinguisher placement, and the storm water protection policy.

2.04 CONTRACTOR RESPONSIBILITIES

- A. Contractors shall provide the following documents **no less than seven (7) business days prior** to the start of contracted work:
1. Scope of work to be performed.
 2. Name of primary contractor's onsite representative.

3. Names of all companies subcontracted to do work on the project.
4. Completed "Contract Firm Registration Form" (see Attachment 'A') for prime contract firm and every subcontract firm.
5. A "Contractor Employee Registration Form" completed for the contractors and every employee who needs to be granted site access (see Attachment 'B').
6. List of items to be stored on-site.
7. MSDS for all chemicals to be used/stored on-site.

NOTE: It is the responsibility of the contractor to facilitate gathering and submittal of the "Contractor Employee Registration Form" for all subcontractors working on the project. A subcontractor is defined as an individual or firm hired by the primary contractor to perform a specific task as part of the overall project. This would not include an organization making deliveries of supplies or equipment to the job site; procedures for these firms are covered under Part 8, "DELIVERIES".

- B. In the event it is necessary for the contractor to add additional employees to the list of approved personnel, a minimum of 72 hours, or three (3) business days must be allowed for processing of the request. Site access will be denied to the additional personnel until processing is complete.
- C. Contractor firms are obligated to notify MWW in a timely manner of any site-authorized staff that leaves the employ of the contractor.
- D. At no time should anyone but the contractor be contacting MWW employees with issues or access requests. If a request for site access does not come from the contractor, the request will not be processed.
- E. During the time period the contractor is on-site, they must agree to:
 1. Notify the Water Plant Manager immediately of any significant chemical spills or leaks.
 2. Maintain normal non-toxic breathable air quality, through adequate ventilation at their work site.
 3. Perform no equipment isolations or tie-ins without the signed approval of site management.
 4. Restrict movement to the specific work areas within the site to perform contractor's scope of work.

2.05 CONTRACTOR SPECIAL WORK PERMITS

- A. Contractors must notify Engineering/site management staff of any welding, torching, or potentially hazardous or operational impact request prior to commencing such operations. Special work permits shall be issued to the contractor and these must also be displayed at the work site.
- B. Failure to comply with the terms of the special work permits or provisions that provide for MWW employee safety shall be cause for revocation of such permits, and the contractor may be forced to discontinue activities at the site.

2.06 CONTRACTOR IDENTIFICATION AND DAILY REGISTRATION

- A. All contractors shall be required to show a valid picture ID card to sign-in at the start of every work day and to sign out at the end of every work day. A MWW employee or designated security representative shall be on-site to ensure compliance. Any identification tags or lanyards issued by MWW are to be worn while on-site and returned to site management upon completion of contracted work. A fee of \$50.00 each will be charged for any identification tags or lanyards issued by MWW that are not returned.

2.07 CONTRACTOR GATE ACCESS AND PARKING

- A. Contractors must comply with the terms of entry for the site and park only in the areas designated for parking by the MWW site representative.

NOTE: Parking privileges may be rescinded at any time as site operational requirements dictate.

PART 3 - CITY OF MILWAUKEE PERMITS

3.01 GENERAL

- A. The contractor shall obtain the necessary permits for this project.

PART 4 - OCCUPANCY DURING CONSTRUCTION

4.01 GENERAL

- A. The MWW facility shall be in continuous operation during this contract. Contractor and subcontractors are to take any and all necessary precautions to ensure there is no interference with daily operations or security. MWW personnel shall be continuously occupying the facility. All hours of contractor's operations shall be coordinated with the MWW site or Water Engineering representative.

PART 5 - ELECTRICAL POWER AND TELEPHONE SERVICE5.01 GENERAL

- A. On-site electrical service is NOT available for contractor use at the Linnwood Water Treatment Plant site. The contractor is required to request a dedicated service for job trailers from the electric utility.
- B. Contractor shall provide and maintain all necessary power cords and electrical lighting, and shall make all necessary connections in accordance with OSHA regulations.
- C. Contractor shall provide, maintain, and pay for his own wireless telephone and internet service.

PART 6 – HEATING AND VENTILATION6.01 GENERAL

- A. Contractor shall provide and maintain all necessary heating and ventilation equipment required for the contract. Contractor shall perform all air treatment procedures and make all necessary connections in accordance with OSHA regulations.

PART 7 - WATER7.01 GENERAL

- A. Water is available for the contractor at the site and may be obtained from the fixture(s) so designated by MWW staff or Water Engineering representative.
- B. Contractor and subcontractors must provide their own hoses, back-flow preventer and any other connection appurtenances required for the contract.

PART 8 - TOILET FACILITIES8.01 GENERAL

- A. On-site toilet facilities are NOT available for contractor use during project duration. Contractor shall furnish their own portable facilities. Contractor shall maintain these toilet facilities in a sanitary condition throughout the duration of the project and shall remove them from site at the end of the project. The placement and location of the temporary portable toilets shall be coordinated with the Water Plant Manager and Water Engineering representative.

PART 9 - DELIVERIES9.01 **GENERAL**

- A. Contractor shall coordinate the delivery of all equipment, materials, dumpsters, portable toilets (and their maintenance) and other required items required for the contract work with the MWW staff. A minimum of 24-hours prior notice in advance of the desired delivery date shall be transmitted to the designated Water Engineering representative.

- B. Contractor shall provide the following information in the notification:
 - 1. Trucking/Delivery company
 - 2. Driver name
 - 3. Truck license plate number

- C. The driver of the delivery vehicle is required to display picture identification as a prerequisite for entry to the MWW facility for the delivery. Failure to comply with the above will result in denial of project site access, requiring the contractor to reschedule delivery.

END OF SECTION

Milwaukee Water Works

Safe, Abundant Drinking Water.

WP-321
Attachment "A"

FORM A

CONTRACT FIRM REGISTRATION FORM

CONTRACTOR: _____

PLANT/SITE: _____

CONTRACT/SERVICE ORDER NO. _____

WATER ENGINEERING PROJECT NO. _____

PRIMARY CONTACT PERSON: _____

OFFICE PHONE NUMBER: _____

CELL PHONE NUMBER: _____

REQUESTED WORK HOURS (00am – 00pm): _____

NUMBER OF EMPLOYEES TO BE WORKING ON-SITE: _____

**Signature certifies receipt of the materials outlined in
Contract Section 01500, Part 2 – Security and Safety, Section 2.04.**

SIGNATURE: _____

PRIMARY CONTACT PERSON

DATE: _____

***Accompanying this form should be a complete listing of all
equipment to be stored on site for the duration of the project.***

Milwaukee Water Works

Safe, Abundant Drinking Water.

WP-321
Attachment "B"

FORM B

CONTRACTOR EMPLOYEE REGISTRATION FORM

Contract Firm: _____

Plant/Site/Project: _____

Employee Name (Printed): _____

This certifies that I have received the building site security and safety policies.

EMPLOYEE
SIGNATURE: _____
Required

DATE: _____

ONSITE PARKING

- I will always be driving a Company vehicle.
- I will always be a passenger in a vehicle.
- I will be driving my personal vehicle. (If checked, complete and sign the next section.)

Contractor Personal Vehicle Liability Waiver

EMPLOYEE VEHICLE
MAKE & MODEL: _____ LICENSE PLATE: _____

I, hereby agree to hold harmless the City of Milwaukee for any and all damage, loss or injury, which may occur as a result of utilizing the contractor onsite parking area.

EMPLOYEE
SIGNATURE: _____
Required

DATE: _____

SECTION 01600**MATERIALS AND EQUIPMENT****PART 1 – GENERAL****1.01 PRODUCTS**

- A. Products: Defined as new material, machinery, components, equipment, fixtures and systems forming the work; does not include machinery and equipment used for preparation, fabrication, conveying and erection of the work.
- B. All materials that will be in direct contact with potable drinking water shall be in compliance with NSF Standard 61 Drinking Water System Components – Health Effects.
- C. Do not use materials and equipment removed from existing premises, except as specifically permitted.
- D. Assure standardization and uniformity in all parts of the work by providing like items of equipment or certain materials as products of one manufacturer.
- E. Uniformity in equipment items is required in order to provide the City with interchangeability capabilities, simplified spare parts inventories and standardized maintenance programs and manufacturers services.

1.02 TRANSPORTATION AND HANDLING

- A. Transport and handle products in accordance with manufacturer's instructions.
- B. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.
- C. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage.

1.03 STORAGE AND PROTECTION

- A. Store and protect products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight, climate controlled enclosures.
- B. Provide off-site storage and protection when site does not permit on-site storage or protection.
- C. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation.
- D. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

- E. Arrange storage of products to permit access for inspection. Periodically inspect to assure products are undamaged and are maintained under specified conditions.
- F. Spare parts and special tools shall be properly marked to identify the associated equipment by name, equipment and part number. Delivery of spare parts and special tools shall be made prior to the initial test run of the associated equipment.

END OF SECTION

SECTION 01700**CONTRACT CLOSEOUT****PART 1 - GENERAL**1.01 **SUMMARY**A. **INDEX**

1. Closeout Procedures
2. Final Cleaning
3. Adjusting
4. Project Record Documents
5. Operation and Maintenance Data
6. Guarantee
7. Spare Parts and Maintenance Materials

B. Related Sections

1. Section 01010 – Summary of Work

1.02 **CLOSEOUT PROCEDURES**

- A. Submit written certification that contract has been reviewed, work has been inspected, and work is complete in accordance with the contract and is ready for City of Milwaukee (City) inspection.
- B. Provide submittals to City that is required by governing or other authorities.
- C. Submit final application for payment identifying total adjusted contract price, previous payments, and sum remaining due.

1.03 **FINAL CLEANING**

- A. Execute final cleaning prior to final inspection.
- B. Clean equipment and fixtures to a sanitary condition.
- C. Clean site, sweep paved areas, rake clean landscaped surfaces.

- D. Remove waste and surplus materials, rubbish, and construction facilities from the work site.

1.04 ADJUSTING

- A. Adjusting operating products and equipment to ensure smooth and unhindered operation.

1.05 PROJECT RECORD DOCUMENTS

- A. Maintain on site, one set of the following record documents; record actual revisions to the work:
 - 1. Contract Drawings
 - 2. Specifications
 - 3. Addenda
 - 4. Change Orders
 - 5. Reviewed shop drawings, product data, and samples.
- B. Store record documents separate from documents used for construction.
- C. Record information concurrent with construction progress. Electrical boxes and conduit location determined in the field and not specifically shown on the drawings shall be recorded and documented.
- D. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
 - 1. Manufacturer's name and product model and number
 - 2. Product substitutions or alternate utilized.
 - 3. Changes made by addenda or change orders.
- E. Record documents and shop drawings: Legibly mark each item to record actual construction including:
 - 1. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the work.
 - 2. Field changes of dimensions and details.

3. Details not on original contract drawings.
- F. Delete consultant, City title block and Engineer's seal from all documents.
- G. Submit five (5) sets of documents with one (1) electronic version to City prior to final application for payment.
1. Accompany submittal with transmittal letter containing the following:
 - a) Date
 - b) Project title and number
 - c) Contractor's name and address
 - d) Title and number of each record document
 - e) Certification that each document as submitted is complete and accurate.
 - f) Signature of contractor, or his/her authorized representative.

1.06 OPERATION AND MAINTENANCE DATA

- A. Submit six (6) sets prior to final inspection, bound in 8 ½ x 11-inch text pages, three D-side ring binder capacity expansion binders with durable plastic covers.
- B. Prepare binder covers with printed title "OPERATION MAINTENANCE INSTRUCTIONS", title of project, and subject of binder when multiple binders are required.
- C. Internally subdivide the binder contents with permanent dividers, logically organized as described below, with tab titling clearly printed under reinforced laminated plastic tabs.
- D. Contents: Prepare a table of contents for each volume, with each product or system description identified, typed on 30-pound white paper.
1. Part 1: Directory, listing names, addresses, telephone numbers and emails of City, contractor, subcontractors, and major equipment suppliers.
 2. Part 2: Operation and maintenance instructions arranged by system and subdivided by specification section. For each category, identify name, addresses, telephone numbers and emails of subcontractors and suppliers. Identify the following:

- a) Significant design criteria.
 - b) List of equipment.
 - c) Parts list for each component.
 - d) Operating instructions.
 - e) Maintenance instructions for equipment and systems.
 - f) Maintenance instructions for special finishes, including recommended cleaning methods and materials and special precautions identifying detrimental agents.
3. Part 3: Project documents and certificates, including the following:
- a) Shop drawings and product data.
 - b) Air and water balance reports.
 - c) Certificates.
 - d) Photocopies or warranties and bonds, if required.
- E. Special requirements for operation and maintenance data and manuals. Adequate operation and maintenance information shall be supplied for all equipment requiring maintenance or other attention. The contractor shall provide operation and maintenance manuals for each type of equipment supplied.
1. Operation and maintenance manuals shall include the following:
 - a) All sets of manuals shall be originals. Copies will not be acceptable.
 - b) Equipment function, normal operating characteristics, and limiting conditions.
 - c) Assembly, installation, alignment, adjustment, and checking instructions.
 - d) Operation instructions for start up, routine and normal operation, regulation and control, shutdown, and emergency conditions.
 - e) Lubrication and maintenance instructions, including lubrication cross references to a minimum of three locally available suppliers.

- f) Guide to "troubleshooting".
 - g) Parts list and predicted life of parts subject to wear.
 - h) Outline, cross-section, and detailed assembly drawings; engineering data; wiring diagrams.
 - i) Test data and performance curves, where applicable.
2. The operation and maintenance manuals shall be in addition to any instructions or parts packed with or attached to the equipment when delivered, or instructions that may be required by the contractor.
 3. Manuals and other data shall be printed on heavy, first quality paper, in an 8 ½ x 11-inch size with standard 3-hole punching. Drawings and diagrams shall be reduced to 8½ x 11-inches, or 11 x 17 inches. Where reduction is not practicable, larger drawings shall be folded separately and placed in an envelope that is bound into the manuals. Each envelope shall bear suitable identification on the outside.
 4. Material shall be assembled and bound in the same order as it appears in the specifications, and each volume shall have a table of contents and suitable index tabs.
 5. All submittals shall be marked with contract identification, and inapplicable information shall be erased or deleted.
 6. Shipment of equipment will not be considered complete until required data and manuals have been received.
- F. Copies will be returned after final inspection, with City's comments. Revise content of documents as required prior to final submittal.
 - G. Submit final volumes within ten (10) days after receipt of City's comments.

1.07 SPARE PARTS AND MAINTENANCE MATERIALS

- A. Provide products, spare parts and equipment, maintenance and extra materials in quantities as noted in applicable specification sections.
- B. Deliver to project site and place in location as directed, obtain receipt prior to final payment.

1.08 GUARANTEE

- A. Provide duplicate notarized copies.

- B. Execute and assemble documents and subcontractors, suppliers, and manufacturers.
- C. Provide table of contents and assemble in three D-side ring binder with durable plastic cover.
- D. Submit prior to final application for payment.

END OF SECTION

SECTION 02050**DEMOLITION****PART 1 GENERAL**1.01 **SECTION WORK INCLUDES**

- A. Stripping, removing, and disposing of the existing EPDM and underlying built-in roof (BUR) roofing system, insulation, vapor barrier, cant strips (if required), wood nailers (if required), flashing, and counter-flashing on the Linnwood Chemical Building and Service Building roofs.
- B. Removing and disposing of the existing lightweight concrete saddles (Roof "U").

1.02 **CITY'S OCCUPANCY**

- A. City will occupy the premises during the entire period of construction for the conduct of its normal operations. Cooperate with City in all construction operations to minimize conflict and to facilitate City usage.

1.03 **SUBMITTALS**

- A. Quality Control Submittals:
 - 1. Schedule of demolition, as part of and consistent with the progress schedule.
 - 2. Methods of demolition and equipment proposed. Copies of any authorizations and permits required to execute the Work.

PART 2 EXECUTION2.01 **PREPARATION**

- A. Utilities:
 - 1. Notify City and appropriate utilities to turn off affected services before starting demolition or alterations.

- B. Removal and storage of equipment for reuse:
 - 1. Do not remove equipment and materials without approval of City.
 - 2. Properly store and maintain equipment and materials in same condition as when removed.
 - 3. City will determine condition of equipment and materials prior to removal.

2.02 DEMOLITION

- A. Drawings define minimum portion of structures to be removed. Unless otherwise shown, rough cuts or breaks may be made exceeding limits of demolition shown.
- B. Remove all materials associated with existing equipment that is to be removed or relocated.
- C. Contractor shall use caution in removing the existing items from the roof and shall inspect the condition of the roof opening.
- D. Asbestos: The Linnwood Chemical Building and Service Building roofs are believed to contain asbestos. Materials/debris should be treated as containing non-friable asbestos. Notify the City of Milwaukee, Department of Neighborhood Services, Environmental Section to obtain a City Project (no fee) asbestos removal permit.

The contractor is responsible for and shall take any and all precautions necessary for the safe removal of the existing EPDM over BUR system that contains asbestos. The removal plan shall be submitted to and approved by the City.
- E. Dispose of debris and other non-salvaged materials offsite in licensed landfills.

2.03 SALVAGE

- A. Equipment and materials within the limits of demolition, unless otherwise specified, will become the property of the contractor.

END OF SECTION

SECTION 06100
ROUGH CARPENTRY

PART 1 GENERAL

1.01 DESCRIPTION

- A. Section includes requirements for the installation of miscellaneous carpentry as indicated in specification sections and on the construction drawings, including, but not limited to, rough carpentry in conjunction with other work, blocking, nailers, and sheathing panels.

1.02 SUBMITTALS

- A. Submit under provisions of Section 01010 Summary of Work.
- B. Product Data:
 - 1. Submit manufacturer's descriptive literature and product specifications for each product.
 - 2. Include data to indicate use.

1.03 DELIVERY, STORAGE AND HANDLING

- A. Comply with requirements of Section 01600 - Material and Equipment.

PART 2 PRODUCTS

2.01 DIMENSIONAL LUMBER

- A. Wood blocking in nominal thickness:
 - 1. Blocking shall be Grade #2 or better, complying with lumber producer's inspection agency grading rules certified as conforming to the "National Grading Rule for Dimension Lumber", by the Board of Review of the American Lumber Standards Committee (ALSC), established under Section 10 of PS-20.
 - 2. Dimensional lumber shall be smooth four sides (S4S), unless otherwise shown or indicated.

3. Dimensional lumber shall be seasoned, with 19% maximum moisture content at time of dressing, complying with the dry size requirements of PS-20. Lumber shall be marked "S-Dry."
4. Dimensional lumber shall be:
 - a) Nailers: nominal size as indicated on the construction drawings.
 - b) Blocking: nominal size as indicated on the construction drawings.
 - c) Cant Strips: diagonal saw-cut from 2x2 or 4x4 dimensional lumber, as indicated on the construction drawings.
 - d) Plywood: thickness as indicated on the contract drawings for use as shim material beneath nailers.

2.02 PRESERVATIVE TREATED WOOD

- A. "Treated wood" shall be dimensional lumber pressure-treated with water-borne preservatives for exterior use, complying with AWPB LP-22, 0.40 retention, and marked "Wolmanized" or certified as an equal.
- B. Treated wood shall be kiln-dried to maximum moisture content of 15% following treatment with water-borne preservatives.

2.03 PLYWOOD

- A. Minimum thickness: 1/2-inch, 4-ply.
- B. Interior grade C-D or better, with exterior glue (CDX), conforming to the rating of the American Plywood Association (APA), PS 1-83.
- C. Thickness to match existing decking.

2.04 FASTENERS

- A. Carpentry to wood substrate:
 1. Common wire nails with galvanized coating.
 2. Length as necessary to penetrate the substrate by a minimum of 1-1/2 inches.

3. Nail sizes:
 - a) One-inch nominal thickness decking - 12d.
 - b) Two-inch nominal thickness decking - 16d.
 - c) Three-inch nominal thickness decking - 20d.
 - d) Four-inch nominal thickness decking - 30d.

B. Carpentry to concrete or solid masonry substrate:

1. Tapper, 1/4-inch diameter, Phillips-head screw, by Powers Fastening, Inc., New Rochelle, NY, or approved equal. Length as necessary to provide a minimum of 1-inch embedment.
2. Tapcon 1/4-inch diameter, Phillips-head screw by Buildex Division of ITW, Inc., Itasca, IL, or approved equal. Length as necessary to provide a minimum of 1-inch embedment.

C. Carpentry to hollow masonry substrate:

1. Sleeve anchor by Hilti Fastening Systems, Tulsa, OK, or approved equal. Length as necessary to penetrate a minimum of 1-inch into the interior of the hollow masonry units.
2. Tapper, 1/4-inch diameter, Phillips-head screw, by Powers Fastening, Inc., New Rochelle, NY, or approved equal. Length as necessary to provide a minimum of 1-inch embedment.
3. Tapcon, 1/4-inch diameter, Phillips-head screw by Buildex Division of ITW, Inc., Itasca, IL, or approved equal. Length as necessary to provide a minimum of 1-inch embedment.

D. Carpentry to sheet metal substrate:

1. Self-drilling sheet metal screws, cadmium plated.
2. Length shall penetrate the substrate by a minimum of 1-inch.
3. 10-24 wafer-head Plymetal TEKS/3 with wings by the Buildex Division of ITW, Inc. Itasca, IL, or approved equal.

- E. Carpentry to structural steel:
1. Self-drilling sheet metal screws, cadmium plated.
 2. Length shall penetrate the substrate by a minimum of 1-inch.
 3. 12-24 flat-head TEKS/4 by Buildex Division of ITW, Inc. Itasca, IL, or approved equal.
- F. Carpentry to gypsum or cementitious wood fiber roof decking:
1. NTB- I H screw with 1-inch head and locking wire barbs by Olympic Manufacturing Group, Inc., Agawam, MA, or approved equal. Length as necessary to achieve required pull-out resistance (225 lbs.) without penetrating the underside of the roof deck.
 2. Toggle Bolt assembly, 1/4-inch diameter with flat head, Powers Fastening, Inc., New Rochelle, NY, or approved equal. Length as necessary for toggle wings to properly engage the bottom side of the roof deck.
NOTE: The contractor shall request written approval, from the City, prior to using this fastener in an area where the deck is exposed.

PART 3 EXECUTION

3.01 CARPENTRY INSTALLATION

- A. General Requirements
1. Do not use lumber or materials that are unsound, warped, bowed, twisted, inadequately seasoned, or too small to fabricate the work with a minimum of joints.
 2. Fit carpentry work to other work. Produce joints of which are tight, true and well fastened.
 3. Set carpentry accurately to required levels and lines with members plumb and true.
 4. Attach carpentry to substrates in accordance with recognized standards.
 - a) Countersink the new fastener heads flush with top of wood members. Hollow out bottom of new wood members, if necessary, to fit over existing exposed bolt heads that are not countersunk.

- b) Countersink the nail heads on exposed carpentry and fill holes.
- 5. Select fastener size that will not penetrate members where opposite side will be exposed to view or will receive finish materials.
- 6. Threaded fasteners shall be turned into place, not driven.
- 7. Fasteners shall be tightened at installation and re-tightened as required prior to closing in or at completion of work.
- B. Examine existing nailers and blocking which conforms to the construction details at walls, edges, expansion joints, hatches, pipes or curbs.
 - 1. Replace deteriorated sections with new dimensional lumber of the same size.
 - 2. Enhance existing fastening to secure as required.
- C. Install new wood nailers and blocking to achieve thickness and elevations required by the construction details.
 - 1. Secure to substrate as shown on the construction details.
 - 2. Install additional fasteners, as required to counteract minor warpage or variances in substrate, and to hold tight and true to lines.
 - 3. When using multiple nailer courses, weave comers and stagger end joints a minimum of 3 feet from underlying course.
 - 4. Provide blocking to achieve a minimum of 8-inch height above finished roof surface.

3.02 CLEANING

- A. General: Comply with requirements of Section 01500.
- B. Wood chips, shavings, sawdust and other debris shall be swept up and removed from the work area daily prior to installation of subsequent roofing components.

END OF SECTION

SECTION 07220
ROOF DECK AND INSULATION

PART 1 GENERAL

1.01 **SUMMARY**

- A. Provide all labor, equipment and materials to install roof insulation over the properly prepared temporary roof/vapor barrier, In accordance with all governing codes and good workmanship practices. Related work specified elsewhere:
1. Section 01010 Summary of Work
 2. Section 07520 Modified Bituminous Membrane Roofing-Hot Applied

1.02 **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 Insulating 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 of 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).
- J. Insulation Board, Thermal (Fiberboard) (FS LLL-1-535B)

1.03 SUBMITTALS FOR REVIEW

- A. Submit under provisions of Section 01010 Summary of Work.
- B. Product Data: Provide manufacturers specification data sheets for each product.
- C. Provide approval letters from insulation manufacturer for use of their insulation within this particular roofing system type.
- D. Provide a sample of each insulation type.
- E. Manufacturer's Certificate: 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.

1.04 QUALITY ASSURANCE

- A. Fire Classification, ASTM E-108.
- B. Pre-Installation Meeting: Refer to Section 07520 Modified Bituminous Membrane Roofing-Hot Applied for Pre-Installation Meeting requirements.

1.05 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

2.01 PRODUCTS, GENERAL

- A. Basis of Design: Materials and product characteristics specified herein shall be regarded as the minimum standard of quality required for work of this Section. Comply with all quality and performance criteria specified.
- B. Substitutions: Products proposed as equal to the products specified in this Section shall be submitted in accordance with Department of Public Works General Specifications and Section 01600 Material and Equipment.
 - 1. 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 Water Engineering's Representative.
 - 2. The MWW's decision regarding substitutions will be considered final. Unauthorized substitutions will be rejected.

2.02 INSULATION MATERIALS

- A. Rigid Polyisocyanurate Roof Insulation; ASTM C-1289:

1. Qualities: Rigid, closed cell polyisocyanurate foam core bonded to heavy-duty glass fiber mat facers.
 2. Thickness: Minimum 4-inches.
 3. R-Value: Minimum 23.6.
 4. Compliances: UL, WH or FM listed under Roofing Systems Federal Specification HH-I-1972, Class 1.
- B. High Density Fiberboard Roof Insulation; ASTM C-208:
1. Qualities: Rigid, composed of interlocking fibers factory blended treated with asphalt on the top side.
 2. Board Size: 4' x 4'
 3. Thickness: Minimum 1/2-inch.
 4. Compliances: UL, WH, FM listed under Roofing Systems. Federal Specification LLL-I-535-B.

2.03 RELATED MATERIALS

- A. Vapor Barrier: See Section 07520 Modified Bituminous Membrane Roofing-Hot Applied.
- B. Fiber Cant: Preformed rigid insulation units of sizes/shapes required by roofing system manufacturer, matching insulation board or of perlite or organic fiberboard, as per the approved manufacturer.
- C. Asphalt: ASTM D-312, Type III Steep Asphalt.

PART 3 EXECUTION

3.01 DEMOLITION

- A. Tear off existing roofing ballast, membrane, insulation, flashings, counter-flashings, cants and roofing systems hidden beneath the existing top roof system and expose the vapor barrier.

3.02 EXAMINATION

- A. 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. Replace failed wood blocking as needed (unit price). Add additional wood blocking as required to provide proper flashing height and per detail drawings.
 3. Verify that roof drains have plugs installed in them before starting the day's work. Verify that plugs have been removed after the day's work has been completed. Plugs shall eliminate any opportunity for roofing materials or debris to enter the roof drain piping.
 4. Examine surfaces for defects, rough spots, ridges, depressions, foreign material, moisture, and unevenness.
 5. Do not proceed until defects are corrected.
 6. Raise or lower existing drains to match new roof system.
 7. Do not apply insulation until substrate is sufficiently dry.
 8. Broom clean substrate immediately prior to application.
 9. Use additional insulation to fill depressions and low spots that would otherwise cause ponding water.

3.03 INSTALLATION

- A. Temporary roof / vapor barrier
1. Tear off existing vapor barrier that has separated from roof deck or failed. Leave vapor barrier in place where still firmly bonded to roof deck.
 2. Prime existing roof deck and existing vapor barrier with asphalt primer at the rate of 1/2 gallon per 100 square feet.
 3. Provide two ply vapor barrier, ASTM D4601, Type II. Set vapor barrier in asphalt.

- B. Attachment to vapor barrier with bitumen
1. Install insulation, crickets and saddles per insulation plan.
 2. Embed one layer of rigid insulation board in solid moppings of hot asphalt at the rate and temperature recommended by insulation manufacturer. Walk in each piece of insulation and leave boards completely adhered to vapor barrier. Each insulation board shall be butt firmly against adjoining panels.
 3. Embed additional layer(s) of insulation board in solid moppings of hot asphalt after first layer has been adhered as recommended by insulation manufacturer. Stagger end joints of boards so all open joints will be eliminated. Walk in each piece of insulation and leave boards completely adhered to vapor barrier. Each insulation board shall be butt firmly against adjoining panels. All open joints shall be eliminated.
 4. Approved insulation shall be tapered around roof drains and scuppers. Tapered insulation sump shall start with a thickness of one-half at drain bowl to the specified dimension out two feet from the center line of the drain. Install tapered insulation sump in such a way to provide proper slope for runoff. Shape insulation with tool as required so completed surface is smooth and flush with ring of drain. Under no circumstances will the membrane be left unsupported in an area greater than one quarter (1/4) inch. Install recovery board over tapered insulation sump as required.
 5. Recovery board 1/2-inch thick shall be installed over flat and tapered insulation using hot asphalt at the rate of approximately 33 pounds per 100 square feet.
 6. 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 1/4-inch away from the vertical surface.
 7. Install no more insulation at one time than can be roofed on the same day. A base sheet shall not be considered as a proper weather barrier.
 8. Install temporary water cut-offs at completion of each day's work and remove upon resumption of work.
 9. Cant Strips: Install preformed 45° degree cant strips at junctures of vertical surfaces.

B. Protection from Weather:

1. Insulation shall be protected from the weather at all times.
2. Insulation that becomes wet during or after installation shall be removed and replaced with dry insulation. If roofing is in place, the roofing shall be also replaced. All replacing work shall be done at no added cost to the City.

3.04 CLEANING

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

3.05 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 07520**MODIFIED BITUMINOUS MEMBRANE ROOFING-HOT APPLIED****PART 1 GENERAL****1.01 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.

1.02 SUMMARY

- A. Section includes modified bituminous roofing system.
- B. Related work specified elsewhere:
 - 1. Section 01010 Summary of Work
 - 2. Section 06100 Rough Carpentry
 - 3. Section 07220 Roof Deck and Insulation
 - 4. Section 07600 Flashing and Sheet Metal

1.03 REFERENCES

- A. American Society of Civil Engineers (ASCE):
 - 1. ASCE 7-02 Minimum Design Loads for Buildings and Other Structures.
- B. American Society for Testing and Materials (ASTM):
 - 1. ASTM D41 Standard Specification for Asphalt Primer Used in Roofing, Dampproofing and Waterproofing.
 - 2. ASTM D451 Standard Test Method for Sieve Analysis of Granular Mineral Surfacing For Asphalt Roofing Products.
 - 3. ASTM D1079 Terminology Relating to Roofing and Waterproofing.

4. ASTM D1227 Standard Specification for Emulsified Asphalt used as a Protective Coating for Roofing.
 5. ASTM D1863 Standard Specification for Mineral Aggregate Used on Built-Up Roofs.
 6. ASTM D2178 Standard Specification for Asphalt Glass Felts used in Roofing and Waterproofing.
 7. ASTM D2824 Standard Specification for Aluminum-Pigmented Asphalt Roof Coatings, Nonfibered, Asbestos Fibered, and Fibered without Asbestos.
 8. ASTM D4586 Standard Specification for Asphalt Roof Cement.
 9. ASTM D4601 Standard Specification for Asphalt-Coated Glass Fiber Base Sheet Used in Roofing.
 10. ASTM D5147 Standard Test Methods for Sampling and Testing Modified Bituminous Sheet Material.
 11. ASTM D6162 Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements.
 12. ASTM D6163 Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements.
 13. ASTM E108 Standard Test Methods for Fire Tests of Roof Coverings.
- 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.

1.04 SUBMITTALS FOR REVIEW

- A. Submit under provisions of Section 01010 Summary of Work.
- B. Product Data: Provide manufacturer's technical product data for each type of roofing product specified. Include independent data substantiating that materials comply with specified requirements.
 - 1. Roofing Membrane Base Ply Sheet.
 - 2. Roofing Membrane Ply Sheet.
 - 3. Roof Flashing Base Ply Sheet.
 - 4. Roof Flashing Membrane Ply Sheet.
- C. Samples: Submit one (1) sample of the following:
 - 1. A one pound sample of roofing aggregate.
- D. Specimen Warranty: Provide an unexecuted copy of the warranty specified for this project, identifying the terms and conditions required of the manufacturer and the MWW.

1.05 SUBMITTALS FOR INFORMATION

- A. Submit under provision of Section 01010 Summary of Work.
- B. Manufacturer's Installation Instructions: Submit installation instructions and recommendations indicating special precautions required for installing the membrane.
- C. 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.
- D. Manufacturer's Certificate: Certify that the roof system is adhered properly to meet or exceed the requirements of FM 1-90. The maximum wind speed coverage shall be peak gusts of 55 mph measured at 33 feet above ground level. Certification is required with bid submittal indicating the manufacturer has reviewed and agreed to such wind coverage.

- E. Manufacturer's Certificate: Certify that the roof system furnished is accepted by Factory Mutual Approval Standard 4470.
- F. Manufacturer's Certificate: Certify 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.
- G. Manufacturer's Certificate: Submit a certified copy of the roofing manufacturer's ISO 9001 compliance certificate.
- H. Test Reports: Submit test reports, prepared by an independent testing agency, for all modified bituminous sheet roofing, indicating compliance with ASTM D5147.
- I. Written certification from the roofing system manufacturer certifying the applicator is currently authorized for the installation of the specified roof system.
- J. Design Loads: Submit copy of manufacturer's minimum design load calculations according to ASCE 7-02, Method 2 for Components and Cladding, sealed by a registered professional engineer.
- K. Qualification data for firms and individuals identified in Quality Assurance Article in Part 1.07 of this Section.

1.06 CONTRACT CLOSEOUT SUBMITTALS

- A. General: Comply with requirements of Section 01700 Contract Closeout.
- B. Guarantee: Provide guarantee for the project, executed by the authorized agent of the Waterproof Membrane Manufacturer.
- C. Roofing Maintenance Instructions. Provide a manual of manufacturer's recommendations for maintenance of installed roofing systems.

1.07 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with not less than 12 years documented experience and have ISO 9001 certification. Contractor shall provide written evidence of certification upon request.

- B. **Installer Qualifications:** Company specializing in modified bituminous roofing installation with not less than five years' experience and authorized by roofing system manufacturer as qualified to install manufacturer's roofing materials. The roof systems must be applied only by those contractors who have received approval from the material manufacturer who is issuing the system warranty for such installations. No guarantees will be issued when installation has been performed by a contractor that has not been approved.
- C. **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. Maintain proper supervision of workmen.
 - 1. Maintain a copy of the Contract Documents in the possession of the Supervisor/Foreman and on the roof at all times.
- D. **Manufacturer Representation:** The manufacturer shall have a representative, who is a full-time employee of the company, on site a minimum of four (4) days per week to verify compliance with the specifications, answer questions that may arise and provide on-going inspection services. The manufacturer's representative shall provide the City's Project Engineer with photographs of the work and daily progress reports.
- E. **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.
 - 1. Submit manufacturer's written approval of secondary components in list form. The written approval shall be signed by an authorized agent of the manufacturer. These components shall be covered by the roof manufacturer's 30-year No Dollar Limit (NDL) roof system guarantee.

1.08 PRE-CONSTRUCTION MEETING

- A. **Pre-Construction Conference:** Convene a meeting approximately 10 days after Notice to Proceed is issued. Pre-construction meeting will be held at the job site.
- B. Require attendance of installer of each component of associated work, installers of deck or substrate construction to receive roofing work, installers of rooftop units and other work in and around roofing which must precede or follow roofing work, including mechanical work if any, MWW, roofing system manufacturer's representative, and other representatives directly concerned with performance of the Work.

- C. Objectives of conference include:
1. Review foreseeable methods and procedures related to roofing work, including set up and mobilization areas for stored material and work area.
 2. Tour representative areas of roofing substrates, inspect and discuss condition of substrate, roof drains, curbs, penetrations and other preparatory work performed by others.
 3. Review structural loading limitations of deck and inspect deck for loss of flatness and for required attachment.
 4. Review roofing system requirements, drawings, specifications and other contract documents.
 5. Review required submittals both completed and yet to be completed.
 6. Review and finalize construction schedule related to roofing work and verify availability of materials, installer's personnel, equipment and facilities needed to make progress and avoid delays.
 7. Review required inspection, testing, certifying and material usage accounting procedures.
 8. Review weather and forecasted weather conditions and procedures for coping with unfavorable conditions, including possibility of temporary roofing (if not mandatory requirement).
 9. Record discussion of conference including issues, decisions and agreements reached and furnish copy of record to each party attending. If substantial disagreements exist at conclusion of conference, determine how disagreements will be resolved and set date for reconvening conference.
 10. Review notification procedures for weather or non-working days.
- D. The MWW's Representative will record the proceedings and promptly distribute them to the participants for record.
- E. The intent of the conference is to resolve issues affecting the installation and performance of roofing work. Do not proceed with roofing work until such issues are resolved to the satisfaction of the City. This shall not be construed as interference with the progress of Work on the part of the City.
- F. See Section 01039 Coordination and Meetings for additional information.

1.09 DELIVERY, STORAGE AND HANDLING

- A. Deliver products to site with seals and labels intact, in manufacturer's original containers, dry and undamaged.
- B. Store and handle roofing sheets in a dry, well-ventilated, weather-tight place to prevent moisture exposure. Store rolls of felt and other sheet materials on pallets or other raised surface. Stand all roll materials on end. Cover rolled goods with a canvas tarpaulin or other breathable material (not polyethylene).
- C. Do not leave unused materials on the roof overnight or when roofing work is not in progress unless protected from weather and other moisture sources.
- D. Secure all material and equipment on the job site. If any material or equipment is stored on the roof, assure that the integrity of the deck is not compromised at any time. Damage to the deck caused by the contractor's actions shall be the sole responsibility of the contractor and shall be repaired or replaced at his expense.

1.10 INSPECTIONS

- A. When the project is in progress, the roofing system manufacturer as part of the daily progress report (see Part 1.07 QUALITY ASSURANCE, Item D) shall provide the following:
 - 1. Report progress and quality of the work as observed.
 - 2. Report to the City in writing any failure or refusal of the Contractor to correct unacceptable practices called to the contractor's attention.
 - 3. Confirm after completion that manufacturer has observed that no application procedures are in conflict with the specifications other than those that may have been previously reported and corrected.
 - 4. Provide the City Engineer of Record for this roofing project with a written statement that they will provide a daily site inspection that confirms the project is being constructed as specified, by an experienced, full time employee of the company.
- B. The contractor shall stop work at the following "stop points". Work shall only resume after the inspection has been made by the City and the work approved:
 - 1. After the modified membrane has been applied and prior to installing the floodcoat.
 - 2. After the vapor barrier has been installed and prior to installing the insulation.

1.11 PROJECT CONDITIONS

- A. Proceed with roofing work only when existing and forecasted weather conditions will permit unit of work to be installed in accordance with manufacturer's recommendations and warranty requirements.
- B. Do not apply roofing insulation or membrane to damp deck surface.
- C. Do not expose materials subject to water or solar damage in quantities greater than can be weatherproofed during same day.

1.12 SEQUENCING AND SCHEDULING

- A. Sequence installation of roofing with related units of work specified in other sections to ensure that roof assemblies including roof accessories, flashing, trim and joint sealers are protected against damage from effects of weather, corrosion and adjacent construction activity.
- B. Complete all roofing field assembly work each day. Phased construction shall not be accepted.

1.13 GUARANTEE

- A. Comply with provisions of Section 01010 – Summary of Work.
- B. Upon completion of installation, and acceptance by the City, the manufacturer will supply to the City a 30-year No Dollar Limit (NDL) roof system guarantee.
- C. A roofing guarantee is available for review from the material manufacturer for the roofing systems published in these specifications. The guarantee shall be issued only upon completion of all the guarantee requirements by an approved contractor. Such guarantees cannot be altered or amended, nor may any other warranties, guarantees or representations be made by an agent or employee of the material manufacturer unless such alteration, amendment or additional representation is issued in writing and is signed by a duly authorized officer of the material manufacturer, and sealed with the material manufacturer's seal. This guarantee does not cover cosmetic deficiencies.

PART 2 PRODUCTS

2.01 GENERAL

- A. Substitutions: The material product characteristics specified herein shall be regarded as the minimum standard of quality and performance for the work covered under this Section. Substitutions shall comply with all manufacturer and contractor/fabricator quality and performance criteria specified in Part 1. Products proposed as equal to the products specified herein shall be submitted in accordance with Bidding Requirements and Section 01600 Material and Equipment. The MWW's decision regarding substitutions will be considered final. Unauthorized substitutions will be rejected.

2.02 DESCRIPTION

- A. Modified bituminous roofing work including but not limited to:
1. Hot Bitumen: ASTM D312, Type III steep asphalt having the following characteristics:
 - a) Softening Point: 185°F - 205°F
 - b) Flash Point: 500°F
 - c) Penetration @ 77°F: 15-35 units
 - d) Ductility @ 77°F: 2.5 cm
 2. Vapor Barrier: Single ply, ASTM D4601, Type II.
 3. Insulation: Rigid polyisocyanurate and rigid fiberboard.
 4. Base Plies: Minimum three (3) plies of approved ASTM D2178, Type IV glass fiber roofing felt bonded to the prepared substrate with hot bitumen.
 5. Modified Membrane Ply: Single ply, 115 mil SBS and SIS (Styrene-Butadiene-Styrene and Styrene-Isoprene-Styrene) rubber modified membrane incorporating post consumer recycled rubber and reinforced with a super strong fiberglass and polyester composite scrim. Membranes proposed by other manufacturers not incorporating post consumer recycled rubber, but having equal performance characteristics in all other respects, shall be considered as equal.

- 6. Base Flashing Ply: Single ply of a double-coated polyester-fiberglass-polyester base sheet, covered by an additional layer of modified bitumen membrane and set in bitumen. See material specified for Base Flashing Ply.
- 7. Modified Membrane Flashing Ply: One ply. See material specified for Modified Membrane.
- 8. Ice and Water Shield: Waterproofing membrane composed of high density cross laminated polyethylene with rubberized asphalt adhesive backing.
- 9. Surfacing: Flood coat of Cold Process Coal Tar Pitch bitumen, and ASTM D1863 roofing aggregate consisting of pea gravel and white spar. Coal tar based bitumen having the following characteristics:
 - a) Flash Point 105°F
 - b) Viscosity (cps) 120,000
 - c) Solids Content 89% vol

2.03 BITUMINOUS MATERIALS

- A. Asphalt Primer: V.O.C. compliant, ASTM D41.
- B. Asphalt Roofing Mastic: V.O.C. compliant, ASTM 4586, Type II.
- C. Asphalt or Bitumen: ASTM D312, Type III.

2.04 SHEET MATERIALS

- A. Base Plies: Fiberglass Felts, ASTM D2178, Type IV
- B. Base Flashing Ply: Tri-Laminate Base Sheet, Double coated polyester-fiberglass-polyester scrim with the following minimum performance requirements according to ASTM D5147.

Tensile Strength (ASTM D2523)
 2 in/min. @ 73.4 ± 3.6°F MD 250 lbf/in CMD 250 lbf/in

Tear Strength (ASTM D4073)
 2 in/min. @ 73.4 ± 3.6°F MD 370 lbf CMD 370 lbf

Elongation at Maximum Tensile (ASTM D2523)
 2 in/min. @ 73.4 ± 3.6°F MD 6.0% CMD 6.0%

- C. Modified Membrane Ply (Finished Membranes): Conforming to ASTM D-6162, Type III Grade S.

Tensile Strength (ASTM D-5147)		
2 in/min. @ 73.4 ± 3.6°F	MD 700 lbf/in	CMD750 lbf/in
Tear Strength (ASTM D-5147)		
2 in/min. @ 73.4 ± 3.6°F	MD 1300 lbf	CMD 1400 lbf
Elongation at Maximum Tensile (ASTM D-5147)		
2 in/min. @ 73.4 ± 3.6°F	MD 6.0%	CMD 6.0%
Low Temperature Flexibility (ASTM D-5147):		
		Passes -30°F

- D. Modified Membrane Flashing Ply: Conforming to ASTM D-6162, Type III Grade S.

- E. Vapor Barrier: Conforming to ASTM D4601, Type II.

- F. Ice and Water Shield: Waterproofing membrane composed of high density cross laminated polyethylene with rubberized asphalt adhesive backing having the following characteristics:

Thickness, membrane (ASTM 3767)	40 mil
Tensile Strength (ASTM D412)	250 psi
Elongation, membrane (ASTM D412)	250%
Adhesion to plywood (ASTM D903)	3.0lbs/in., width
Low Temperature Flexibility (ASTM D1970)	Unaffected @ -20°F
Permeance, max (ASTME96)	0.05 Perms

2.05 SURFACINGS

- A. Flashings: Fibered Aluminum Roof Coating: Fibered aluminum roof coating having the following characteristics:

Flash Point	100°F min.
Weight/Gallon	8.2 lbs./gal.
Viscosity (75°F)	100 - 125 K.U.

- B. Roof Membrane: Coal Tar Protective Roof Coating: Heavy-bodied, fiber reinforced, cold process polymer modified coal tar roof coating having the following characteristics:

Weight/Gallon	9.0 lbs./gal.
Solids by weight	87%
Brookfield Heliopath, 2.5 rpm	120,000 cPs

- C. Roofing Membrane Surfacing Aggregate: Pea gravel to conform to ASTM D-1863.

2.06 RELATED MATERIALS

- A. Roof Insulation: In accordance with Section 07220.
- B. Nails and Fasteners: Non-ferrous metal or galvanized steel, 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. Nails and fasteners shall be flush-driven through flat metal discs of not less than 1-inch diameter. Omit metal discs when one-piece composite nails or fasteners with heads not less than 1-inch diameter are used.
- C. Metal Discs: Flat discs or caps of zinc-coated sheet metal not lighter than 28-gauge and not less than 1-inch in diameter. Form discs to prevent dishing. Bell or cup shaped caps are not acceptable.
- D. Urethane Sealant: One part, non-sag sealant as recommended and furnished by the membrane manufacturer for moving joints.

1.	Tensile Strength (ASTM D412)	250 psi
2.	Elongation (ASM D412)	950%
3.	Hardness, Shore A (ASTM C920)	35
4.	Adhesion-in-Peel (ASTM C920)	30 lbf
- E. Butyl Tape: 100% solids, asbestos free and compressive tape designed to seal as recommended and furnished by the membrane manufacturer. When used with a termination bar, the butyl tape shall be the same width as the termination bar.

- F. Non-Shrink Grout: Use an all weather fast setting chemical action concrete material to fill pitch pans.
1. Flexural Strength (ASTM C-78 (modified)) 7 days 1100 psi\
 2. High Strength (ASTM C-109(modified)) 24 days 8400 lbs
(3810 kg)
- G. Pitch Pocket Sealer: Two-part, 100% solids, self leveling, polyurethane sealant for filling pitch pans as recommended and furnished by the membrane manufacturer.
1. Durometer (ASTM D2240) 40-50 Shore
 2. Elongation (ASTM D412) 250%
 3. Tensile Strength (ASTM D412) 200@100 mil
- H. Pitch Pans: Rain Collar, 24 gauge stainless steel. All joints should be welded/soldered watertight. See details for design and additional requirements; Four inch minimum width.
- I. Roof Drains: If required, the drain system shall match existing and be recommended by the membrane manufacturer.
- J. Drain Flashings should be 4-lbs/sq ft. sheet lead; formed and rolled.
- K. Cants: Asphalt Impregnated Wood Fiberboard.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Verify that deck and parapet surfaces are properly prepared in accordance with Manufacturer's recommendations and ready to receive work of this section and project conditions are suitable before proceeding with the work.
- B. Verify that deck is supported and secured to structural members.
- C. Verify that deck is clean and smooth, free of depressions, projections or ripples, and is properly sloped to drains. Cracks or spalling concrete larger in width than 0.25" must be repaired with latex filler.
- D. Verify that deck surfaces are dry and free of snow or ice.

- E. Verify that openings, curbs, pipes, conduit, sleeves, ducts, and other items, which penetrate the roof, are set solidly, and that cant strips, nailing strips, and reglets are set in place.
- F. Verify that openings in deck shall not allow asphalt to drip or seep inside the building.

3.02 GENERAL INSTALLATION REQUIREMENTS

- A. Roof system shall be installed per the design load calculations according to ASCE 7-02, Method 2 for Components and Cladding as calculated by the modified membrane manufacturer.
- B. Cooperate with manufacturer, inspection and test agencies engaged or required to perform services in connection with installing the roof system.
- C. Pumping equipment shall be located on the ground at a safe distance from building; the location being subject to the approval of the City. The contractor shall be responsible for guarding against fires, and shall provide suitable fire extinguishers conveniently located at the site. A minimum of two fire extinguishers and "Fire Out" must be adjacent to the kettle.
- D. Protect other work and property from spillage of roofing materials and prevent materials from entering or clogging drains and conductors. Replace or restore other work damaged by installation of the modified bituminous roofing system.
- E. Coordinate installation of roofing system components so that insulation and roofing plies are not exposed to precipitation or left exposed overnight. Provide cut-offs at end of each day's work to cover exposed ply sheets and insulation with two plies of #15 organic roofing felt set in full moppings of bitumen and with joints and edges sealed with asphalt roofing mastic. Remove cut-offs immediately before resuming work.
- F. Asphalt Bitumen Heating: Heat and apply bitumen in accordance with the Equiviscous Temperature (EVT) Method as recommended by National Roofing Contractors Association (NRCA). Do not raise temperature above minimum normal fluid-holding temperature necessary to attain EVT (plus 5°F at point of application) more than one hour prior to time of application. Determine flash point, finished blowing temperature, EVT, and fire-safe handling temperature of bitumen either from information by manufacturer or by suitable test.
 - 1. Do not exceed recommended temperature limits during bitumen heating. Do not heat to a temperature higher than 25° below flash point.

2. Discard bitumen that has been held at temperature exceeding Finishing Blowing Temperature (FBT) for more than 3 hours. Keep kettle lid closed except when adding bitumen.

G. Bitumen Mopping Rate:

1. Interply Mopping: Apply bitumen at the rate of approximately 25 lbs. of bitumen per roof square.
2. Modified Membrane Mopping: Apply bitumen at the rate of approximately 30 lbs. of bitumen per roof square.
3. Flood Coat: Apply bitumen at the rate of approximately 60-70 lbs. of bitumen per square (plus or minus 25% percent on a total job average basis).

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

I. Apply roofing materials as specified by manufacturer's instructions.

1. Keep roofing materials dry before and during application.
2. Do not permit phased construction.
3. Complete application of roofing plies, modified sheet and flashing in a continuous operation.
4. Begin and apply only as much roofing in one day as can be completed that same day.

J. Verify that roof drains have plugs installed in them before starting the day's work. Verify that plugs have been removed after the day's work has been completed. Plugs shall eliminate any opportunity for roofing materials or debris to enter the roof drain piping.

3.03 VAPOR BARRIER INSTALLATION

- A. Fiberglass Plies: Install single ply vapor barrier ply sheet, see Section 07520, Item A.2, in 25 lbs. per square of bitumen shingled uniformly to achieve two plies over the entire prepared substrate. Shingle in direction of slope of roof to shed water on each area of roof.
- B. Lap ply sheet ends 8-inches. Stagger end laps 12-inches minimum.
- C. Lightly broom in fiberglass plies to assure complete adhesion.

- D. Extend ply 2 inches beyond top edges of cants at wall and roof projections and equipment bases.
- E. Install base flashing ply to all perimeter and projection details. Properly seal all curbs penetrations and perimeter, prior to application of remaining roof.

3.04 INSULATION INSTALLATION

- A. Refer to Section 07220 Roof Deck and Insulation.
- B. Insulation: 4" layer of flat polyisocyanurate hot mopped in type III asphalt over vapor barrier. Fully adhere asphalt impregnated high density wood fiberboard insulation in solid moppings of hot type III asphalt.
- C. Insulation attachment: Hot type III asphalt.

3.05 BASE PLIES INSTALLATION

- A. Fiberglass Plies: Install three fiberglass ply sheets in 25 lbs. per square of bitumen shingled uniformly to achieve three plies over the entire prepared substrate. Shingle in direction of slope of roof to shed water on each area of roof. Do not step on felt rolls until asphalt has cooled, fish mouths should be cut and patched.
- B. Lap ply sheet ends 8-inches. Stagger end laps 12 inches minimum.
- C. Lightly broom in fiberglass plies to assure complete adhesion.
- D. Extend plies, 2 inches beyond top edges of cants at walls, roof projections and equipment bases.
- E. Install base flashing ply to all perimeter and projection details after membrane application.

3.06 MODIFIED MEMBRANE APPLICATION

- A. Solidly bond the modified membrane to the base layers with specified asphalt at the rate of 30 lbs. per 100 square feet.
- B. The modified membrane roll must push a puddle of asphalt in front of it with asphalt slightly visible at all side laps. Exercise care during application to eliminate air entrapment under the membrane.
- C. Apply pressure to all seams to ensure that the laps are solidly bonded to substrate.

- D. Install subsequent rolls of modified membrane across the roof as above with a minimum of 4-inch side laps and 8-inch end laps. Stagger the end laps. Apply the modified membrane in the same direction as the previous layers but stagger the laps so they do not coincide with the laps of the base layers.
- E. Apply asphalt no more than 5 feet ahead of each roll being embedded.
- F. Extend membrane beyond top edge of cants at wall up to existing nailer; all other cants, minimum 2 inches beyond, in full moppings of the specified asphalt.

3.07 FLASHING MEMBRANE INSTALLATION

- A. Seal all curb, wall, and parapet flashings with an application of asphalt roofing 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.
- B. Prepare all walls, penetrations, expansion joints and where shown on the drawings to be flashed with asphalt primer at the rate of 100 square feet per gallon. Allow primer to dry tack free.
- C. Use the modified membrane as the flashing membrane. Adhere to the underlying base flashing ply with specified asphalt unless otherwise noted in these specifications. Nail off at a minimum of 8 inches on center from the finished roof at all vertical surfaces.
- D. Solidly adhere the entire sheet of flashing membrane to the substrate. Tops of all flashings that are not run up and over curb shall be secured through termination bar and butyl tape every 6 inches. Top of termination bar shall be sealed with urethane sealant.
- E. Seal all vertical laps of flashing membrane with a three-course application of asphalt roofing mastic and fiberglass mesh. The three-course application shall be applied in the following manner:
 - 1. First, apply a minimum 3/16-inch thick and 8-inch wide layer of Asphalt Roofing Mastic.
 - 2. Second, fully imbed one layer of woven fiberglass mesh into Asphalt Roofing Mastic. Woven fiberglass mesh shall be a minimum of 6-inches wide.
 - 3. Finally, apply a minimum 3/16-inch thick and 8-inch wide layer of Asphalt Roofing Mastic. After the final layer of Asphalt Roofing Mastic has been applied, no fiberglass mesh shall be visible.

- F. Coordinate counter flashing, cap flashings, expansion joints, and similar work with modified bitumen roofing work as specified in other sections.
- G. Coordinate roof accessories, miscellaneous sheet metal accessory items, including piping vents and other devices with the roofing system work as specified in other sections.
- H. Reglet Mounted Counterflashing:
 - 1. Minimum flashing height is 8 inches above finished roof height. Maximum flashing height is 24 inches, (see Contract Drawings for details).
 - 2. Set cant in bitumen. Run all field plies over cant a minimum of 2 inches.
 - 3. Install base flashing ply covering wall set in bitumen with 6 inches onto field of roof.
 - 4. Install a second ply of modified flashing ply over the base flashing ply, 9-inches onto the field of the roof. Apply a three-course application of asphalt roofing mastic and fiberglass mesh at all vertical seams and allow to cure and aluminize.
 - 5. Apply butyl tape to wall behind termination bar. Secure termination bar, through flashing, butyl tape, and into nailer, 8 inches on center.
 - 6. Install ice and water shield, self-adhering roofing underlayment, over parapet wall. See Part I. Item 3.
 - 7. Secure extended counterflashing with expansion fasteners; coping cap anchor chair shall overlap counterflashing.
- I. Ice and Water Shield
 - 1. Clean parapet surface to receive ice and water shield, removing all dirt and debris. Cracks or spalling concrete larger in width than .25" must be repaired with latex filler.
 - 2. Prime surface with Manufacturer's recommended concrete primer.
 - 3. Install water and ice shield in according to Manufacturer's instructions. Extend underlayment 3 inches down outer face of wall and approximately 14 inches down roof side face of wall, enough to overlap flashing plies and termination bar at nailer. Overlap ends a minimum of 6 inches.

J. Roof Drain:

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

K. Plumbing stack:

1. Minimum stack height should be 12-inches above modified membrane, 6-inches above metal coping cap on parapet wall, unless noted otherwise on the Contract Drawings. If stack height is less than the required minimum, the Contractor shall extend with an appropriate length of PVC pipe, Fernco coupling and hose clamps. Provide Fernco's recommended series of coupling for connecting PVC to the stack.
2. Seal the base of the stack with asphaltic roofing mastic.
3. Install prefabricated interlocking pitch pocket system, according to manufacturer's recommendations.
4. Place a watershedding type, sheet metal, rain bonnet over the top of the pitch pocket and clamp the top with a drawband collar. Caulk the upper edge of the band with an elastomeric sealant. See Contract Drawings for details.

3.08 APPLICATION OF SURFACING

A. Aggregate Surfacing:

1. Apply surfacing materials in the quantities specified 500 lbs. per square for aggregate. Uniformly embed aggregate in a flood coat of bitumen at a rate of 70 lbs. per square coverage after felt flashings, tests, repairs, and corrective actions have been completed and approved.

3.09 FIELD QUALITY CONTROL

- A. Perform field inspection and testing as required under provisions of Division 01 Section Quality Requirements.
- B. Correct defects or irregularities discovered during field inspection.
- C. Require attendance of roofing materials manufacturers' representatives at site during installation of the roofing system. A copy of the specification should also be on site at all times.

3.10 CLEANING

- A. Remove bitumen adhesive drippings from all walls, windows, floors, ladders and finished surfaces.
- B. In areas where finished surfaces are soiled by asphalt or any other sources of soiling caused by work of this section, consult manufacturer of surfaces for cleaning instructions and conform to their instructions.
- C. Repair or replace defaced or disfigured finishes caused by work of this section.
- D. Remove and properly dispose of waste products generated during roofing procedures. Comply with requirements of authorities having jurisdiction.

3.11 FINAL INSPECTION

- A. At completion of roofing installation and associated work, meet with contractor, installer, installer of associated work, City, roofing system manufacturer's representative, and other representatives directly concerned with performance of roofing system.

- B. Walk roof surface areas of the building, inspect perimeter building edges as well as flashing of roof penetrations, walls, curbs and other equipment. List all items requiring correction or completion and furnish copy of list to each party in attendance.
- C. The roofing system manufacturer reserves the right to request a thermographic scan of the roof during final inspection to determine if any damp or wet materials have been installed. The thermographic scan shall be provided by the contractor.
- D. If core cuts verify the presence of damp or wet materials, the contractor shall be required to replace the damaged areas at his own expense.
- E. Repair or replace deteriorated or defective work found at time above inspection as required to produce an installation which is free of damage and deterioration at time of Substantial Completion and according to warranty requirements.
- F. Notify the City upon completion of corrections.
- G. Following the final inspection, provide written notice of acceptance of the installation from the roofing system manufacturer.
- H. Immediately correct roof leakage during construction. If the contractor does not respond within 24 hours, the City will exercise its right to correct the work under the terms of the conditions of the contract.

END OF SECTION

SECTION 07555**COLD APPLIED ELASTOMERIC PROTECTED MEMBRANE****PART 1 GENERAL****1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the contract, including General & Supplementary Conditions and Division 1 Specification Sections, apply to this section.

1.02 SUMMARY

- A. This section includes the following summary of work to be performed (Roof "U"):
1. Removal and disposal of the existing roof system components where indicated.
 2. Preparation of concrete substrate.
 3. Installation of new temporary roof / vapor barrier
 4. Installation of new cant strips.
 5. Installation of tapered insulation saddles.
 6. Installation of new single ply adhered protected membrane roofing system, cold applied with polymer modified adhesive.
 7. Install specified flashings adhered with required materials and mastics.
 8. Application of aluminum coating to all flashings and projections.
 9. Installation of drainage board.
 10. Installation of new concrete capped, interlocking polystyrene insulation panels.
 11. Installation of required metal trims per specifications.
- B. Related Sections include the following:
1. Section 06100 "Rough Carpentry" for wood nailers, cants, curbs, and blocking.

2. Section 07600 "Flashing and Sheet Metal" for metal roof penetration flashings, termination bars, and counterflashings.

1.02 DEFINITIONS

- A. Roofing Terminology: Refer to ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this section.
- B. Hot Roofing Asphalt: Roofing asphalt heated to its equiviscous temperature, the temperature at which its viscosity is 125 centipoise for mopping application and 75 centipoise for mechanical application, within a range of plus or minus 25°F (14°C), measured at the mop cart or mechanical spreader immediately before application.

1.03 PERFORMANCE REQUIREMENTS

- A. General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.
- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing manufacturer based on testing and field experience.

1.04 SUBMITTALS (Upon Request)

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For roofing system. Include tapered insulation plans, elevations, sections, details, and attachments to other Work.
 1. Base flashings, cants, and membrane terminations.
- C. Samples for verification: For the following products for review upon request of the Owner:
 1. 12" x 8" (300-by-200-mm) square of base ply sheet (vapor barrier).
 2. 12" x 8" (300-by-200-mm) square of membrane sheeting.
 3. Pull sample of polymer modified adhesive material specified.
 4. 12" x 8" (300-by-200-mm) square of drainage board material.
 5. Singular insulated panel as specified (24" x 48").

- D. Installer Certificates: Signed by roofing system manufacturer certifying that installer is approved, authorized, or licensed by manufacturer to install roofing system.
- E. Manufacturer Certificates: Signed by roofing manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" article.
 - 1. Submit evidence of meeting performance requirements.
- F. Qualification Data: For installer and manufacturer.
- G. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for components of roofing system.
 - 1. Indicate that bulk roofing asphalt materials delivered to project comply with requirements. Include quantity, statistical and descriptive data for each product. Submit certificate with each load before it is used.
 - 2. Include continuous log showing time and temperature for each load of bulk asphalt, indicating date obtained from manufacturer, where held, and how transported before final heating and application on roof.
- H. Research/Evaluation Reports: For components of roofing system.
- I. Maintenance Data: For roofing system to include in maintenance manuals.
- J. Warranties: Special warranties specified in this Section.
- K. Inspection Report: Copy of roofing system manufacturer's inspection reports of completed roofing installation.

1.05 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's warranty.
- B. Manufacturer Qualifications: A qualified manufacturer that has UL listing for roofing system identical to that used for this project.
- C. Manufacturer Qualifications: Proof of ISO 9001 quality certification or proof of similar quality standard level for the primary roof manufacturer providing the warranty for the roof system and major roofing components.

- D. Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.
- E. Source Limitations: Obtain components for roofing system from or approved by primary roofing system manufacturer providing the roof warranty.
- F. Fire-Test-Response Characteristics: Provide roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, FMG, or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.
 - 1. Exterior Fire-Test Exposure: Class A; ASTM E 108, for application and roof slopes indicated.
 - 2. Fire-Resistance Ratings: ASTM E 119, for fire-resistance-rated roof assemblies of which roofing system is a part.
- G. Pre-construction Conference: Conduct conference at project site. Comply with requirements in Division 1, Section 01039 "Coordination and Meetings". Review methods and procedures related to roofing system including, but not limited to, the following:
 - 1. Meet with owner, roofing Installer, roofing system manufacturer's representative, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
 - 2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
 - 3. Review and finalize construction schedule and verify availability of materials, installer's personnel, equipment, and facilities needed to make progress and avoid delays.
 - 4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
 - 5. Review structural loading limitations of roof deck during and after roofing.
 - 6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.

7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storage as stated in Division 1, Section 01600 "Material and Equipment".
- B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
 1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.07 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

1.08 WARRANTY

- A. Product Warranty (Manufacturer): Manufacturer's standard form, without monetary limitation, in which manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period. Failure includes roof leaks.
 1. Product warranty includes roofing membrane, base flashings, roofing membrane accessories, roof insulation, fasteners, cover boards and other components of roofing system.

2. Warranty Period: 20 years from date of manufacturer’s acceptance of roofing system installation.
 3. Peak Wind Coverage: Up to 74 miles per hour.
- B. Materials and Workmanship Warranty (Contractor): Submit roofing installer's warranty, on warranty form at end of this section, signed by installer, covering work of this section, including all components of roofing system such as roofing membrane, base flashing, roof insulation, fasteners, and vapor retarders, for the following warranty period:
1. Warranty Period: Five (5) years from date of final acceptance of work.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following: The primary roof system “Basis of Design” specification is based upon the manufacturer’s materials and roof systems.
- C. The intent of the specification package is to establish minimum acceptable quality and performance standards for the finished roof replacement project. Subject to compliance with all requirements, any manufacturer meeting or exceeding the specifications will be considered as a substitute.
- D. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
 1. Products: Subject to compliance with requirements, provide one of the products specified.

2.02 BASE-SHEET MATERIALS (Base sheet for vapor barrier)

- A. Base Sheet: Trilaminate reinforced ply sheet, complying with ASTM D 4601-91; ASTM 228-90A and ASTM 146-90 with the following properties:

1. Thickness: 1.2 mm
2. Breaking strength: 220 lbf/in(38.5 kN/M) MD.
235 lbf/in (41.1 kN/m) XMD.
3. Elongation: 6.5% MD/XMD.
4. Tear Strength: 345 lbf (1534 N) MD.
330 lbf (1467 N) XMD minimum.
5. Mass of desaturated polyester/glass/polyester mat, min.:
3.5 lb/100ft (172 g/m²).
6. Asphalt: 10.0 lb/100 ft (485g/m²) minimum.
7. Recycled Content Materials: 10% minimum.

2.03 ROOFING MEMBRANE SHEETING

- A. Roof Membrane: SBR-modified EPDM, polyester reinforced, meeting ASTM D4637; reinforced, conforming to the following criteria:
1. Breaking Strength, minimum, ASTM D751: machine direction, 325 lbf; cross machine direction, 290 lbf.
 2. Tear Strength, minimum ASTM D 751: machine direction 311 N (70 lbf); cross machine direction 348 N (78 lbf).
 3. Elongation at Failure: ASTM D 751: 25 percent minimum.
 4. Low Temperature Flexibility, minimum, ASTM D 2136: -40 deg. C (-40 deg. F).
 5. Thickness, minimum, ASTM D 751: 1.14 mm (0.045 inch).
 6. Weight: ASTM D228: 1.3 kg/sq. m. (4.5 oz/sq. ft.).

2.04 FLASHING MATERIALS

- A. Backer Sheet: Trilaminate reinforced ply sheet, complying with ASTM D 4601-91; ASTM 228-90A and ASTM 146-90 with the following properties:
1. Thickness: 1.2 mm

2. Breaking strength: 220 lbf/in(38.5 kN/M) MD.
235 lbf/in (41.1 kN/m) XMD.
 3. Elongation: 6.5% MD/XMD.
 4. Tear Strength: 345 lbf (1534 N) MD. 330 lbf (1467 N) XMD minimum.
 5. Mass of desaturated polyester/glass/polyester mat, min.:
3.5 lb/100ft (172 g/m²).
 6. Asphalt: 10.0 lb/100 ft (485g/m²) minimum.
 7. Recycled Content Materials: 10% minimum.
- B. Flashing Sheet: Roof Membrane: SBR-modified EPDM, polyester reinforced, meeting ASTM D4637; reinforced, conforming to the following criteria:
1. Breaking Strength, minimum, ASTM D751: machine direction, 325 lbf; cross machine direction, 290 lbf.
 2. Tear Strength, minimum ASTM D 751: machine direction 311 N (70 lbf); cross machine direction 348 N (78 lbf).
 3. Elongation at Failure: ASTM D 751: 25 percent minimum.
 4. Low Temperature Flexibility, minimum, ASTM D 2136: -40 deg. C (-40 deg. F).
 5. Thickness, minimum, ASTM D 751: 1.14 mm (0.045 inch).
 6. Weight: ASTM D228: 1.3 kg/sq. m. (4.5 oz/sq. ft.).
- C. Glass-Fiber Fabric: Woven fiberglass glass cloth, treated with asphalt, complying with ASTM D 1668, Type I.

2.05 ADHESIVE MATERIALS

- A. Water based, polymer modified, asphalt primer:
1. ASTM D2823: Nonvolatile content: 32%
 2. ASTM D 1475-98: Density @ 77 degrees F: 8.5 lbs / gal
 3. ASTM D 562-82: Viscosity 50 KU
- B. Roofing Asphalt: ASTM D 312, Type III.

- C. Membrane Adhesive: Single component, bitumen modified moisture curing polyurethane adhesive.

2.06 AUXILIARY ROOFING MEMBRANE MATERIALS

- A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with roofing system.
- B. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required by roofing system manufacturer for application.
- C. Mastic Sealant: Single component roof elastomer, polymer modified. Non-hardening, non-migrating, non-skinning, and non-drying or required mastic as required by primary roofing manufacturer.
- D. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FM 4470; designed for fastening roofing membrane components to substrate; tested by manufacturer for required pullout strength; and acceptable to roofing system manufacturer.
- E. Metal Flashing Sheet: Metal flashing sheet is specified in Section 07600 "Flashing and Sheet Metal."
- F. Miscellaneous Accessories: Provide miscellaneous accessories recommended by roofing system manufacturer.
- G. Water Cutoff Mastic: Manufacturer's recommended butyl mastic sealant
- H. Protective Coating for Exposed Membrane Flashings: Fibrated, Aluminum Coating meeting ASTM D 2824 Type III.
- I. Drainage Board: Polyethylene drainage core with non polypropylene filter fabric bonded to both sides of the assembly.
 - 1. Post Industrial Recycled Content: 30%
 - 2. Thickness: ¼" Thick
 - 3. Roll Dimension: 4' x 75'

2.07 ROOF INSULATION

- A. General: Provide preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.

- B. Concrete Capped, Extruded Polystyrene Panels: ASTM C 578-92,
1. Manufacturers: As recommended by roof system manufacturer /warranty provider.
 2. Insulation Size / Thickness: 24" width x 48" length; 3/8" Concrete Facer + 3.0" Insulation (3 3/8" Total thickness).
 3. R Value: 5.0 / Inch
 4. Compressive Strength: ASTM 1621-79; 40 lbs / inch
 5. Water Absorption: ASTM D2842-90; Less than 0.1
 6. Permeability: ASTM E96-95; 0.8
- C. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, felt or glass-fiber mat facer on both major surfaces.
1. Manufacturers: As recommended by Roof System Manufacturer / Warranty Provider.
 2. Tapered Insulation Saddles
 - A. Slope: 1/4" per foot;
 - b. Minimum thickness: 1/2"
- D. Cover-board Insulation (Over Saddles Only): Densdeck Prime Roof Insulation
1. Size / Thickness: 48" x 48" x .25" thick.
- E. Tapered Wedge Board: ASTM C 208, Type II, Grade 1, cellulosic-fiber insulation board, 6 Side Asphalt Coated.
1. Variable Thickness and Width.

PART 3 EXECUTION

3.01 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with the following requirements and other conditions affecting performance of roofing system:

1. Verify that roof openings and penetrations are in place and set and braced and that roof drains are securely clamped in place.
2. Verify that existing or any required new wood cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Inspect the condition of parapet walls and correct any deteriorated conditions.
- C. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.
- D. Seal deck joints with 6" – 12" strips of asphalt coated, fiberglass base sheet set in asphalt mastic over all joints.
- E. Prime deck with water based, asphalt primer at a minimum rate of 200 square feet per gallon.

3.03 ROOFING MEMBRANE INSTALLATION, GENERAL

- A. Install roofing membrane system according to roofing system manufacturer's written instructions and applicable recommendations of ARMA/NRCA's "Quality Control Guidelines for the Application of Built-up Roofing."
- B. Start installation of built-up roofing membrane in presence of roofing system manufacturer's technical personnel.
- C. Cooperate with testing and inspecting agencies engaged or required to perform services for installing built-up roofing system.
- D. Coordinate installing roofing system components so insulation and roofing membrane sheets are not exposed to precipitation or left exposed at the end of the workday or when rain is forecast.

1. Provide tie-offs at end of each day's work to cover exposed roofing membrane sheets and insulation with a course of coated felt set in roofing cement or hot roofing asphalt with joints and edges sealed.
 2. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
 3. Remove and discard temporary seals before beginning work on adjoining roofing.
- E. Apply membrane adhesive directly to the substrate by squeegee and cross-roll with a long nap roller to uniform thickness of approximately 60 mils or according to roofing system manufacturer's written instructions. Overlap previous day's work 6" minimum.
- F. Vertical grade adhesive shall be applied with a trowel.
- G. Substrate-Joint Penetrations: Prevent roofing asphalt from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.
- H. Broom Felts / Membrane: Fully broom felts where required to ensure proper adhesion of plies.

3.04 VAPOR BARRIER INSTALLATION

- A. Install one lapped course of waterproof, polyester reinforced base sheet, extending sheet over and terminating beyond cants. Attach base sheet as follows:
1. Adhere to substrate in a solid mopping of hot Type III roofing asphalt.
- B. Install base sheet starting at low point of roofing system. Align ply sheets without stretching. Shingle in direction to shed water. Extend base sheet over and terminate beyond cants.
1. Embed each base sheet in a solid mopping of hot asphalt applied at rate required by roofing system manufacturer, to form a uniform membrane.

3.05 ROOF MEMBRANE INSTALLATION

- A. Apply primer to vapor barrier substrate in accordance with manufacturer's written instructions for system specified. Allow to dry.
- B. Apply membrane to manufacturer's written instructions.

- C. Roll out membrane, free from air pockets, wrinkles or tears. Firmly press sheet into place without stretching.
- D. Adhere to substrate in a uniform coating of cold- applied adhesive applied at a rate of 3.0 gallons / 100 square feet.
- E. Overlap edges and ends and seal by membrane lap adhesive, minimum 3". Seal permanently waterproof.
- F. Reinforce membrane seams. Apply seam reinforcing fabric overlay in membrane reinforcement adhesive minimum 4" wide over seam.
- G. Shingle joints on sloped substrate in direction of drainage.
- H. Extend membrane up cant strips a minimum of 4" vertically.
- I. Seal around all roof penetrations.

3.06 FLASHING AND STRIPPING INSTALLATION

- A. Install flexible base flashing over cant strips and other sloping and vertical surfaces, at roof edges, and at penetrations through roof, and secure to substrates according to roofing system manufacturer's written instructions and as follows:
 - 1. Prime substrates with asphalt primer if required by roofing system manufacturer.
 - 2. Extend the flashing up vertical surfaces a minimum of 8 inches, where possible, above the finished roof membrane surface. Extend the flashing onto the finished roof surface a minimum of 6 inches.
 - 3. Adhere the flashings to the substrate with vertical grade, single component, bitumen modified, moisture curing polyurethane adhesive.
 - 4. Terminate the top of the flashing with aluminum termination bar fastened every 12" OC minimum.
 - 5. Seal the termination bar flashing with polyurethane sealant and tool neatly.
 - 6. Seal and reinforce the vertical seams with a three course seal of a 4" reinforcement fiberglass mesh and polymer modified mastic.
 - 7. Seal the flashing base onto the field membrane with a three course seal of 6" reinforcement fiberglass mesh polymer modified mastic. Cover with polyethylene sheeting strips.

8. Allow all mastics and adhesives to cure 2 days.
 9. Coat all roof flashings with specified aluminum coating.
- B. Roof Drains: Clamp roofing membrane into roof-drain clamping ring.
1. Provide and install new drain hardware (bolts, nuts, washers) to all drain assemblies.
 2. Provide and install cast iron drain strainers to the existing drain rings if missing or damaged.

3.07 DRAINAGE BOARD INSTALLATION

- A. Starting at the low end of the horizontal deck, roll out and place water drain over the finished roof membrane.
- B. Overlap the top of the fabric onto the adjacent sheets of the water drain in the direction of water flow.

3.08 CONCRETE CLAD INSULATION BOARD INSTALLATION

- A. Place concrete panels on the roof, interlocking in place with rows staggered 24". Butt in close contact. Panels shall be installed away from the perimeter walls a minimum of 8" away and in-filled with 2" smooth river rock flush to the panels.
- B. Pre-cut round or square holes neatly around roof projections.
- C. Place and fit perimeter restraints to minimize movement of insulation boards. Install restraints across corners and roof penetrations to manufacturer's recommendations.

3.09 FIELD QUALITY CONTROL

- A. Testing Agency: Owner and primary manufacturer reserve the right to engage a qualified independent testing and inspecting agency to perform roof tests and inspections and to prepare test reports.
- B. Test Cuts: Before flood coating and surfacing built-up roofing membrane, the Owner reserves the right to test specimens will be removed to evaluate problems observed during quality-assurance inspections of roofing membrane as follows:
1. Approximate quantities of components within roofing membrane will be determined according to ASTM D 3617.

2. Test specimens will be examined for interply voids according to ASTM D 3617 and to comply with criteria established in Appendix 3 of ARMA/NRCA's "Quality Control Guidelines for the Application of Built-up Roofing."
- C. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel and roofing consultant to inspect roofing installation on completion and submit report to Owner.
 1. Notify Owner 48 hours in advance of date and time of inspection.
- D. Repair or remove and replace components of roofing system where test results or inspections indicate that they do not comply with specified requirements.
- E. Additional testing and inspecting, including infrared analysis, at contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.10 PROTECTING AND CLEANING

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

END OF SECTION

SECTION 07600**FLASHING AND SHEET METAL****PART 1 GENERAL****1.01 RELATED DOCUMENTS**

- A. Drawings and general provisions of the contract, including the Conditions of the Contract and Division 1 Specification Sections apply to this section.

1.02 SUMMARY

- A. Provide all labor, equipment, and materials to fabricate and install the following.
 - 1. Metal flashing.
 - 2. Copper thru wall flashing, if necessary.
- B. Related work specified elsewhere:
 - 1. Section 06100 Rough Carpentry.
 - 2. Section 07520 Modified Bituminous Membrane Roofing – Hot Applied.
 - 3. Section 07555 Cold Applied Elastomeric Protected Membrane

1.03 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 E 241 Standard Guide for Limiting Water-Induced Damage to Buildings.
 7. ASTM EA 792 Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
- B. Warnock Hersey International, Inc., Middleton, WI (WH).
- C. Factory Mutual Research Corporation (FMRC).
- D. Underwriters Laboratories (UL).
- E. Sheet Metal and Air Conditioning Contractors National Association (SMACNA).
1. 1993 Edition Architectural Sheet Metal Manual.
- F. National Roofing Contractors Association (NRCA).
1. Roofing and Waterproofing Manual.
- G. American National Standards Institute and Single Ply Roofing Institute (ANSI/SPRI).
1. Wind Design Guide for Use with Low Slope Roofing.

1.04 SUBMITTALS FOR REVIEW

- A. Product Data:
1. Provide manufacturer's specification data sheets for each product.
 2. Metal material characteristics and installation recommendations.
 3. Submit color chart prior to material ordering and/or fabrication so that equivalent colors to those specified can be approved.
- B. Samples: Submit two (2) samples, illustrating typical metal edge, coping, gutters, fascia extenders for material and finish.

- C. Shop Drawings.
 - 1. For manufactured and shop fabricated gravel stops, fascia, scuppers, and all other sheet metal fabrications.
 - 2. Indicate material profile, jointing pattern, jointing details, fastening methods, flashing, terminations, and installation details.
 - 3. Indicate type, gauge and finish of metal.
- D. Specimen Warranty: Provide an unexecuted copy of the warranty specified for this Project, identifying the terms and conditions required of the manufacturer and the City.

1.05 SUBMITTALS FOR INFORMATION

- A. Design Loads: Any material submitted as equal to the specified material must be accompanied by a report signed and sealed by a professional engineer licensed in the state of Wisconsin. This report shall show that the submitted equal meets the wind uplift and perimeter attachment requirements according to ASCE 7-05 and ANSI/SPRI ES-1. Substitution requests submitted without licensed engineer approval will be rejected for non-conformance.
- B. Design and Test Reports: Provide the following certified test reports from an independent testing laboratory:
 - 1. Independent laboratory testing report for system design load and seam integrity.
 - 2. Professional engineer's documentation that system incorporates sufficient allowance for stress and movement.
 - 3. A letter from an officer of the manufacturing company certifying that the materials furnished for this project are the same as represented in tests and supporting data.
 - 4. Manufacturer's verifications that the panels are factory roll-formed.
 - 5. UL 1897: Test report must be submitted for windstorm rating no less than that specified in Design and Performance Criteria article. The proposed roof system must have approval over specified substrate with steel framing spaced no further apart than as specified.

6. FM 4470: Test report must be submitted for windstorm rating no less than that specified in Design and Performance Criteria article. The proposed roof system must have approval over specified substrate with steel framing spaced no further apart than as specified.
 7. ASTM E108 or similar evidence of Class A Fire Resistance.
- C. Mill production reports certifying that the steel thicknesses are within allowable tolerances of the nominal or minimum thickness or gauge specified.
- D. Qualification Data for Installer. Refer to Quality Assurance Article below.
- E. Certification of work progress inspection. Refer to Quality Assurance Article below.
- F. Certifications:
1. Submit roof manufacturer's certification stating that metal fasteners furnished are acceptable to roof manufacturer.
 2. Submit roof manufacturer's certification that metal furnished is acceptable to roofing manufacturer as a component of roofing system and is eligible for roof manufacturer's system warranty.

1.06 CONTRACT CLOSEOUT SUBMITTALS

- A. General: Comply with Requirements of Section 01700 – Contract Closeout.
- B. Special Project Warranty: Provide specified warranty for the Project, executed by the authorized agent of the Manufacturer.
- C. Insurance Certification: Assist City 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.

1.07 QUALITY ASSURANCE

- A. Engage an experienced roofing contractor specializing in sheet metal flashing work with a minimum of five (5) years experience.
- B. Maintain a full-time supervisor/foreman who is on the job-site at all times during installation. Foreman must have a minimum of five (5) years experience with the installation of similar system to that specified.

- C. Source Limitation: Obtain components from a single manufacturer.
- D. Upon request fabricator/installer shall submit work experience and evidence of financial responsibility. The City's representative reserves the right to inspect fabrication facilities in determining qualifications.

1.08 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.

1.09 PROJECT CONDITIONS

- A. Determine that work of other trades will not hamper or conflict with necessary fabrication and storage requirements for pre-formed metal edge system.

1.10 DESIGN AND PERFORMANCE CRITERIA

- A. Thermal expansion and contraction:
 - 1. Completed metal edge flashing system shall be capable of withstanding expansion and contraction of components caused by changes in temperature without buckling, producing excess stress on structure, anchors or fasteners, or reducing performance ability.
 - 2. The design temperature differential shall be not less than 200°F.
 - 3. System shall be capable of installation with all seam and flashing sealants in continuous, full compression.
- B. Factory Mutual Approvals.
 - 1. Factory Mutual Research Corporation's (FMRC) wind uplift resistance classification: The roof perimeter flashing as defined in the FMRC Loss Prevention Data Sheets 1-7 and 1-49 shall be classified under an FM rating as FM 1-90.

1.11 WARRANTIES

- A. City shall receive one (1) warranty from manufacturer of roofing materials covering all of the following criteria. Multiple warranties are not acceptable.
1. Pre-finished metal material shall require a written 20-year minimum, 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 D2244 or chalking excess of 8 units per ASTM D659. If either occurs material shall be replaced per warranty, at no cost to the City.
 2. Changes: Changes or alterations in the edge metal system without prior written consent from the manufacturer shall render the system unacceptable for a warranty.
 3. Warranty shall commence on date of manufacturer's acceptance.
 4. The contractor shall provide the City 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 years from the date of final acceptance of the building. Warranty shall include all materials and workmanship required to repair any leaks that develop, and repair any damage to other work or equipment caused by such leaks or the repairs thereof.
 5. Installing roofing contractor shall be responsible for the installation of the edge metal system in general accordance with the membrane manufacturer's recommendations.
 6. Installing contractor shall certify that the edge metal system has been installed per the manufacturer's printed details and specifications.
 7. One manufacturer shall provide a single warranty for all accessory metal for flashings, counterflashing, termination bars, etc., along with the warranty for metal roof areas.

PART 2 PRODUCTS

2.01 PRODUCTS, GENERAL

- A. Substitutions: The materials and manufacturer's product designations specified herein shall be regarded as the minimum standard of quality and performance for the work covered under this section. Substitutions shall comply with all manufacturer and contractor/fabricator quality and performance criteria specified in Part 1. Products proposed as equal to the products specified herein shall be submitted in accordance with Division 1 Sections of the specifications. Metal cap and flashing systems submitted as substitutions shall be accompanied by the following:
1. Proposals shall be accompanied by a copy of the manufacturer's standard specification section and revised detail drawings. These documents 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 projects of similar type and extent, located within a 100 mile radius from the location of the project. In addition, the three projects must be at least five years old and be available for inspection by the City or City's representative.
 3. Equivalency of performance criteria, warranty terms, submittal procedures, and contractual terms will constitute the basis of acceptance.
 4. The City's decision regarding substitutions will be considered final. Unauthorized substitutions will be rejected.

2.02 MATERIALS

- A. Materials: Coping and Counterflashing:
1. Exposed base metal material:
 - a) Aluminum-zinc alloy (galvalume) coated steel, ASTM A792, coating designation AZ-50, or Zinc-coated steel, ASTM A653, coating designation G-90, in thickness of .0217 nom./24 gauge; 36" to 48" by coil length, chemically treated, commercial or lock-forming quality.
 2. Unexposed base metal material:

- a) Zinc-coated steel, ASTM A653, coating designation G-90, in thickness of 0.0299 nom./ 22 gauge, 36" to 48" by coil length, chemically treated, commercial or lock-forming quality.
- 3. Minimum gauge of steel or thickness of aluminum to be specified in accordance with Architectural Sheet Metal Manual, Sheet Metal and Air Conditioning Contractor's National Association, Inc. recommendations.

B. Finishes:

- 1. Exposed surfaces for coated panels:
 - a) Steel Finishes: fluorocarbon finish. Epoxy primer baked both sides, .2-.25 mils thickness as approved by finish coat manufacturer.

Weathering finish, as referred by National Coil Coaters Association (NCCA).

<u>PROPERTY</u>	<u>TEST METHOD</u>	<u>FLUOROCARBON*</u>
Pencil	ASTM D3363	HB-H
Hardness	NCCA II-2	
Bend	ASTM D-4145 NCCA II-19	O-T
Cross-Hatch Adhesion	ASTM D3359	no loss of adhesion
Gloss (60° angle)	ASTM D523	25+/-5%
Reverse Impact	ASTM D2794	no cracking or loss of adhesion
Nominal Thickness	ASTM D1005	
Primer		0.2 mils
Topcoat		0.8 mils
TOTAL		1.0 mils

* Subject to minimum quantity requirements

- b) Color shall be as specified.
- 2. Exposed and unexposed surfaces for mill finish flashing, fascia, and coping cap, shall be as shipped from the mill.
- 3. Exposed and unexposed surfaces for anodized aluminum flashing, fascia, and coping cap, shall be as shipped from mill.

2.03 RELATED MATERIALS AND ACCESSORIES

- A. Metal Primer: Zinc chromate type.
- B. Plastic Cement: ASTM D 4586.
- C. Sealant.
- D. Underlayment: Conforming to ASTM D1970, water and ice shield underlayment.
- E. Fasteners:
 - 1. Corrosion resistant screw fastener as recommended by metal manufacturer. Finish exposed fasteners same as flashing metal.
 - 2. Fastening shall conform to factory mutual requirements or as stated on section details, whichever is more stringent.

2.04 SOURCE QUALITY CONTROL

- A. Manufacturer shall furnish written documentation that all roof material, flashing, trim, seam attachment devices, framing members, weather-exposed accessories, tape, caulking, and sealants were furnished by said single-source manufacturer.
- B. Manufacturer shall furnish mill production documentation of specifications for steel coil stock used in the fabrication of the roof system, without organic coating per ASTM A446, ASTM A525, ASTM A527, or ASTM A792.
- C. Manufacturer shall furnish all other documentation as required herein.

PART 3 EXECUTION3.01 EXECUTION, GENERAL

- A. Refer to Contract Specification Sections and detail drawings.

3.02 PROTECTION

- A. Isolate metal products from dissimilar metals, masonry or concrete with bituminous paint, tape, or slip sheet. Use gasketed fasteners where required to prevent corrosive reactions.
- B. Fastening of metal to walls shall comply with building code standards.
- 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. Allow sufficient clearances for expansion and contraction of linear metal components. Secure metal using fasteners as required by the system. Exposed face fastening of coping cap will be rejected.

3.03 INSPECTION

- A. Perform field measurements prior to fabrication.
- B. Coordinate work with work of other trades.
- C. Verify that substrate is dry, clean and free of foreign matter.
- D. Commencement of installation shall be considered acceptance of existing conditions.

3.04 MANUFACTURED SHEET METAL SYSTEMS

- A. Furnish and install manufactured fascia and coping cap systems in strict accordance with manufacturer's printed instructions.
- B. Provide factory-fabricated accessories including, but not limited to, fascia extenders, miters, scuppers, joint covers, etc. Refer to source limitation provision in Part 1.

3.05 SHOP-FABRICATED SHEET METAL

- A. Metal work shall be shop fabricated to configurations and forms in accordance with recognized sheet metal practices.
- B. Hem exposed edges.
- C. Angle bottom edges of exposed vertical surfaces to form drip.
- D. Lap corners with adjoining pieces fastened and set in sealant.
- E. Form joints for gravel stop fascia system, coping cap with a 3/8" opening between sections. Back the opening with an internal drainage plate formed to the profile of fascia piece.
- F. Install sheet metal to comply with referenced SMACNA and NRCA standards.

3.06 CLEANING

- A. Clean installed work in accordance with the manufacturer's instructions.
- B. Replace damaged work that cannot be restored by normal cleaning methods.

3.07 CONSTRUCTION WASTE MANAGEMENT

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

3.08 FINAL INSPECTION

- A. At completion of installation and associated work, meet with contractor, installer of associated work, City, roofing system manufacturer's representative, and other representatives directly concerned with performance of roofing system.
- B. Inspect work and flashing of roof penetrations, walls, curbs and other equipment. List all items requiring correction or completion and furnish copy of list to each party in attendance.
- C. Repair or replace deteriorated or defective work found at time above inspection as required to produce an installation which is free of damage and deterioration at time of substantial completion and according to warranty requirements.
- D. Notify the City upon completion of corrections.

- E. Following the final inspection, provide written notice of acceptance of the installation from the roofing system manufacturer.
- F. Immediately correct roof leakage during construction. If the contractor does not respond within 24 hours, the City will exercise its right to correct the work under the terms of the conditions of the contract.

3.09 DEMONSTRATION AND TRAINING

- A. At a time and date agreed to by the City, instruct the City's facility manager, or other representative designated by the City, on the following procedures:
 - 1. Troubleshooting procedures.
 - 2. Notification procedures for reporting leaks or other apparent roofing problems.
 - 3. Maintenance.
 - 4. The City's obligations for maintaining the warranty in effect and force.
 - 5. The manufacturer's obligations for maintaining the warranty in effect and force.

END OF SECTION