



The LaBiche
ARCHITECTURAL GROUP INC

Dohn H. LaBiche, FAIA - Principal
Greg Wall, AIA - Principal

7999 Gladys Avenue, Suite 101
Beaumont, Texas 77706
(409) 860-0197 • Fax (409) 860-0198

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ADDENDUM NO. 1

**PROJECT #21030 - Jefferson Co. Jerry Ware Terminal and ARFF Station
Rehabilitation
BEAUMONT, TEXAS**

The following changes, corrections and additions or deletions to the Drawings and Specifications are hereby made part of the Contract Documents. Bidders shall acknowledge receipt of this Addendum in the Bid Form

SPECIFICATIONS

Section 070151 – Preparation for Re-Roofing

1. Add attached Section 070151 – Preparation for Re-Roofing.

Section 072200 – Roof Insulation

1. Add attached Section 072200 – Roof Insulation.

Section 074113 – Symmetrical Metal Roof Panels

1. Add attached Section 074113 – Symmetrical Metal Roof Panels.

Section 074140 – Metal Wall Panels

1. Add attached Section 074140 – Metal Wall Panels.

Section 075216 – Modified Bitumen Roof System

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Section 075220 – Roofing Installer's Warranty

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Section 075600 – Fluid Applied Membrane Flashing

1. Add attached Section 075600 – Fluid Applied Membrane Flashing.

Section 076200 – Flashing and Sheet Metal

1. Add attached Section 076200 – Flashing and Sheet Metal.

Section 077200 – Roof Accessories

1. Add attached Section 077200 – Roof Accessories.

DRAWINGS

None

End of Addendum No. 1



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SECTION 070151 - PREPARATION FOR RE-ROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 through Division 26 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Roof removal.
 - 2. Cementitious deck repair.
 - 3. Metal deck repair and replacement.
 - 4. Plywood/wood deck repair and replacement.
- B. Related Sections
 - 1. Section 012200 - Proposal Items Unit Prices
 - 2. Section 075220 - Roofing Installer's Warranty
 - 3. Section 076200 - Flashing and Sheet Metal
 - 4. Section 075216 - Modified Bitumen Roof System

1.3 MATERIALS OWNERSHIP

- A. Except for items or materials indicated to be reused, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.

1.4 DEFINITIONS

- A. Cementitious: Lightweight concrete or normal weight concrete.

1.5 SUBMITTALS

- A. Comply with provisions of Division 01.
- B. Mark each product data cut-sheet by circling or highlighting and affix the corresponding Article and Paragraph designations from this Specification Section. Product data not so marked will be returned without review, for re-submittal complying with the above requirements.
- C. Submit current catalogs/brochures describing products for review, coordination and final approval for use in this Project.
- D. Submit Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including exterior and interior finish surfaces that might be misconstrued as having been damaged by reroofing operations. Submit before Work begins.

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

- E. Provide a demolition plan indicating at a minimum the following:
 - 1. Schedule of demolition detailed to correspond to re-roofing operations.
 - 2. Requirements of staging including methods proposed for transport of materials from the roof to the ground.
 - 3. Submit containment fence layout, materials and support structure for rooftop and ground locations.
- F. Submit fastener pull test reports for review and acceptance prior to commencement of roofing work.
- G. Product Data: For each type of product indicated, including but not limited to items specified in Part 2 – Products or otherwise required by the Work, as follows:
 - 1. Cementitious deck patching material.
 - 2. Metal decking, deck fasteners, stitch screws and rust inhibitor primer.
 - 3. Plywood decking, deck fasteners and adhesives.

1.6 PROJECT CONDITIONS

- A. Owner will occupy portions of building immediately below reroofing area. Conduct reroofing so Owner's operations will not be disrupted. Provide Owner with not less than 72 hours' notice of activities that may affect Owner's operations.
 - 1. Coordinate work activities daily with Owner so Owner can place protective dust or water leakage covers over sensitive equipment or furnishings, shut down HVAC and fire-alarm or -detection equipment if needed, and evacuate occupants from below the work area.
 - 2. Before working over structurally impaired areas of deck, notify Owner to evacuate occupants from below the affected area. Verify that occupants below the work area have been evacuated before proceeding with work over the impaired deck area.
- B. Protect building to be reroofed, adjacent buildings, walkways, site improvements, exterior plantings, and landscaping from damage or soiling from reroofing operations.
- C. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.
- D. Weather Limitations: Proceed with reroofing preparation only when existing and forecasted weather conditions permit Work to proceed without water entering existing roofing system or building.
- E. Hazardous Materials: It is not expected that hazardous materials such as asbestos-containing materials will be encountered in the Work.
 - 1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner.
- F. Fastener Pull Tests (Roof Areas: A thru F2):
 - 1. Contractor shall provide the services of an independent testing company to perform fastener pull tests in accordance with ANSI/SPRI FX-1.
 - 2. Perform pull tests on decking immediately upon completion of roofing demolition.
 - 3. Provide at the site for the duration of the demolition Work a calibrated, crank style pull tester for performing pull tests when directed by the Architect.
 - 4. Pull test thresholds:
 - a. In lightweight concrete decking shall be 70 lbs. minimum, or corrective action

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

- shall be required as directed by the Architect.
- b. In metal decking shall be 350 lbs. minimum, or corrective action shall be required as directed by the Architect.
- c. In plywood decking shall be 400 lbs. minimum, or corrective action shall be required as directed by the Architect.
- d. If any pull test falls below the threshold limit, an additional pull test must be performed.
- 5. Pull test quantities:
 - a. Roof areas up to 50,000 sq. ft.: A minimum of two (2) pull tests shall be performed for the first 1,000 square feet (or portion thereof) of decking and one (1) pull test for every 5,000 square feet or portion thereafter.
 - b. Fifty percent (50%) of pull tests shall be located along the perimeter and corners of each roof area.
- 6. Pull test results shall be submitted on forms similar to Forms A and B in ANSI/SPRI FX-1.
- 7. Pull test locations shall be noted on a roof plan drawing.
- 8. Pull test report shall be submitted in pdf format to the Architect for review. Report shall include the pull test results, pull test location plan(s) and display the testing company's name, address, technician's name and authorized signature.
- 9. Re-roofing work shall not commence until after a pull test report has been received and accepted by the Architect.
- H. The allowable weight distribution for roof areas is 20 pounds per square foot.
 - 1. Remove demolished roofing products from the roof to the ground immediately with no stacking of materials permitted.
 - 2. Transfer materials direct from the ground into ground-based trash containers and remove from the project upon completion of demolition.
 - 3. Take precautions to prevent damage to surfaces by ground-based disposal units.
- I. In the event of the discovery of unanticipated substrates, or damaged or deteriorated structural components, immediately advise the Architect and await instructions prior to proceeding, unless otherwise directed. Repair and/or replace damaged or deteriorated decking in strict compliance with this Section, or as otherwise directed by the Architect.
- J. Coordinate with Owner to shut down air-intake equipment in the vicinity of the Work. Cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors in the ductwork.

PART 2 - PRODUCTS

2.1 CEMENTITIOUS DECKING REPAIR OR REPLACEMENT

- A. Cementitious Deck Patching Material: Siplast "Zonopatch," or a prior-approved equal.

2.2 STEEL DECKING REPAIR OR REPLACEMENT

- A. Steel Decking: 22-gauge galvanized decking. Profile shall match existing.
- B. Deck Fasteners Screws: #12 self-drilling galvanized steel TEK 5 screws, 1.5 inch in length.
- C. Stitch Screws: #10 self-tapping galvanized steel sheet metal screws, 0.75 inch in length.

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

- D. Rust Inhibitor Primer: Rust-Oleum Sherwin-Williams, or approved equal.

2.3 PLYWOOD/WOOD DECKING REPAIR OR REPLACEMENT

- A. Plywood: DOC PS 1, Exposure 1, C-D Plugged, thickness as shown on drawings.
- B. Plywood Deck Fasteners: Stainless steel #12 wood screws, flat head, 1.75 inch in length minimum.
- C. Plywood Deck Adhesives: Loctite PL 400 VOC Subfloor & Deck adhesive, as manufactured by Henkel Corporation, or approved equal.

PART 3 - EXECUTION

3.1 PREPARATION/DEMOLITION

- A. Completely remove existing roofing materials and flashings to the existing decking over the entirety of the roof areas indicated by the Drawings. Replace or repair any decking so damaged that it is unable to hold new fasteners.
- B. Remove and properly dispose of existing roofing, insulation, flashings, unused accessories and other items as detailed on areas shown or as required for the scope of work. Coordinate activities with Owner.
- C. Control dust as much as possible by lightly sprinkling the roof surface with clean water. Police the roof and grounds constantly to prevent debris blowing off the roof and around the site.
- D. Adhere to the following removal procedures, without deviation:
 - 1. Transport debris to the disposal vehicle/dumpster using a fully enclosed trash chute. The chute shall be designed to deposit debris a maximum distance of 12 inches above the sides of the container.
 - 2. Do not stack debris above the top edge of the container.
 - 3. Prior to removing the container from the site, cover it with a tarp and contain it so that no debris escapes during transport to the dump site.
 - 4. Cranes with fully enclosed buckets may be used for transport of materials from roof level.
 - 5. When in the Contractor's opinion high winds would be hazardous to the health and safety of its employees, or when debris cannot be controlled in conducting tear-off operations, suspend work and return the roof to a watertight condition.
- E. Leave the substrate completely free of debris or foreign matter. Inspect decks at this time. Where deteriorated conditions are found, report findings to Architect in writing for direction.
- F. Bring accessories which the Contractor may deem no longer necessary to the attention of the Architect.
 - 1. Do not start removal and deck repair procedures until authorization is obtained from the Architect.
 - 2. Any removed accessories are to be considered the property of the Owner, who reserves the right to retain possession.

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

3. Equipment and/or any materials removed, not used, and not claimed by the Owner, shall be removed and properly disposed of off site.

3.2 INSPECTION

- A. Closely inspect the deck surfaces immediately upon completion of roofing demolition.
- B. Notify the Architect immediately upon discovery of any deteriorated deck conditions. Do not proceed without direction.
- C. There is the possibility that water leakage may have caused failure in the decking in isolated areas. Care shall be taken during demolition to ensure the safety of the workers. There is no current knowledge of any failed deck components.
- D. Deck repairs will be added to the Contract Amount and paid for by duly authorized Change Order, utilizing the unit prices in the Contract.

3.3 CEMENTITIOUS DECK REMOVAL, REPLACEMENT AND/OR REPAIR

- A. Notify the Architect immediately upon discovery of any deteriorated deck conditions. Do not proceed without direction.
- B. There is the possibility that water leakage may have caused failure in the cementitious decking in isolated areas. Care shall be taken during demolition to ensure the safety of the workers. There is no current knowledge of any failed deck components.
- C. Closely inspect the deck surfaces immediately upon completion of roofing demolition. Deck repairs will be added to the Contract Amount and paid for by duly authorized Change Order, utilizing the unit prices in the Contract.
- D. Cementitious Deck Repair No. 1 (CDR-1) (**Unit Price No. 1**): Deck deterioration where the metal form deck or form board is intact in areas equal to or less than 48 inches x 48 inches, or 16 square feet maximum, shall be repaired by the following procedure.
 1. Remove damage to existing form deck. Sweep existing metal or form board clean.
 2. Install specified cementitious repair product mixed and applied in accordance with the manufacturer's instructions.
- E. Cementitious Deck Repair No. 2 (CDR-2) (**Unit Price No. 2**): Deck deterioration in areas greater than the area cited in Cementitious Deck Repair No. 1 and over damaged metal form deck or form board, shall be repaired by the following procedure:
 1. Remove existing damaged cementitious fill and metal or form board deck. Remove deck to the nearest structural supports in every direction. Do not drop materials into the building.
 2. Neatly saw-cut the end and edges of existing cementitious fill to a point where acceptable material is encountered.
 3. Completely remove loose material from the metal or form board deck surfaces.
 4. Install new metal deck to match existing supporting it on the nearest bulb tees or other structural supports.
 5. Complete repair as shown on the drawings.
- F. Cementitious Deck Repair No. 3 (CDR-3) - Hole Repair, (**Unit Price No. 3**):
 1. Hole repairs do not require prior notification to the Architect and may occur while classes are in session.

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

2. Holes through deck measuring less than 12-inches in diameter or sides shall be repaired by attaching one layer of 10-gauge galvanized metal with insulation screws spaced at 6-inches on centers, maximum.
3. The new repair metal shall lap over the existing decking by a minimum of 6 inches on all sides of the hole.

3.4 METAL DECK REMOVAL, REPLACEMENT AND/OR REPAIR

- A. Metal Deck Removal and Replacement. The following procedures shall be followed:
1. Where possible, the Architect shall be notified a minimum of 48-hours (weekdays only) in advance of the Contractor's intended deck replacement work.
 2. Following removal of the built-up roofing and insulation the Contractor shall completely clean the deck and flutes of debris, dust, etc.
 3. Welds shall be ground loose and the deck removed in sections. The use of cutting torches is prohibited. Caution shall be exercised to not damage the bar joists or other steel structural members during deck removal.
 4. Metal decking shall be moved from the roof to the storage or demolition area on the day it is removed. Stocking of removed panels on the roof surface overnight is prohibited. Deck panels shall be removed to the ground by controlled lift or crane.
 5. The top chords of each bar joist shall be inspected and repaired as required. Existing welds shall be ground smooth and flush with the top chord to prevent conflicts with the new decking. Ground surfaces shall be primed with one coat of red oxide primer.
 6. Lay metal deck panels perpendicular to the existing bar joists and fastened along each joist with specified TEK screws spaced at 6 inches on centers. Fully seat side laps in adjacent deck panels or set within 0.25-inch of other side stops. End laps shall be handled as shown in the manufacturer's shop drawings. End laps shall occur over existing bar joists only. Side laps shall be fastened with stitch screws spaced at 12 inches on centers.
 7. Installation of new insulation shall not occur until decking is in place and has been observed by the Architect's representative.
 8. Debris dropped below the deck shall be removed in its entirety. Any damaged materials below the deck, occurring as a part of this work, shall be remedied to the Owner's and Architect's satisfaction.
- B. Metal Deck Repair No. 1 (MDR-1) - Large Sheet Replacement, **(Unit Price No. 4)**:
1. New metal decking shall match the existing profile.
 2. Sheet replacement shall cover a minimum of two spans.
 3. New decking shall extend a minimum of 6 inches over each end joist with the entire width of the sheets being replaced.
 4. New decking shall be fastened with specified screws spaced at 6 inches on centers along each bar joist.
 5. Laps shall have sheet metal stitch screws spaced at 12 inches on centers.
- C. Metal Deck Repair No. 2 (MDR-2) - Surface Rust Remediation, **(Unit Price No. 5)**:
1. Remove rust by wire brushing and apply rust bonding red oxide metal rust inhibitor primer.
- D. Metal Deck Repair No. 3 (MDR-3) - Hole Repair, **(Unit Price No. 6)**:
1. Hole repairs do not require prior notification to the Architect and may occur while classes are in session.
 2. Holes through deck measuring less than 12-inches in diameter or sides shall be repaired by attaching one layer of 18-gauge galvanized metal with sheet metal

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

screws spaced at 6 inches on centers, maximum.

3. The new repair metal shall lap over the existing decking by a minimum of 6 inches on all sides of the hole.

3.5 PLYWOOD DECK REMOVAL, REPLACEMENT AND/OR REPAIR

- A. Plywood Deck Removal and Replacement. The following procedures shall be followed:
 1. Where possible, the Architect shall be notified a minimum of 48-hours (weekdays only) in advance of the Contractor's intended deck replacement work.
 2. Following removal of the built-up roofing and insulation the Contractor shall completely clean the plywood decking of debris, dust, etc.
 3. Visible signs of mold, mildew, water damage or sponge conditions shall be cause for plywood decking replacement.
 4. Plywood decking removal shall be by complete replacement of a plywood sheet as originally installed. Fasteners shall be removed and disposed of. Partial sheet replacement is prohibited.
 5. Stocking of removed panels on the roof surface overnight is prohibited. Deck panels shall be removed to the ground by controlled lift or crane.
 6. The top chords of exposed wood joists or roof framing lumber shall be inspected for damage. The Architect shall be notified immediately upon discovery of damaged or deteriorated wood framing. Do not proceed with plywood decking replacement until further direction is provided by the Architect.
 7. Plywood Deck Replacement: Lay plywood decking panels similar to the original installation. Attach decking to the existing wood joist or framing lumber with wood screws at 6 inches on-center along the panel edge and 8 inches on-center in the panel field.
 8. Installation of new insulation shall not occur until decking is in place and has been observed by the Architect's representative.
 9. Debris dropped below the deck shall be removed in its entirety. Any damaged materials below the deck, occurring as a part of this work, shall be remedied to the Owner's and Architect's satisfaction.
- B. Plywood Deck Repair No. 1 (PDR-1) – 4' x 8' Sheet Replacement, (**Unit Price No. 7**):
 1. New plywood decking shall match the existing profile or as indicated.
 2. Apply adhesive per manufacturer's recommendations to wood framing and plywood decking surfaces to be in contact with each other.
 3. New decking shall be fastened with specified screws along each wood joist or framing lumber.
- C. Plywood Deck Repair No. 2 (PDR-2) - Hole Repair, (**Unit Price No. 8**):
 1. Hole repairs do not require prior notification to the Architect and may occur while the building is occupied.
 2. Holes through deck measuring less than 12-inches in diameter or sides shall be repaired by attaching one layer of 18-gauge galvanized metal with wood screws spaced at 6 inches on centers, maximum.
 3. The new repair metal shall extend a minimum of 6 inches beyond all sides of the hole.

3.6 CLEANING

- A. Clean walks, drives and other surfaces on a daily basis. Promptly pick up and dispose of all debris outside the containment fencing.

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

3.7 RECORDS

- A. Accurately record roof deck repairs on the Project Record Documents ("as-built" drawings).

END OF SECTION 070151

SECTION 072200 - ROOF INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 through Division 26 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Polyisocyanurate board insulation.
 - 2. Roof cover board.
 - 3. Base sheet and fasteners.
 - 4. Insulation fasteners.
 - 5. Insulation adhesive.
 - 6. Fiber cant strips.
- B. Related Sections
 - 1. Section 061050 - Roof Carpentry
 - 2. Section 074113 - Symmetrical Metal Roof Panels
 - 3. Section 074140 - Metal Wall Panels
 - 4. Section 075216 - Modified Bitumen Roof System
 - 5. Section 075220 - Roofing Installer's Warranty
 - 6. Section 076200 - Flashing and Sheet Metal

1.3 PERFORMANCE REQUIREMENTS

- A. General Performance: Provide installed insulation and/or base sheet that withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.
- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.
- C. Roof System Design: Provide a roofing system that meets or exceeds the wind uplift pressures indicated on the drawings or, if not indicated, in accordance with applicable versions of ASCE 7, FM 1-28 AND FM 1-29.
- D. Approval Standards: Meet testing standards of FM 4450 and FM 4470.

1.4 SUBMITTALS

- A. Comply with provisions of Division 01.
- B. Mark each product data cut-sheet by circling or highlighting and affix the corresponding Article and Paragraph designations from this Specification Section. Product data not so

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

marked will be returned without review, for re-submittal complying with the above requirements.

- C. Product Data: For each type of product indicated with construction details, material descriptions, dimensions of individual components and profiles, and accessories, including but not limited to the following:
 - 1. Polyisocyanurate insulation board.
 - 2. Crickets and saddles.
 - 3. Roof cover board.
 - 4. Cants.
 - 5. Asphalt primer.
 - 6. Fasteners for roof decks.
 - 7. Insulation adhesive.
 - 8. Fiberglass base sheet.
 - 9. Base sheet fasteners.
- D. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other Work, and as follows:
 - 1. Tapered insulation, including slopes and transitions at roof drains and scuppers, where applicable.
 - 2. Crickets, saddles, and tapered edge strips, including slopes.
 - 3. Wind zone roof plan for the actual project, if not provided in the Contract Documents, depicting field (interior/exterior), perimeter and corner zones in compliance with ASCE 7-10 and IBC 2015.
 - 4. Insulation fastening patterns for corner, perimeter, and field-of-roof (interior/exterior) wind zone locations meeting FM Class 135 along with documented evidence that patterns meet wind uplift criteria from AHJ adopted versions of IBC, ASCE 7, FM 1-28 and FM 1-29.
- E. Submit specified manufacturer's letters and certificates under Section 07 5216.

1.5 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, approval or listing agency markings, and directions for storing and mixing with other components.
 - 1. Inspect for damage.
 - 2. Store products in weather protected environment, clear of ground and moisture.
 - 3. Deliver materials in quantities to allow continuity of application throughout the Project.
 - 4. Coordinate shipment receipt as necessary to cause Owner least amount of interference in Owner's operations. Owner will not take responsibility for product deliveries.
- 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.

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

- C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources.
 - 1. Store materials subject to water damage in fully enclosed, watertight storage trailers.
 - 2. Do not store insulation materials on the roof overnight.
 - 3. Store materials on the roof surfaces only on the morning they will be installed. Do not store more materials on roof overnight unless approved by the Architect.
 - 4. Maximum Allowable Loading on Roof: 20 pounds per square foot.
- D. Handle materials in a manner precluding damage and contamination by moisture or other harmful/foreign matter.
- E. Promptly mark, remove from the site, and discard any materials contaminated by moisture.

1.6 PROJECT CONDITIONS

- A. Do not apply any portion of the roof system or its accessories during precipitation, or start application in the event precipitation is threatening, unless proper precautions have been taken.
- B. Do not apply insulation during inclement weather. Temperatures must be a minimum of 40° Fahrenheit and rising. Do not apply insulation material to damp or frozen deck or substrate.
- C. Do not apply insulation when the wind is determined to be detrimental to safe installation practices.

1.7 WARRANTY

- A. The manufacturer of the insulation shall be approved in writing by the manufacturer of the roof membrane system. Submit manufacturer's letter.
- B. Include insulation as part of 20-year NDL warranty required for the overall roofing system.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Preformed roof insulation boards manufactured or approved by roofing manufacturer, selected from manufacturer's standard sizes suitable for application, of thicknesses indicated.
- B. Polyisocyanurate Insulation Board:
 - 1. Rigid flat and tapered polyisocyanurate foam insulation board, meeting ASTM C-1289, Type II, Class 1 or Class 2, Grade 2 with organic or in-organic insulation board facers.
 - 2. Sizes:
 - a. 48 inches x 96 inches maximum where mechanically fastened.

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

- b. 48 inches x 48 inches maximum where adhesively applied.
 - 3. Board thickness: As shown on the Drawings. Minimum base layer thickness shall be 2 inches.
 - 4. Tapered insulation slope: As shown on the Drawings.
 - 5. R-value (In-service): Minimum R-25.
- C. Crickets: Provide factory tapered polyisocyanurate insulation boards with the same characteristics as Article 2.1.B above.
 - 1. Minimum 1/2-inch per foot slope. Widths of crickets and saddles shall not be less than 1/3 their lengths, unless otherwise shown on Drawings.
- D. Roof Cover Board:
 - 1. Acceptable Materials:
 - a. "DensDeck Prime," by Georgia-Pacific.
 - b. "Dexcell FA" by National Gypsum Company.
 - c. "Securock," by U.S. Gypsum.
 - 2. Thickness:
 - a. Over Field of Roof Insulation: 1/2-inch thickness.
 - b. Over Cants, Roof Curbs & Vertical Surfaces: 1/4-inch thickness.
 - 3. Board Size:
 - a. 48-inches x 96-inches where mechanically fastened.
 - b. 48-inches x 48-inches where adhesively applied.
 - 4. Miter edges of 1/4-inch roof board strips at tops and bottoms of cants.
- E. Cant Strips:
 - 1. Fire-retardant wood fiber or perlite, meeting ASTM C-728.
 - 2. Size: 1.5 inches thick minimum x 4 inches face minimum.

2.2 RELATED MATERIALS

- A. General: Furnish roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with membrane roofing
- B. Asphalt Primer: Asphalt cut-back type primer manufactured in accordance with ASTM D-41 standards and without asbestos, for use on masonry, metal and other surfaces.
- C. Fasteners for Metal Decks: Coated steel insulation screws, using metal disks, and of sufficient length for proper penetration of roof deck.
- D. Insulation Adhesive: For use in adhering fiber cant strips and gypsum cover board at curbs and other vertical flashing surfaces:
 - 1. Olybond 500 or as recommended by roofing membrane manufacturer.
 - 2. Note that Duotack 365 is not acceptable.

2.3 BASE SHEET MATERIALS

- A. Fiberglass Base Sheet: Asphalt-impregnated fiberglass mat, produced by the roofing membrane manufacturer, and meeting requirements of ASTM D-4601, Type II.
- B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FMG Approvals 4470; designed for fastening roofing

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

membrane components to substrate; tested by manufacturer for required pullout strength, and acceptable to roofing system manufacturer.

1. Mechanical Fasteners for Base Sheet:
 - a. Concrete Deck: Coated nail and plate: ES-90 by ES Products or approved equal.
 - b. Secondary Disks for Fasteners: Sized to meet requirements to resist wind up-lift pressures specified in Part 1 "Performance Requirements" of this Section.

PART 3 - EXECUTION

3.1 INSPECTION AND PREPARATION

- A. Verify that surfaces and site conditions are ready to receive work and that deck is supported and secured.
- B. Verify the deck is clean and smooth, free of depressions, waves, or projections, properly sloped to drains or eaves.
- C. Verify that deck surfaces are dry and free of snow or ice. Verify flutes of metal deck are clean and dry. Confirm deck dryness by moisture meter; maximum allowable: 12-percent.
- D. Verify that roof openings, curbs, pipes, sleeves, ducts, and vents through the roof are solidly set and wood nailing strips are in place.
- E. Beginning of installation means installer accepts existing surfaces.

3.2 BASE SHEET INSTALLATION

- A. Fiberglass base sheet shall be mechanically fastened in accordance with ASCE 7 and FM Class 135.
- B. The minimum fastening patterns for wind zones shall be as follows:
 1. Field: 9" o.c. in the min. 3-inch lap and four equally spaced rows between laps at 9" o.c. staggered.
 2. Perimeter: 6" o.c. in the min. 3-inch lap and four equally spaced rows between laps at 6" o.c. staggered.
 3. Corner: 4" o.c. in the min. 3-inch lap and four equally spaced rows between laps at 4" o.c. staggered.

3.3 INSULATION BOARD INSTALLATION

- A. Base Layer Application at Metal Decks: Install base layer of insulation with end joints staggered not less than 12 inches in adjacent rows and with long joints continuous at right angles to the flutes.
 1. Locate end joints over crests of decking.
 2. Trim insulation neatly to fit around penetrations and projections, and to fit intersecting sloping roof decks.
 3. Maximum joint width between adjacent boards shall be not more than 1/4-inch. Fill larger gaps with insulation.
 4. Cut and fit insulation within 1/4-inch of nailers, projections and penetrations.

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

5. Do not install more board stock than can be covered during each day's operation.
 6. Screws shall be of sufficient length to penetrate the existing or new metal deck by approximately 1 inch. Extra-long screws are not permitted.
 7. Mechanical fastening shall be in accordance with ASCE 7 and FM Class 135 requirements and approved shop drawings.
 8. Base layer thickness shall not exceed 2.5 inches.
- B. Upper Layer Application: Install upper layers of insulation and cover board with longitudinal and transverse joints of each layer offset not less than 12 inches from previous layer.
1. Adhere each upper layer of insulation and cover board using adhesive.
 2. Place, fit and trim upper layers of insulation as required for base layer.
 3. Set each layer of insulation in ribbons of bead-applied insulation adhesive or full-spread adhesive, firmly pressing and maintaining insulation in place.
 4. Space adhesive ribbons to achieve wind uplift pressures shown on the drawings and in accordance with ASCE 7 and FM Class 135 requirements and approved shop drawings.
- C. Base Sheet Application at Lightweight Concrete Decks: Install one ply of the specified fiberglass base sheet, attaching with specified base ply fasteners with disks. Attach the base sheet to meet the spacing pattern requirements of ASCE 7 and FM Class 135.
- D. Modified Bitumen Base Ply Application at Structural Concrete Decks: Torch apply per the requirements of Section 07 5216 – Modified Bitumen Roof System.
- E. Insulation Application at Cementitious and Plywood Decks:
1. Install insulation layers over mechanically fastened base sheet except structural concrete.
 2. Install base layer of insulation with end joints staggered not less than 12 inches in adjacent rows and with long joints continuous at right angles to the flutes.
 - a. Base layer thickness shall not exceed 2.5 inches.
 3. Butt boards tightly together. Walk-in boards to ensure solid adhesion. Fill gaps. Stagger joints between adjacent boards.
 4. Do not install more board stock than can be covered during each day's operation.
 5. Set each layer of insulation in ribbons of bead-applied insulation adhesive or full-spread adhesive, firmly pressing and maintaining insulation in place.
 6. Space adhesive ribbons to achieve wind uplift pressures shown on the drawings and in accordance with ASCE 7 and FM Class 135 requirements and approved shop drawings.
 7. Lay insulation board in full sheets wherever possible, and carefully fit and push against adjoining boards, nailers and/or other stops to form a tight joint.
 8. Miter edges of insulation boards at ridges, or elsewhere, to prevent open or irregular joints. Fill joints with tightly-fit, cut pieces of matching roof insulation.
 9. Install upper layers of insulation and cover board with longitudinal and transverse joints of each layer offset not less than 12 inches from previous layer.
- F. Cricket Installation:
1. Apply solidly in full embedment of low-rise foam adhesive.
 2. Slope materials a minimum of twice the slope of the aggregate roof slope over which crickets and saddles are installed.
 3. Extend cricket widths not less than 1/3 their lengths, unless otherwise detailed.

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

- G. Cant Strip Installation: Solidly adhere strips in full embedment of low-rise foam adhesive at all vertical terminations and as detailed.
- H. Insulation Application at Exterior Walls:
 - 1. Install board insulation on masonry or metal panel walls behind new wall panels in as shown on the drawings.
 - 2. Protect edges at door and window openings or other penetrations as tested in accordance with NFPA 285.
 - 3. Butt edges and ends tightly to adjacent boards and protrusions.
 - 4. Cut and fit insulation tightly to protrusions or interruptions to the insulation plane.

3.4 COVER BOARD INSTALLATION

- A. Installation shall comply with roof insulation guidelines stipulated above.
- B. Over Field of Insulation: Fully adhere 1/2-inch thick roof cover board and comply with ASCE 7 and FM requirements stipulated for roof insulation.
- C. Miter cover board edges where ridges are formed at tops and bottoms of crickets, to prevent open or irregular joints.
- D. Cover cants, roof curbs and vertical surfaces where indicated with 1/4-inch roof cover board.
 - 1. Mechanically fasten to wood blocking with galvanized ring shank cap nails.
 - 2. Set in full embedment of low-rise foam adhesive at non-nailable substrates.
- E. Leave surfaces clean in preparation for roof membrane installation.

3.5 PROTECTION

- A. Protect installed insulation and cover board from damage due to harmful weather exposures, physical abuse, and other causes.
- B. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 072200

SECTION 074113 - SYMMETRICAL METAL ROOF PANELS

PART 1 GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 through Division 26 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Symmetrical metal roof panels.
 - 2. Metal roofing accessories.
- B. Related Sections:
 - 1. Section 072200 - Roof Insulation
 - 2. Section 075220 - Roofing Installer's Warranty
 - 3. Section 076200 - Flashing and Sheet Metal

1.3 DEFINITIONS

- A. Metal Roof Panel Assembly: Metal roof panels, attachment system components, miscellaneous metal framing, thermal insulation, and accessories.
- B. Coordinate with Work of other trades. Although such Work is not specifically indicated, furnish and install supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.

1.4 REFERENCES

- A. General: Any material or operation specified by reference to the published specification or standard of a manufacturer, trade association, technical organization or other published standard, shall comply with the requirements of the current specification or standard listed or enforced by the Authority Having Jurisdiction (AHJ).
- B. American Society of Civil Engineers (ASCE)
 - 1. ASCE 7 – Minimum Design Loads for Buildings and Other Structures – as enforced by local AHJ. Without a local AHJ, ASCE 7–10 shall be incorporated.
- C. American Society for Testing and Materials (ASTM)
 - 1. ASTM A792 - Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 - 2. ASTM E1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding System by Uniform Static Air Pressure Difference.
 - 3. ASTM E1680 - Standard Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems.

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

4. ASTM E1646 - Standard Test Method for Rate of Water Penetration Through Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference.
 5. ASTM E2140 - Standard Test Method for water penetration of metal roof panel systems by static water pressure head.
- D. Factory Mutual (FM)
1. FM 1-28 – “Wind Design”.
 2. FM 1-31 – “Panel Roof Systems”.
 3. FM 4471 Appendix G- “Susceptibility to Leakage Test Procedure for Class 1 Panel Roofs”.
- E. International Code Council (ICC)
1. International Building Code (IBC) – as enforced by AHJ. Without a local AHJ, the 2015 IBC shall be incorporated.
 2. International Existing Building Code (IEBC) – as enforced by AHJ. Without a local AHJ, the 2015 IEBC shall be incorporated.
- F. Sheet Metal and Air Conditioning Contractors’ National Association (SMACNA)
1. Architectural Sheet Metal Manual.
- G. Underwriter’s Laboratories (UL)
1. UL 580 – “Standard for Tests for Uplift Resistance of Roof Assemblies”.
 2. UL 1897 – “Standard for Uplift Tests for Roof Covering Systems”.
- H. PERFORMANCE REQUIREMENTS
- I. Thermal Movement: Metal Roofing system, including flashing, shall accommodate unlimited thermal movement without buckling or excess stress on the structure.
- J. Roof panel and trim attachments will be designed to satisfy the requirements of the roof design (shown in shop drawings).
- K. Maximum wind uplift capacity of roof system shall be determined by ASTM E 1592, Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference. Testing shall be reported by an independent ASTM accredited testing laboratory.
- L. Maximum wind uplift capacity of roof system shall be determined using certified results from UL 1897-98, Uplift Tests for Roof Covering Systems. Testing of the entire roof assembly shall be conducted in a UL-580 test chamber.
- M. Panel system installation shall be in accordance with ASCE 7 Wind Speed for project location with respect to appropriate Importance Factor, Exposure Category and Safety Factor.
- 1.5 SUBMITTALS
- A. Comply with provisions of Division 01.
- B. Mark each product data cut-sheet by circling or highlighting and affix the corresponding Article and Paragraph designations from this Specification Section. Product data not so

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

marked will be returned without review, for re-submittal complying with the above requirements.

- C. Product Data: For each type of product indicated with construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type and accessory, including but not limited to the following:
 - 1. Roof Panel System.
 - 2. Panel Finish.
 - 3. Panel Color Chart.
 - 4. Panel Clip Fasteners.
 - 5. Panel Clips.
 - 6. Accessory Screws and Rivets.
 - 7. Field Sealant.
 - 8. Sealant Tape.
 - 9. Penetration Flashings.
 - 10. Underlayment.
- D. Shop Drawings and Engineering Calculations: Not required for this project. However, metal roof panels shall be installed per the prescriptive requirements of Article 2.3.A.3 and Article 3.4.G.
- E. Submit sample Installer's Warranty.
- F. Submit roof panel manufacturer's sample Finish Warranty.
- G. Submit sample Manufacturer's NDL Weathertight Roof Warranty.
- H. Samples:
 - 1. Submit two samples, 12" long, full width panel, showing metal gage, seam and required finish.
 - 2. Two samples each for roof panel clip, bearing plate and clip fastener.
 - 3. Submit color samples for Architect's selection.
- I. Certification:
 - 1. Submit roof panel manufacturer's certification that fasteners, clips, backup plates, closures, roof panels and finishes meet specification requirements, wind uplift requirements.
 - 2. Submit roof panel manufacturer's certification that installer meets requirements to install roof system and is qualified to obtain required warranties and has been certified for 3-years prior to proposal due date.
 - 3. Test Reports –Certified test results that indicate roof system meets or exceeds design and performance criteria. Testing to include:
 - a. Static Water Testing Certification: The panel system shall be tested in accordance with FM4471 Appendix G, and pass with no leakage. The test specimen must successfully withstand being submerged under 6" of water for a minimum period of 7 days.
 - b. UL 580 – Submit UL 580/1897 test results for full assembly metal roof panel system as specified substantiating that the full assembly will meet the wind pressures with a safety factor of 2.0.

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

- c. ASTM E1680 – Manufacturer's test data for air infiltration rates up to 20 pounds per square inch differential pressure.
- d. ASTM E1646- Manufacturer's test data for water infiltration rates up to 20 pounds per square inch differential pressure.
- e. ASTM E 1592. Submit ASTM E 1592 Test reports prepared by independent test laboratory substantiating that roof system will meet the applicable ultimate wind pressures with a safety factor of 2.0.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Installer ("roofer") to perform the Work of this Section, which firm has no fewer than 5 years of successful experience with installation metal roof systems similar to those required for this Project, and is qualified by the roof panel manufacturer, for installation of manufacturer-warranted systems and has been certified by the manufacturer for a minimum of 3-Years prior to proposal due date.
- B. Field Measurements: Prior to fabrication of panels, take field measurements of structure or substrates to receive panel system. Allow for trimming panel units, where final dimensions cannot be established prior to fabrication.
- C. Install a 30-foot wide, quality control area of metal roofing, for review by the Architect, to establish the quality of installation for the roof, and have approved prior to installing additional metal panels.
- D. Workers: All roofers and laborers to be direct employees of Primary Contractor.
 - 1. Project Manager and Superintendent: Minimum five years roofing experience and employed by Contractor for a minimum one year prior to Bid Date.
 - 2. Non-working Supervisor: Able to communicate effectively with School staff and Applicator's workers and employed by Contractor for a minimum one year prior to Bid Date.
 - 3. Tradesmen: Minimum 50-percent of installation crew to have been employed by Contractor for a minimum six months prior to Bid Date.

1.7 COORDINATION

- A. Coordinate Work, with installation of other associated Work, to ensure quality application.
- B. Coordinate Work with installation of associated metal flashings and building walls.
- C. Coordinate Work to minimize foot traffic and construction activity on installed finished surfaces.
- D. Coordinate location of pipe penetrations to allow centering of pipe in panel.
- E. Coordinate location of roof curbs, to allow proper integration with roof panel seams.

1.8 PRE-ROOFING CONFERENCE

- A. Schedule meeting to discuss roof Work before start of work onsite.

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

- B. Comply with requirements of roof Specification Section(s).
- C. Required attendees: Contractor, metal deck & roof installer, metal roof system manufacturer's representative, and any other subcontractors who have equipment penetrating the roof or Work that requires roof access or traffic.

1.9 DELIVERY, STORAGE AND HANDLING

- A. Deliver panels to jobsite properly packaged to provide protection against transportation damage.
- B. Exercise care in unloading, storing and erecting panels to prevent bending, warping, twisting, and surface damage.
- C. Store material and accessories above ground on well skidded platforms. Store under waterproof covering. Provide proper ventilation to panels to prevent condensation build-up between each panel.
- D. Remove from site panels which are damaged or become water-stained during storage and handling. Remove, and replace materials, which are installed damage, or stained.

1.11 WARRANTY

- A. The installer shall warrant materials and installation of roof and soffit systems for two (2) years against leaks and defects in materials and workmanship. Submit on form found in Section 075220.
- B. Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal roof panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Finish Warranty Period: 20 years from date of Substantial Completion.
- C. Single Source NDL Weathertight Roof Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace metal roof panel assemblies and roof penetrations that fail to remain weather-tight, including leaks within specified warranty period.
 - 1. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURER

- A. Basis of Design: McElroy Metal, Inc., 1500 Hamilton Road, Bossier City, Louisiana 71111. Toll Free Phone (800) 950-6531. Website: www.mcelroymetal.com.

2.2 ROOF PANEL SYSTEM

- A. Type: 238T metal over metal roof overlay system, or approved substitute, meeting the following requirements:

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

1. Factory-formed panel, width of 16 inches. Panels shall be symmetrical in design and shall be mechanically seamed with a field operated electric seaming machine provided by the manufacturer.
2. Minimum seam height 2-3/8 inches. Integral seam, double lock and snap together type panels are not acceptable
3. Seam cap matching panel finish with two rows of integral factory hot applied sealant.
4. Finish:
 - a. Prefinished Metal: 22-gauge, Galvalume® steel, treated, primed and prefinished under precision conditions.
 - b. Exposed Finish: Kynar 500® Fluorocarbon coating. Bottom or unexposed side: manufacturer's standard primer coat.
 - c. Color: Selected by the Architect and/or Owner from the manufacturer's standard colors unless custom colors are indicated elsewhere in the Contract Documents.
 - d. Deliver pre-finished metal to site with factory-applied protective plastic film, to be removed immediately upon installation.
5. Roof panel system must allow individual roof panel removal and replacement from any point on the roof without damage to adjacent roof panel(s).
6. Panels must be furnished and installed in continuous lengths from ridge to eave with no overlaps. Panels too long to ship will be manufactured on site using manufacturers employees and equipment.
 - a. Panel surface: Plank and Pencil.
7. Roof panels proposed for substitution shall fully comply with specified requirements in appearance, assembly, and performance. Substitution request must comply with Division 1 requirements for submission.

2.3 FASTENERS AND ACCESSORIES

- A. Panel Clip Fasteners:
 1. Stainless steel, pancake-head Phillips screws unless otherwise noted or required by the manufacturer. (Hot-dipped galvanized or coated fasteners are not acceptable.)
 2. Length as required for 3/4" minimum penetration beyond bottom of substrate.
- B. Roof Panel Clips:
 1. Intermittent Clip: 16 gage galvanized steel, one-piece, designed to allow roof panel thermal movement and not contact roof panel cap, as supplied by roof panel manufacturer, marking meeting wind uplift requirements of this Section.
 2. Intermittent Clip Bearing Plate: in gage, size and finish as supplied by and approved by roof panel manufacturer for use in roof panel manufacturer's full assembly warranted systems.
 3. Continuous Clip: as provided by roof panel manufacturer for full assembly warranted systems.
- C. Trim and flashing will be of the same gage and finish unless approved otherwise by the metal roof system manufacturer.
 1. Sheet metal valleys will be supplied in continuous lengths up to 32'.
 2. Ridge closures, consisting of metal channel surrounding factory precut closed cell foam, will not be secured through the field of the panel.

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

3. Trim will be installed specifically as displayed in the manufacturer provided shop drawings. Proposed changes must be approved in writing by the metal roof system manufacturer.
- D. Concealed supports, angles, plates, accessories and brackets: in gage and finish as recommended and furnished by manufacturer.
- E. Accessory Screw: Size and screw type as provided by panel manufacturer for each use, with prefinished hex washer head in color to match panels where exposed to view.
- F. Rivets: Full stainless steel, including mandrel, in size to match application.
- G. Field Sealant: Color coordinated primerless silicone, or high grade, non-drying butyl, as supplied by panel manufacturer.
- H. Sealant Tape: Non-drying, 100 percent solids, high grade butyl tape, as supplied by panel manufacturer, in sizes to match application.
- I. Pipe Penetration Flashings: Flexible boot type, with stainless steel compression ring, and stainless-steel pipe strap, Dektite by Buildex, or approved substitute. Secure flanges to roof panels in full beds of sealant, with neoprene-head screws at 2-inches on centers. Use silicone type at hot pipes.

2.4 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
 1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F.
 2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F.
 3. Products: Subject to compliance with requirements, provide one of the following:
 - a. Carlisle Coatings & Waterproofing Inc.; CCW WIP 300HT.
 - b. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.
- B. Underlayment Schedule:
 1. Insulated roofs: 1 ply of self-adhering, high-temperature sheet.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Ensure surfaces are ready for panel application.
- B. Inspect and ensure surfaces are free from objectionable warp, wave, and buckle before proceeding with installation of pre-formed metal roofing.
- C. Ensure substrate is ready to receive metal roofing. Report items for correction and do not proceed with metal roof panel system installation until resolved.

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

3.2 PREPARATION

- A. Miscellaneous Framing: Install eave angles, sub-purlins, and other miscellaneous roof panel support members and anchorage according to metal roof panel manufacturer's written instructions.

3.3 UNDERLAYMENT INSTALLATION

- A. Self-Adhering, High-Temperature Sheet Underlayment: Install one (1) ply of specified material over clean polyisocyanurate insulation, lapping sides of sheets a minimum of 2 inches and end laps a minimum of 6 inches. Lay sheets shingle style perpendicular to the roof slope. Terminate sheet at eaves and vertical penetrations. Do not seal with flashing cement at penetrations

3.4 INSTALLATION OF ROOF PANELS

- A. Comply with and install roofing and flashings in accordance with details shown on manufacturer's approved shop drawings and manufacturer's product data and instructions, within specified erection tolerances.
- B. Install field panels in continuous lengths, without endlaps. Remove and replace panels with endlaps.
- C. Do not install panels damaged by shipment or handling.
- D. Install intermittent clips with bearing plates and continuous clips according to manufacturer's recommendation.
- E. Breadpan roof panel at ridge, hip and headwalls.
- F. Concealed Clips at Panel Seams. Install clips with minimal contact with panel edge to prevent warping or binding and restriction of panel expansion. Attach clips with two (2) stainless steel pan-head Phillips screws each.
 - 1. Clips at Eaves and Ridges: Space at 8-inches maximum from eave or ridge.
 - 2. Clips at Plywood Roof Deck: Space at 24-inches on centers, maximum.
- G. Allow for 1-inch panel clearance at penetrations.
- H. Install concealed supports, angles and brackets as furnished by manufacturer to form complete assemblies.
- I. Remove roof panel and flashing protective film prior to extended exposure to sunlight, heat, and other weather elements.
- J. Field-apply sealant tape and gun-grade sealant according to reviewed shop drawings and manufacturer's requirements for airtight, waterproof installation.
- K. Ensure sealant beads and tape are applied prior to sheet metal installation to achieve a concealed bead. Neatly trim exposed portions of sealant without damaging roof panel or flashing finish.

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

- L. Align pipe penetrations to occur at center of roof panel. Report and have corrected improperly placed penetrations before proceeding with panel installation. Remove and replace roof panels which have improperly placed penetration flashings.
- M. Install sheet metal flashings according to manufacturer's recommendations, reviewed shop drawings and in accordance with provision of Section 076200.

3.5 CLEANING

- A. Clean exposed surfaces of Work promptly after completion of installation.
- B. Clean mud, dirt, and construction-related debris from panels before panels are scratched or marred.

3.6 PROTECTION

- A. Protect Work as required to ensure roofing will be without damage at time of final completion.
- B. Do not allow excessive foot traffic over finished surfaces.
- C. Do not track mud, dirt, or construction-related debris onto panel surfaces.
- D. Replace damaged Work before final completion.

END OF SECTION 074113

SECTION 074140 – METAL WALL PANELS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Metal wall panels.
 - 2. Underlayment.
- B. Related Sections
 - 1. Section 075220 - Roofing Installer's Warranty
 - 2. Section 076200 - Flashing and Sheet Metal

1.3 DEFINITIONS

- A. Metal Wall Panel Assembly: Metal wall panels, attachment system components, miscellaneous metal framing and accessories.
- B. Coordinate with Work of other trades. Although such Work is not specifically indicated, furnish and install supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.

1.4 SYSTEM PERFORMANCE

- A. System shall accommodate movement of underlying structure and of wall components, without buckling, failure of joint seals, undue stress on fasteners, or other detrimental effects, when subject to seasonal temperature ranges.
- B. Sheet metal wall system including, but not limited to, metal wall panels, anchors and fasteners, sheet metal flashing integral with sheet metal wall, trim and accessories, shall comply with performance requirements without failure due to defective manufacture, fabrication, installation, or other defects in construction

1.5 SUBMITTALS

- A. Comply with provisions of Division 01.
- B. Mark each product data cut-sheet by circling or highlighting and affix the corresponding Article and Paragraph numbers from this Specification Section. Product data not so marked will be returned without review, for re-submittal complying with the above requirements.
- C. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of wall panel and accessory.

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

- D. Shop Drawings:
1. Submit complete shop drawings and erection details to the Architect for review. Shop drawings shall be prepared by metal wall panel manufacturer specifically for this project. Contractor prepared shop drawings are not acceptable.
 2. Show method of erection, elevations, and plans of wall, sections and details, flashings, gutters, roof curbs, vents, sealant locations, interfaces with materials not supplied, and proposed identification of component parts and their finishes.
 3. Include full-sized cross-section details of the standing seams.
 - a. One in the field of the roof
 - b. One at a typical roof rake condition.
 4. Do not proceed with manufacture prior to Architect's review and approval of shop drawings.
- E. Engineering Calculations: Submit wind pressure calculations according to applicable version of ASCE 7 for project location with respect to appropriate wind speed, risk category and exposure category.
1. Calculations shall be sealed by a professional engineer licensed to practice structural engineering in the state in which project is located.
 2. In no event shall wind pressure calculations utilize lower design parameters than those indicated on the Drawings.
- F. Samples for Metal Wall Panels: Submit two (2) 12-inch long samples by full width of specified panel.

1.6 QUALITY ASSURANCE

- A. Installation of metal panels and accessories shall be by installers with a minimum of three (3) years' experience in Work of this nature. Installer must be able to show satisfactory evidence of completion of at least three (3) projects of similar size and complexity within an area of no more than 200-mile radius of the project site in the past five (5) years.
- B. Any material or operation specified by reference to the published specification or standard of a manufacturer, trade association, technical organization or other published standard, shall comply with the requirements of the current specification or standard listed:
1. AISI: "Steel Construction Manual," American Institute of Steel Construction.
 2. AISI: "Cold Form Steel Design Manual," American Iron and Steel Institute (1986 edition).
 3. ASTM A792-83-A355: Specification for Steel Sheet, aluminum-zinc alloy coated (galvanized) by the hot dip process, general requirements (Galvalume®).
 4. SMACNA: "Architectural Sheet Metal Manual" Sheet Metal and Air Conditioning Contractors National Association, Inc.
 5. ANSI/ASTM A153: Zinc Coating (hot-dipped) on Iron and Steel Hardware.
 6. ANSI/ASTM A446: Steel Sheet, Zinc-Coated (galvanized) by the hot-dip Process, Structural (physical) Quality.
 7. ASTM E84: Surface Burning Characteristics of Building Materials.
- C. The forming and installation of sheet metal shall be as indicated on the Drawings and in accordance with the applicable details of the SMACNA Manual.
- D. In case of conflict between the referenced specifications or standard and the project

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

specification, the Contractor shall be deemed to have assumed the more expensive method of accomplishing the Work, unless prior to signing of the Agreement, the Contractor shall have asked for and obtained a decision as to which method or material is intended.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.
- B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.
- C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Retain strippable protective covering on metal panels during installation.

1.8 WARRANTY

- A. The installer shall warrant materials and installation of wall systems for two (2) years against leaks and defects in materials and workmanship. Submit on form found in Section 075220.
- B. Pre-finished metal panel manufacturer's standard 20-year finish warranties
- C. Warranties shall commence on the Date of Substantial Completion for the overall project.

PART 2 - PRODUCTS

2.1 WALL PANELS

- A. Acceptable Products:
 - 1. McElroy Metal: "R-Panel"
 - 2. MBCI "PBR"
 - 3. PAC-CLAD "R-36"
 - 4. Wall panels shall be manufactured by the same manufacturer as approved for the metal roof panels.
- B. Type: Shop-formed, 36-inch wide profiled pre-finished metal sheet, used as wall panels.
- C. Style: Exposed fasteners.
- D. Panel Length: Continuous, uninterrupted length.
- E. Construction:
 - 1. 24-gauge pre-finished Galvalume® sheet metal, primed and finished under precision

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

- conditions.
- 2. Panel gauge shall be verified by manufacturer's engineering analysis.
- F. Panel Finish:
 - 1. Exposed Finish: Kynar 500® fluorocarbon coating.
 - 2. Unexposed Finish: Manufacturer's standard primer coat.
- G. Color: Exposed, top side of panels shall match pre-finished metal color selected under Section 076200.
- H. Protection: Deliver metal to the site with a factory-applied protective plastic film which shall be removed immediately upon installation.

2.2 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
 - 1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F.
 - 2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F.
 - 3. Products: Subject to compliance with requirements, provide one of the following:
 - a. Carlisle Coatings & Waterproofing Inc.; CCW WIP 300HT.
 - b. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.

2.3 FASTENERS

- A. Panel Fasteners: Stainless steel pancake-head Phillips screws; #12 x length required.
- B. Miscellaneous Fasteners: See Section 076200.
- C. Compatibility: Fasteners shall be compatible with materials to be joined.

2.4 FLASHINGS AND TRIM

- A. Flashings shall not compromise the integrity of the wall system by constricting movement due to thermal expansion and contraction.
- B. Trim and flashing shall be manufactured from minimum 24 ga. pre-finished Galvalume® sheet metal. See Section 076200.
- C. Seam Sealant: Sonneborn NP-1, or an approved equal. One-component urethane gun-grade sealant, meeting ASTM C 920, Type S, Grade NS.

2.5 TRIM PRODUCTION

- A. Corners: Same materials, thickness, and finish as wall panels as detailed on the drawings, brake formed, shop cut, and factory mitered to required angles.
- B. Miscellaneous trim: Same material, thickness, and where exposed, of same finish as sheet stock; brake formed to required profiles.

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

- C. On-site fabrication of component profiles must be with approved equipment intended for that purpose. Hand- or tong-braking of sheet metal components will not be permitted unless approved in advance.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Inspect and ensure surfaces are free from objectionable warp, wave, and buckle before proceeding with installation of metal wall/mansard panels.
- B. Ensure substrate is ready to receive underlayment and metal panels. Report items for correction and do not proceed with metal roof panel system installation until resolved.

3.2 UNDERLAYMENT INSTALLATION

- A. Self-Adhering, High-Temperature Sheet Underlayment: Install one (1) ply of specified material over existing sheathing, lapping sides of sheets a minimum of 2 inches and end laps a minimum of 6 inches. Lay sheets horizontally or vertically in shingle style. Terminate sheet at eaves and as indicated on Contract Drawings. Do not seal with flashing cement at penetrations.

3.3 WALL PANEL INSTALLATION

- A. Install accessory Work such as trim, cleats, etc., prior to installation of panels, as required.
- B. Install panels in accordance with the Drawings, the current edition of the specified standards and approved shop drawings.
- C. Install panels, plumb, level, and straight with seams and ribs parallel, conforming to design as indicated.
- D. Fabricate and install Work with lines and corners of exposed units true and accurate. Form exposed faces flat and free of buckles, excessive waves and avoidable tool marks, considering the temper and reflectivity of the metal. Provide uniform, neat seams. Except as otherwise shown, fold back the sheet metal to form a hem on the concealed side of exposed edges where required.
- E. When fitting panels and seams provide maximum care to prevent deformation of the metal.
- F. Install metal wall panels mounted to furring channels and/or light gauge framing members. Furring and panels shall be installed in accordance with manufacturer's written instructions.
- G. Install panels continuous from major termination to major or natural termination. Transverse - or lap seams - are not permitted.
- H. Factory-cut panels to length. Field cutting of panel ends is discouraged. When field cutting is required, do so with snips or shears, and not with high speed saws.

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

- I. Install sheet metal trim at terminations and as shown on the drawings. Provide neat rectangular or square escutcheons around penetrations.

3.4 CLEANING AND PROTECTION

- A. Dispose of excess materials and remove debris from site.
- B. Clean Work in accordance with standard NRCA industry recommendations.
- C. Protect Work against damage until final acceptance. Replace or repair to the satisfaction of the Architect and Owner any Work that becomes damaged prior to final acceptance.
- D. Do not use touch-up paint to repair scratched metal surfaces. Scratches unacceptable to the Architect shall result in replacement of the damaged metal. This determination shall be the Architect's alone.

END OF SECTION 074140

SECTION 075216 - MODIFIED BITUMEN ROOF SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 through Division 26 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Qualifications, Standards and Materials for new roof assembly.
 - 2. Modified bituminous membrane roofing.
 - 3. Roof walkway pads.
- B. Related Sections
 - 1. Section 061050 - Roof Carpentry
 - 2. Section 072200 - Roof Insulation
 - 3. Section 075220 - Roofing Installer's Warranty
 - 4. Section 075600 - Fluid Applied Membrane Flashing
 - 5. Section 076200 - Flashing and Sheet Metal
 - 6. Section 077200 - Roof Accessories

1.3 DEFINITIONS

- A. Roofing Terminology: See ASTM D 1079 and glossary in NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" for definition of terms related to roofing work in this Section.

1.4 REFERENCES

- A. General: Any material or operation specified by reference to the published specification or standard of a manufacturer, trade association, technical organization or other published standard, shall comply with the requirements of the current specification or standard listed or enforced by the Authority Having Jurisdiction (AHJ).
- B. American Society of Civil Engineers (ASCE)
 - 1. ASCE-7 – "Minimum Design Loads for Buildings and Other Structures" – as enforced by local AHJ. Without a local AHJ, ASCE 7–10 shall be incorporated.
- C. American Society for Testing and Materials (ASTM)
 - 1. ASTM D41 - "Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing".
 - 2. ASTM D4586 – "Standard Specification for Asphalt Roof Cement, Asbestos-Free".
 - 3. ASTM D6163 – "Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fiber Reinforcements".
 - 4. ASTM D6298 – "Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheets with a Factory Applied Metal Surface".

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

5. ASTM D6222 – “Standard Specification for Atactic Polypropylene (APP) Modified Bituminous Sheet Materials Using Polyester Reinforcements”.
 6. ASTM D6223 – “Standard Specification for Atactic Polypropylene (APP) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fiber Reinforcements”.
 7. ASTM D6509 – “Standard Specification for Atactic Polypropylene (APP) Modified Bituminous Base Sheet Materials Using Glass Fiber Reinforcements”.
- D. Factory Mutual (FM)
1. FM 1-SH – “Roof Assembly Classification for Severe Hail Exposure”.
 2. FM 4450 – “Approval Standard for Class 1 Insulated Steel Roof Decks”.
 3. FM 4470 – “Approval Standard for Single-Ply, Polymer-Modified Bitumen Sheet, Built-Up Roof (BUR) and Liquid Applied Roof Assemblies for use in Class 1 and Noncombustible Roof Deck Construction”.
- E. International Code Council (ICC)
1. International Building Code (IBC) – as enforced by AHJ. Without a local AHJ, the 2015 IBC shall be incorporated.
 2. International Existing Building Code (IEBC) – as enforced by AHJ. Without a local AHJ, the 2015 IEBC shall be incorporated.
- F. National Roofing Contractors Association (NRCA)
1. “Handbook of Accepted Roofing Knowledge”.
 2. “Roofing and Waterproofing Manual”.
- G. Underwriter’s Laboratories (UL)
1. UL 790 – “Standard for Standard Test Methods for Fire Tests of Roof Coverings”.

1.5 PERFORMANCE REQUIREMENTS

- A. General Performance: Provide installed membrane roofing and base flashings that withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.
- B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing manufacturer based on testing and field experience.
- C. Fire-Resistance Ratings: Provide Class 1A fire-resistance-rated roof assemblies identical to those of assemblies tested for fire resistance per ASTM E 119 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
- D. Hail Resistance Rating: FM 1-SH (Severe Hail).

1.6 SUBMITTALS

- A. Comply with provisions of Division 01.
- B. Mark each product data cut-sheet by circling or highlighting and affix the corresponding Article and Paragraph designations from this Specification Section. Product data not so marked will be returned without review, for re-submittal complying with the above requirements.

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

- C. Product Data: For each type of product indicated with construction details, material descriptions, dimensions of individual components and profiles, and accessories, including but not limited to the following:
 - 1. Modified bitumen base ply.
 - 2. Modified bitumen cap ply.
 - 3. Base flashing backer ply.
 - 4. Base flashing finish ply.
 - 5. Asphalt primer.
 - 6. Plastic roof cement.
 - 7. Flashing cement.
 - 8. Mechanical fasteners.
 - 9. Roofing nails.
 - 10. Annular rings.
 - 11. Roofing granules.
 - 12. Termination bar.
 - 13. Roof walkway pads.
 - 14. Flexible vapor retarder.
 - 15. Compressible insulation.
- D. Manufacturer's Certification: Provide current letter(s) on membrane manufacturer's letterhead, signed by an authorized employee or corporate officer attesting to the following:
 - 1. Products: Certify that roofing system complies with requirements specified in "Performance Requirements" Article.
 - 2. Roofing system components are physically and chemically compatible for installation as designed.
 - 3. Proposed materials, including those by other manufacturers, are acceptable to membrane manufacturer for use in system.
 - 4. Proposed system meets criteria for issuance of required manufacturer's warranty.
 - 5. Specifically identify and define any deviations.
 - 6. Submit sample NDL warranty.
- E. Installer Certificates: Signed by roofing system manufacturer certifying that Installer is approved, authorized, or licensed by manufacturer to install roofing system.
- F. Manufacturer's Field Reports: Summarize findings of each inspection. Indicate any discrepancies from recommended installation methods, corrective action recommended to installer, and any non-compliant or unsatisfactory conditions.
- G. Inspection Report: Copy of roofing system manufacturer's inspection report of completed roofing installation.
- H. Project Record Documents: Accurately record exact location of roof membrane penetrations and authorized changes to Contract Documents.

1.7 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products and systems specified in this Section with minimum five years documented experience, including a minimum of three (3) projects of comparable size, using specified system, installed in the State of Texas within that five-year period. Manufacturer shall certify, in

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

writing, materials to be used in the roof assembly as being compatible with their system, whether manufactured by that company or by others.

- B. Installer Qualifications: A qualified firm that has been continuously approved, authorized, or licensed by roofing system manufacturer to install manufacturer's products and specified roof system, including:
 - 1. Certified by roofing system manufacturer as an approved 20-year NDL applicator for a minimum of three (3) years prior to Bid Date and qualified to provide 20-year NDL warranty on specified systems and flashings.
 - 2. Successful completion of minimum five (5) projects of comparable size and specified systems during that time.
 - 3. Torching operations must be performed by CERTA (Certified Roofing Torch Applicator) trained applicators with up-to-date certifications. Submit copy of worker torching certifications.
 - 4. Assign a qualified, full-time, non-working supervisor to be on Project site always during installation of Work.
 - 5. Designate a responsible Project Manager or Superintendent to inspect installed Work, particularly tie-ins and temporary flashings, at end of each working day and as otherwise required to ensure water-tightness.
 - 6. Verify inspection by signature on approved Daily Inspection Form signifying installation is in accordance with specified requirements.
- C. Source Limitations: Obtain components for roofing system from or approved by roofing system manufacturer.
- D. Perform Work in accordance with NRCA Manual of Roof Maintenance and Roof Repair, NRCA Roofing and Waterproofing Manual, and manufacturer's instructions.
- E. Workers: All roofers and laborers to be direct employees of Primary Contractor.
 - 1. Project Manager and Superintendent: Minimum five years roofing experience and employed by Contractor for a minimum one year prior to Bid Date.
 - 2. Non-working Supervisor: Able to communicate effectively with building personnel and Applicator's workers and employed by Contractor for a minimum one year prior to Bid Date.
 - 3. Tradesmen: Minimum 50-percent of installation crew to have been employed by Contractor for a minimum six months prior to Bid Date.
- F. Assign a qualified, full time, non-working supervisor to be on Project site always during installation of Work.
- G. Pre-Roofing Conference: Before starting roofing operations, conduct conference.
 - 1. Meet with Owner, Architect, 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. Review structural loading limitations of roof deck during and after roofing.
 - 5. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

6. Review governing regulations and requirements for insurance and certificates if applicable.
 7. Review temporary protection requirements for roofing system during and after installation.
 8. Review roof observation and repair procedures after roofing installation.
- H. Do not allow materials which have not been approved through the submittal process to be brought onto the project site.
1. Materials brought onto the site which have not been approved through the submittal process will be rejected and shall be removed immediately.
 2. Remove any materials incorporated into the Work, which have not been approved through the submittal process.
- I. The manufacturer's representative shall make a minimum of two (2) site visits to the project per month at critical stages of the roof installation, and forward to the Architect written reports of the observations and instructions given to the Contractor during these visits. Coordinate the visits to take place at the time of the Architect's visits, with one occurring at the monthly pay application meeting. Include at the minimum the following information in manufacturer's representative's reports:
1. Prepare reports typewritten on the manufacturer's letterhead stationery and submit to the Architect within seven (7) days of the site visit.
 2. Document Work in progress and list deficiencies, corrective actions and recommendations.
 3. Failure of the manufacturer's representative to provide the required reports is cause for rejection of the Contractor's pay application.

1.8 REGULATORY REQUIREMENTS

- A. Conform to applicable local codes for roof assembly fire hazard requirements and application procedures.
- B. Provide certification of inspection confirming approval of design and installation by authority having jurisdiction.
- C. 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, FM, 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.

1.9 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original sealed and labeled shrouds on pallets and labeled with manufacturer's name, product brand name and type.
1. Inspect for damage.
 2. Replace damaged or deteriorated materials.
 3. Deliver materials in quantities to allow continuity of application throughout the Project.

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

4. Coordinate shipment receipt as necessary to cause Owner least amount of interference in Owner's operations. Owner will not take responsibility for product deliveries.
- B. Store roofing materials in weather protected environment, clear of ground and moisture and protected from direct sunlight.
 1. Stand and store roll materials on end.
 2. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer.
 3. Protect roof insulation materials from physical damage. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- C. Handle and place roofing materials and equipment in a manner to avoid permanent deflection of deck.
 1. Do not store materials on roof overnight.
 2. Maximum Allowable Loading on Roof: 20 pounds per square foot.
 3. Promptly mark, remove from the site and legally dispose of:
 - a. Damaged materials,
 - b. Materials contaminated by moisture and other sources,
 - c. Liquid materials that cannot be applied within its stated shelf life.

1.10 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. Do not apply roofing membrane during inclement weather.
 2. Do not apply roofing membrane to damp or frozen deck surface.
 3. Observe wind chill and other cold weather conditions for proper bituminous application.
 4. The Contractor shall have the final decision as to whether to chance roofing operations in the event wet conditions threaten and shall consider wind speed as a determining factor as to whether roofing operations can be safely accomplished under such conditions.
 5. The Contractor shall suspend Work if, in his/her opinion, wind speed will impede the proper installation of the roofing Work, or cause a danger to its personnel, or the Owner's property.
- B. Property Protection: Do not remove any part of the roof and leave the building in an open state that would allow water penetration overnight. Apply a fully watertight temporary or permanent repair.

1.11 SEQUENCING AND SCHEDULING

- A. Coordinate work under provisions of the appropriate Division 01 Section regarding administration requirements.
- B. Coordinate with demolition Work and with Work of other trades to ensure sufficient materials and manpower are available to complete and make watertight roofing Work each day.

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

- C. Coordinate installation of associated metal flashings, and roof-related items as work of this Section proceeds. Strip-in flanged metal components to roof membrane on same day they are installed.
- D. Schedule work to avoid storage on and traffic over finished work.
- E. Upon completion of Work each day that torching operations occur, provide a full 1-hour fire watch by a competent person, trained to detect possible smoke or fire resulting from roofing operations. Should the competent person detect smoke or fire he shall immediately place a telephone call to the Fire Department through the 911 exchange.
- F. Mount and always maintain a minimum of two (2) fully charged and workable 3A60BC class fire extinguishers at the roof level when Work is underway. Position fire extinguishers within 25 feet of torching operations. Train workers in proper fire extinguisher use.

1.12 WARRANTY

- A. Provide a two-year written warranty covering defects in the roofing materials and labor on the form in Section 075220.
- B. Provide the roofing materials manufacturer's 20-year no-dollar-limit type warranty covering repair of defects in the insulation, roofing and composition flashings, and repair of interply blistering.
- C. Commence warranties on the Date of Substantial Completion for the overall project.

PART 2 - PRODUCTS

2.1 MODIFIED BITUMEN MANUFACTURERS

- A. Derbigum
- B. Johns Manville
- C. Siplast
- D. Soprema
- E. U.S. Ply

2.2 SHEET MATERIALS

- A. Modified Bitumen Base Ply: Fiberglass or polyester mat, coated with SBS or APP modified asphalt.
 - 1. Derbigum Derbigum P
 - 2. Johns Manville DynaWeld 180S
 - 3. Siplast Paradiene 20 HT TG
 - 4. Soprema Sopralene Flam 180
 - 5. U.S. Ply DuraFlex 190S TG SBS
- B. Modified Bitumen Cap Ply: Fiberglass or polyester reinforced SBS or APP modified bitumen, with white granular surfacing.
 - 1. Derbigum Derbicolor P FR CR
 - 2. Johns Manville DynaWeld Cap FR CR G

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

- | | | |
|----|----------|---------------------------------|
| 3. | Siplast | Paradiene 30 FR TG BW |
| 4. | Soprema | Elastophene Flam FR GR SG |
| 5. | U.S. Ply | DuraFlex G4FRTG SBS Ultra White |

2.3 FLEXIBLE FLASHINGS

- A. Backer Ply: Fiberglass or polyester mat, coated with SBS or APP modified bitumen, having a smooth surface.
- | | | |
|----|----------------|----------------------|
| 1. | Derbigum | Derbigum P |
| 2. | Johns Manville | DynaWeld 180S |
| 3. | Siplast | Paradiene 20 HT TG |
| 4. | Soprema | Sopralene Flam 180 |
| 5. | U.S. Ply | DuraFlex 190S TG SBS |
- B. Base Flashing Finish Ply: Fiberglass or polyester mat coated with modified bitumen and metal foil surface. The flashing system is to be approved by the membrane manufacturer for use with its respective system.
- | | | |
|----|----------------|---------------------|
| 1. | Derbigum | Derbilume FR |
| 2. | Johns Manville | DynaClad |
| 3. | Siplast | Veral Aluminum |
| 4. | Soprema | Sopralast 50 TV Alu |
| 5. | U.S. Ply | DuraFlex Alum SBS |

2.4 AUXILIARY ROOFING MEMBRANE MATERIALS

- A. Asphalt Primer: ASTM D41.
- B. Plastic Cement: ASTM D4586, Type I, asbestos free.
- C. Flashing Cement: Compatible with modified bitumen membrane.
- D. Mechanical Fasteners for Flexible Flashing:
1. Masonry: 0.25-inch x 1.5-inch zinc-jacketed steel masonry drive pin; Zamac "Hammer Screw," or an approved equal.
 2. Wood Blocking: Stainless steel (for fastening into ACQ treated lumber) or high carbon, zinc coated steel (for fastening into non- ACQ treated lumber); annular threaded 1-inch shank nails; with minimum 1-inch x 30 gage metal disk; Roofing Nail, manufactured by Simplex Nails, Inc.
- E. Roofing Nails:
1. Stainless steel for fastening into ACQ treated lumber.
 2. Provide with annular rings, size as required to suit application; minimum 11-gage with 3/8-inch diameter head.
- F. Roofing Granules: Ceramic-coated roofing granules, No. 11 screen size with 100 percent passing No. 8 sieve and 98 percent of mass retained on No. 40 sieve, color to match roofing membrane.
- G. Termination Bars: 12-ga. or 1/8-inch x 1-inch, hot-dipped galvanized or stainless-steel bar stock.

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

- H. Roof Walkway Pads: Composite pads consisting of layers of hardened asphalt and fiberglass membrane bonded together. Pads shall be equivalent to the roofing cap ply and have an integral contrasting gray granule surface. Provide roll pads 2'-8" wide minimum or modular pads 2'-8" x 2'-8" minimum.
- I. Expansion Joint Filler:
 - 1. Flexible Vapor Retarder: Minimum 45 mil thick elastomeric membrane, such as EPDM, or approved equal.
 - 2. Compressible Insulation: Fiberglass batt insulation or approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that surfaces and site conditions are ready to receive work.
- B. Verify the insulation is clean and smooth, free of depressions, waves, or projections, properly sloped to drains or eaves.
- C. Verify that roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly anchored and wood nailers are in place.
- D. Start of installation shall constitute Contractor's acceptance of existing conditions.

3.2 PREPARATION

- A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing membrane installation according to roofing system manufacturer's written instructions. Remove sharp projections.
- B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove temporary closures or roof-drain plugs prior to leaving the job site each day.

3.3 ROOFING MEMBRANE INSTALLATION - GENERAL

- A. Install roofing membrane system according to roofing system manufacturer's written instructions, these documents and as follows:
 - 1. Deck Type: Insulated.
 - 2. Adhering Method: Torch.
 - 3. Number of Modified Asphalt Sheets: Two.
 - 4. Surfacing Type: Granule.
- B. Cooperate with testing agencies engaged or required to perform services for installing roofing system.
- C. Coordinate installing roofing system so components of the roofing membrane system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

1. Provide tie-offs at end of each day's work to cover exposed roofing membrane sheets 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.

3.4 APPLICATION OF ROOFING SYSTEM

- A. Torch-in-place base ply over specified roof board and insulation per manufacturer's written instructions. Fully-adhere the base ply to the substrate by continuous torching of the plies. Lightly trowel the edges of each sheet.
- B. Torch-seal one additional ply of base sheet around roof penetrations prior to installation of cap sheet.
- C. Apply cap ply parallel to base ply in accordance with manufacturer's instructions. Fully-torch cap ply to the previously installed base ply.
 1. Provide 4-inch side and end laps. Stagger lap joints between base ply and cap ply.
 2. Stagger lap joints between adjacent plies of cap ply sheet by a minimum of 12 inches.
 3. Where cap ply is applied over granule surface of previously installed ply, apply asphalt primer to surface of granular ply and allow it to dry prior to torching next ply.
 4. Limit modified bitumen bleed at ply laps to no more than 0.5 inch. Lightly trowel edges of ply while bitumen remains hot.
 5. Cover exposed bitumen per manufacturer's recommendations.

3.5 APPLICATION OF FLASHING

- A. Apply flexible base flashings over specified backer felt to seal membrane to vertical elements.
 1. Torch-apply specified backer ply, followed by torch-applied base flashing.
 2. Apply both in strict accordance with manufacturer's written instructions and these Specifications.
 3. Secure top of flashing assembly to wood substrate with specified cap nails, at 8 in. on centers.
 4. Secure top of flashing assembly to masonry substrates with specified termination bar and masonry drive pins spaced at 8 inches on centers.
 5. Cover bitumen bleed at per manufacturers recommendations, to avoid leaving black lines.
 6. Cut the toe of the base flashing straight on the scoring of the sheet, and ensure adjacent sheets have an even edge. Lightly trowel edge of each sheet while bitumen remains hot. Lap bleed shall not exceed 0.25 inch.
- B. Install roofing membrane cap-sheet stripping where metal flanges and edgings are set on membrane roofing according to roofing system manufacturer's written instructions. Install strip-in ply on the same day as the sheet metal penetration flashing or roof perimeter metal edge is installed.
- C. Coordinate installation of roof drains, sumps, and related flashings.

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

3.6 WALKWAY PAD INSTALLATION

- A. General Requirements:
 - 1. Install walkway pads according to walkway manufacturer's written instructions.
 - 2. Pads cut from rolls shall be allowed to relax for 24 hours prior to installation.
 - 3. Set walkway pads in cold-applied adhesive or by torch application.
 - 4. Locations:
 - a. For modular pads, provide a minimum of two pads adjacent to plus 12 inches beyond electrical disconnect racks and roof ladder landings, around all sides of mechanical equipment, and on three sides of each roof hatch.
 - b. For roll pads, match the width plus 12 inches beyond electrical disconnect racks and roof ladder landings, continuous around all sides of mechanical equipment, and continuous around three sides of each roof hatch.
 - 5. Modular pads shall be set with a 3-inch gap for drainage.

3.7 FIELD QUALITY CONTROL

- A. Test Cuts: Test specimens may be removed to evaluate problems observed during quality-assurance inspections of roofing membrane. Assist in securing roof cuts and patch roof as required to finished condition at no added cost to the Owner.
- B. Promptly correct identified defects and irregularities. Repair membrane defects called to the attention of the Project Superintendent prior to the end of each day, unless directed otherwise.
- C. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
 - 1. Notify Architect and Owner 48 hours in advance of date and time of inspection.

3.8 PROTECTING AND CLEANING

- A. Protect new and existing roof surfaces from damage by other trades.
- B. Where traffic must traverse existing roofs, provide a protective covering consisting of 4 ft. x 8 ft., 1/2-inch plywood sheets secured to a layer of 1/2-inch wood fiber insulation board and laid loose over the membrane with the insulation board side to the roof surface.
 - 1. Do not store materials on the roof without this protective covering.
 - 2. Any damage to new or existing roofs shall be repaired at the Contractor's cost per requirements of the manufacturer holding or providing the current Warranty.
- C. Protect completed 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 Architect and Owner.
- D. 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.
- E. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

- F. Remove bituminous markings from finished surfaces.
- G. In areas where finished surfaces are soiled by bitumen or any other source of soiling caused by Work of this Section, consult manufacturer of surfaces for cleaning advice, and conform to their documented instructions. Replace any materials or finishes which cannot be cleaned to the Owner's satisfaction.

END OF SECTION 075216

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

SECTION 075220 - ROOFING INSTALLER'S WARRANTY

WHEREAS _____,

of _____,

Herein called the "Contractor," has performed roofing and associated Work on the following project:

Project Name: JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

Acceptance Date: _____ Warranty Period: Two (2) Years

Date of Expiration: _____

AND WHEREAS the Contractor has contracted with Owner to warrant said Work against leaks and faulty or defective materials and workmanship for designated Warranty Period.

NOW THEREFORE the Contractor hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period will at its own cost and expense, make or cause to be made such repairs to, or replacement of said Work as is necessary to correct faulty and defective Work, and as is necessary to maintain said Work in watertight condition.

This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to Work and other parts of the building, and to building contents, caused by: (a) lightning, windstorms, and other unusual phenomena of the elements; (b) fire; (c) failure of roofing system substrate including cracking, settlement, excessive deflection, deterioration, and decomposition; (d) faulty construction of vents, mechanical equipment, and other penetrations not installed as part of the Work; (e) repeated vapor condensation on bottom of roofing; and (f) activity on roofing by other persons including construction contractors and maintenance personnel, whether authorized or unauthorized by Owner.
2. When Work has been damaged by any of the foregoing causes, Warranty shall be null and void until such damage has been repaired by the Contractor, and until cost and expense thereof has been paid for by the Owner, or by another responsible party so designated.
3. The Contractor is responsible for Work covered by this Warranty, but is not liable for consequential damages to buildings or building contents resulting from leaks or faults or defects of the Work.
4. During Warranty Period, if the Owner allows alterations of Work by anyone other than the Contractor, including cutting, patching and maintenance in connection with penetrations, attachment of other Work, and positioning of anything on roof, this Warranty shall become null and void upon date of said alterations, but only to extent said alterations affect Work covered by this Warranty. If the Owner engages the Contractor to perform said alterations, Warranty shall not become null and void, unless the Contractor, before starting said Work, shall have notified the Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate the Work, thereby reasonably justifying a limitation or termination of this Warranty.

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void upon date of said change, but only to extent said changes affect Work covered by this Warranty.

6. Owner shall promptly notify the Contractor of observed, known, or suspected leaks, defects or deterioration, and shall afford reasonable opportunity for the Contractor to inspect the Work, and to examine evidence of such leaks, defects or deterioration.

7. This Warranty is recognized to be the only Warranty of the Contractor on said Work, and shall not operate to restrict or cut off the Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve the Contractor of responsibility for performance of original Work.

IN WITNESS THEREOF, this instrument has been duly executed this ____ day of _____, 202__.

Contractor Name and Address

Typed name and Title

Signature

Telephone Number

Fax Number

Notary Seal

SECTION 075600 - FLUID APPLIED MEMBRANE FLASHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 through Division 26 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Fluid applied membrane flashing.
 - 2. Preparation of substrate to receive flashing materials.
- B. Related Sections:
 - 1. Section 075216 - Modified Bitumen Roof System
 - 2. Section 075220 - Roofing Installer's Warranty
 - 3. Section 076200 - Flashing and Sheet Metal

1.3 DEFINITIONS

- A. Roofing Terminology: See ASTM D 1079 and glossary in NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" for definition of terms related to roofing work in this Section.

1.4 REFERENCES

- A. References in these specifications to standards, test methods and codes, are implied to mean the latest edition of each such standard adopted. The following is an abbreviated list of associations, institutions and societies which may be used as references throughout these specifications:
 - 1. ACI American Concrete Institute, Hills, MI
 - 2. ASTM American Society for Testing and Materials, Philadelphia, PA
 - 3. FM Factory Mutual Engineering and Research, Norwood, MA
 - 4. NRCA National Roofing Contractors Association, Rosemont, IL
 - 5. OSHA Occupational Safety and Health Administration, Washington, DC
 - 6. UL Underwriters Laboratories, Northbrook, IL

1.5 SUBMITTALS

- A. Comply with provisions of Division 01.
- B. Mark each product data cut-sheet by circling or highlighting and affix the corresponding Article and Paragraph designations from this Specification Section. Product data not so marked will be returned without review, for re-submittal complying with the above requirements.

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

- C. For each type of product indicated with construction details, material descriptions, dimensions of individual components and profiles, and accessories, including but not limited to the following:
 - 1. Catalyst.
 - 2. Resin.
 - 3. Membrane and flashing reinforcement.
 - 4. Elastomeric sealant.
 - 5. Cleaner/solvent.
 - 6. Preparation paste.
 - 7. Repair tape.
- D. Products shall be listed as part of the warranted roof system in the Manufacturer's Certification submitted under Section 075216.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Company specializing in manufacturing products and systems specified in this Section with minimum five years documented experience, including a minimum of three (3) projects of comparable size, using specified system, installed in the State of Texas within that five-year period. Manufacturer shall certify, in writing, materials to be used in the roof assembly as being compatible with their system, whether manufactured by that company or by others.
- B. Source Limitations: Obtain components for roofing system from or approved by roofing system manufacturer
- C. Perform Work in accordance with NRCA Manual of Roof Maintenance and Roof Repair, NRCA Roofing and Waterproofing Manual, and manufacturer's instructions.
- D. Workers: Comply with requirements specified for the modified bitumen roof membrane section.
- E. Do not allow materials which have not been approved through the submittal process to be brought onto the project site.
 - 1. Materials brought onto the site which have not been approved through the submittal process will be rejected and shall be removed immediately.
 - 2. Remove any materials incorporated into the Work, which have not been approved through the submittal process.
- F. Manufacturer Requirements: The flashing system manufacturer shall provide direct trained company personnel to attend necessary job meetings, perform periodic inspections as necessary and conduct a final inspection upon successful completion of the project.

1.7 REGULATORY REQUIREMENTS

- A. Conform to applicable local codes for roof assembly fire hazard requirements and application procedures.
- B. Fire Hazard Classification: UL Class A.

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

- C. Roof Assembly Classification: FM Class 1-130 construction, in accordance with FM Construction Bulletin 1-28.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver roofing materials to Project site in original sealed and labeled shrouds on pallets and labeled with manufacturer's name, product brand name and type.
 - 1. Inspect for damage.
 - 2. Replace damaged or deteriorated materials.
 - 3. Deliver materials in quantities to allow continuity of application throughout the Project.
 - 4. Coordinate shipment receipt as necessary to cause Owner least amount of interference in Owner's operations. Owner will not take responsibility for product deliveries.
- B. Store roofing materials in weather protected environment, clear of ground and moisture and protected from direct sunlight.
 - 1. Stand and store roll materials on end.
 - 2. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer.
 - 3. Protect roof insulation materials from physical damage. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
- C. Handle and place roofing materials and equipment in a manner to avoid permanent deflection of deck.
 - 1. Do not store materials on roof overnight.
 - 2. Maximum Allowable Loading on Roof: 20 pounds per square foot.
 - 3. Promptly mark, remove from the site and legally dispose of:
 - a. Damaged materials,
 - b. Materials contaminated by moisture and other sources,
 - c. Liquid materials that cannot be applied within its stated shelf life.

1.9 PROJECT CONDITIONS

- A. Requirements Prior to Job Start:
 - 1. Notification: Give a minimum of 5-days' notice to the Owner and manufacturer prior to commencing any Work and notify both parties on a daily basis of any change in Work schedule.
 - 2. Permits: Obtain permits required by local agencies and pay fees which may be required for the performance of the Work.
 - 3. Safety: Familiarize every member of the application crew with fire and safety regulations recommended by OSHA, NIOSH, NRCA and other industry or local governmental groups.
 - a. Workers shall wear a long sleeve shirt with long pants and Work boots.
 - b. Workers shall use only butyl rubber or nitrile gloves when mixing or applying fluid flashing products.
 - c. Safety glasses with side shields are required for eye protection.
 - d. Use local exhaust ventilation to maintain Worker exposure below the published Threshold Limit Value (TLV).
 - e. If the airborne concentration poses a health hazard, becomes irritating or

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

exceeds recommended limits, use a NIOSH approved respirator in accordance with OSHA Respirator Protection requirements published under 29 CFR 1910.134. The specific type of respirator will depend on the airborne concentration.

- f. A filtering face piece or dust mask is not acceptable for use with this product if TLV filtering levels have been exceeded.

B. Environmental Requirements:

1. Precipitation: Do not apply fluid flashing materials during precipitation or in the event there is a probability of precipitation during application. Take adequate precautions to ensure that materials and building interiors are protected from possible moisture damage or contamination.
2. Temperature Restrictions – Primer Resins: Do not apply primer resin if there is a threat of inclement weather. Apply the primer resin while air temperature is between 32°F (0°C) and 104°F (40°C), and while the substrate temperature is between 32°F (0°C) and 122°F (50°C). Do not apply resin materials when ambient or substrate temperatures exceed that indicated above.
3. Temperature Restrictions – Summer Grade Roofing Resins: Do not apply roofing resins if there is a threat of inclement weather. Apply membrane resin while air temperature is between 59°F (15°C) and 104°F (40°C), providing the substrate temperature is between 50°F (10°C) and 122°F (50°C). Do not apply materials when ambient or substrate temperatures exceed that indicated above.

C. Protection Requirements:

1. Membrane and Property Protection: Provide protection against staining and mechanical damage for newly applied roofing and adjacent building surfaces.

1.10 WARRANTY

- A. Work of this Section shall be included in the two-year written warranty against defects in materials and Workmanship, beginning on the date of Substantial Completion of the overall Project, as executed on the form found in Section 075220.
- B. New Roof System: Fluid Applied Flashing to be included in roof membrane manufacturer's 20-Year NDL Warranty.

PART 2 - PRODUCTS

2.1 MEMBRANE / FLASHING SYSTEM

- A. Catalyst: A reactive agent used to induce curing of polymethylmethacrylate (PMMA) resins.
 1. Derbigum Derbiflash RS Catalyst.
 2. Johns Manville Seamfree™ PMMA Catalyst.
 3. Siplast "Pro Catalyst".
 4. Soprema ALSAN RS Catalyst Powder.
 5. U.S. Ply, Inc. Manufacturer's approved PMMA product.
- B. Resin for Membrane and Flashing Applications: A flexible, PMMA-based resin for use in combination with a polyester fabric to form a monolithic, reinforced roofing or flashing

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

membrane.

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| 1. | Derbigum | Derbitite RS 230 Flash. |
| 2. | Johns Manville | Seamfree™ PMMA Flashing Resin. |
| 3. | Siplast | "Parapro Roof Resin". |
| 4. | Soprema | ALSAN RS 230 Flash. |
| 5. | U.S. Ply, Inc. | Manufacturer's approved PMMA product. |

- C. Membrane and Flashing Reinforcement: A polyester fabric reinforcement as supplied by the membrane system manufacturer.

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| 1. | Derbigum | Derbiflash Fleece. |
| 2. | Johns Manville | Seamfree™ PMMA Scrim. |
| 3. | Siplast | "Pro Fleece". |
| 4. | Soprema | ALSAN Polyfleece. |
| 5. | U.S. Ply, Inc. | Manufacturer's approved PMMA product. |

2.2 AUXILIARY MATERIALS

- A. Elastomeric Sealant: A moisture-curing, non-slump elastomeric sealant designed for roofing applications. The sealant shall be approved by the roof membrane manufacturer for use in conjunction with the roof membrane materials.

- B. Cleaner/Solvent: A clear solvent used to prepare metal and plastic surfaces prior to application of the catalyzed resin flashing membranes and to reactivate transition areas of in-place resin flashing membranes at tie-ins and between staged coats of resin.

- C. Preparation Paste: A multi-component, fast curing, PMMA-based paste used for remediation of depressions in substrate surfaces or other irregularities.

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| 1. | Derbigum | Derbiflash RS Paste. |
| 2. | Johns Manville | Seamfree™ PMMA Joint/Repair Paste. |
| 3. | Siplast | "Pro Paste Resin". |
| 4. | Soprema | ALSAN RS Paste. |
| 5. | U.S. Ply, Inc. | Manufacturer's approved product. |

- D. Repair Tape: A white, flexible, coated cotton cloth tape designed for treatment of insulation panel joints and deck/wall transitions.

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|----|----------------|----------------------------------|
| 1. | Derbigum | Manufacturer's approved product. |
| 2. | Johns Manville | JM Coating Repair Tape. |
| 3. | Siplast | "Pro Tape". |
| 4. | Soprema | SOPRANATURE™ Seam Tape. |
| 5. | U.S. Ply, Inc. | Manufacturer's approved product. |

PART 3 - EXECUTION

3.1 INSPECTION

- A. The Contractor shall examine the Contract Documents and conditions which affect the quality of his Work. Deviations or unsatisfactory conditions shall be reported to the Owner's Representative in writing. No Work shall proceed until conditions are satisfactory to meet requirements of the Contract Documents.

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

- B. Conduct a pre-roofing conference with the manufacturer's technical representative, applicator and architect prior to ordering materials and starting Work.
 - 1. Discuss the products and application techniques.
 - 2. Written minutes shall be maintained and submitted by the Contractor to the Architect and Owner.
 - 3. The Work and products may be adjusted depending on recommendations of the manufacturer's technical representative.

3.2 SUBSTRATE PREPARATION

- A. Preparation of roof penetrations to receive new membrane flashing: Grind and scrape away loose dirt, rust, membrane and any other deleterious materials from the surfaces of the piping, conduit or other material scheduled to receive the new coating.
- B. Wipe down affected surfaces with specified cleaner/solvent as recommended by the manufacturer.
- C. Ply Sheet Application: Bond the modified bitumen ply sheet by adhesive application to the prepared substrate, utilizing minimum 3-inch side and end laps. Cut a dog ear angle at the end laps on overlapping selvage edges. Using a clean trowel, apply pressure to top seal T-laps immediately following sheet application. Stagger end laps a minimum of 3 feet. Follow manufacturer's specifications regarding maximum exposure periods prior to application of the liquid-applied finish membrane.

3.3 MIXING OF RESIN PRODUCTS

- A. Preparation/Mixing/Catalyzing Resin Products: Pour the desired quantity of resin into a clean container and using a spiral mixer or mixing paddle, stir the liquid for the time period specified by the resin manufacturer.
- B. Calculate the amount of catalyst powder needed using the manufacturer's guidelines and add the pre-measured catalyst to the primer. Mix again for the time period specified by the resin manufacturer, ensuring that the product is free from swirls and bubbles. It is imperative that air is not entrained into the product during the mixing process. To avoid aeration, do not use a spiral mixer unless the spiral section of the mixer can be fully contained in the liquid during the mixing process.
- C. Mix only enough product to ensure that it can be applied before expiration of resin pot life.

3.4 FLASHING AND FIELD MEMBRANE APPLICATION

- A. Using masking tape, mask the perimeter of the area to receive the flashing system. Apply resin primer to substrates requiring additional preparation and allow primer to set.
- B. Pre-cut reinforcing fabric to ensure a proper fit at transitions and corners prior to membrane application.
- C. Apply an even, generous base coat of flashing resin using a roller at the manufacturer's recommended rate to prepared surfaces requiring flashing coverage.
 - 1. Work the reinforcing fabric into the wet, resin using a brush or roller to fully embed the reinforcing fabric in the resin and remove trapped air.

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

2. Lap reinforcing fabric layers a minimum of 2 inch (5 cm) and apply an additional coat of resin between layers of overlapping fleece.
 3. Again, using a roller, apply an even top coat of resin immediately following embedment of the reinforcing fabric, ensuring full saturation of the reinforcing fabric.
 4. Ensure that the flashing resin is applied to extend a 0.25 inch (6 mm) beyond the reinforcing fabric. Remove the tape before the resin sets.
 5. Make allowances for saturation of roller covers and application equipment.
- D. Should Work be interrupted for more than 12 hours or the surface of the resin becomes dirty or contaminated by the elements, wipe the surface to be lapped with new flashing resin using the specified cleaner/solvent. Allow the surface to dry for a minimum 20 minutes and a maximum 60 minutes before continuing Work.

3.5 FIELD QUALITY CONTROL AND INSPECTIONS

- A. Site Condition: Leave areas around job site free of debris, roofing materials, equipment and related items after completion of job.
- B. Notification of Completion: Notify the manufacturer by means of manufacturer's printed Notification of Completion form of job completion in order to schedule a final inspection date.
- C. Post-Installation Meeting: Hold a meeting at the completion of the project, attended by parties that were present at the pre-job conference. A punch list of items required for completion shall be compiled by the Contractor and the manufacturer's representative. Complete, sign, and mail the punch list form to the manufacturer's headquarters.
- D. Issuance of The Guarantee: Complete post installation procedures and meet the manufacturer's final endorsement for issuance of the specified guarantee.

3.6 CLEANING

- A. Clean roofing surfaces free of overspray materials. Remove excess materials.
- B. Re-install materials which may have been removed during the Work and ensure them to be in working order.

END OF SECTION 075600

SECTION 076200 - FLASHING AND SHEET METAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 through Division 26 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Qualifications, Standards and Materials for sheet metal flashing.
 - 2. Fasteners.
- B. Related Sections:
 - 1. Section 061050 - Roof Carpentry
 - 2. Section 075216 - Modified Bitumen Roof System
 - 3. Section 075220 - Roofing Installer's Warranty
 - 4. Section 075600 - Fluid Applied Membrane Flashing
 - 5. Section 077200 - Roof Accessories

1.3 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Metal Edge Securement: Except gutter, shall be installed as tested in accordance with the most current version of the ANSI\SPRI ES-1, American National Standard for Edge Systems Used with Low-Slope Roofing Systems.
- C. Thermal Movements: Provide sheet metal roofing that allows for thermal movements resulting from ambient and surface temperatures by preventing buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects.
- D. Water Infiltration: Provide sheet metal roofing that does not allow water infiltration to building interior, with metal flashing and connections of sheet metal roofing lapped to allow moisture to run over and off the material.

1.4 SUBMITTALS

- A. Comply with provisions of Division 01.
- B. Mark each product data cut-sheet by circling or highlighting and affix the corresponding Article and Paragraph designations from this Specification Section. Product data not so

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

marked will be returned without review, for re-submittal complying with the above requirements.

- C. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes, as follows:
 - 1. Galvanized sheet metal.
 - 2. Stainless sheet metal.
 - 3. Prefinished sheet metal.
 - 4. Aluminum sheet metal.
 - 5. Self-adhered underlayment.
 - 6. Fasteners.
 - 7. Lead drain flashing.
 - 8. Lead vent flashing.
 - 9. Asphalt roofing cement.
 - 10. Sealant.
 - 11. Solder.
- D. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:
 - 1. Identification of material, thickness, weight, and finish for each item and location in Project.
 - 2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
 - 3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
 - 4. Details of termination points and assemblies, including fixed points.
 - 5. Details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction.
 - 6. Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
 - 7. Details of special conditions.
 - 8. Details of connections to adjoining work.
 - 9. Detail formed flashing and trim at a scale of not less than 3 inches per 12 inches.
- E. If the Contractor intends to comply – without deviation – with the Contract Drawings, shop drawings will not be required as part of this Section. Contractor shall include with initial submittals a letter confirming Contractor's intent to comply with the Drawings, or:
 - 1. Should any changes from the Drawings be anticipated – for whatever reason – submit detailed and accurate to-scale shop drawings, showing the changes and including components.
 - 2. Include the date, project name and Drawing Detail number of the detail proposed for change.
- F. Samples and Color Charts for Initial Selection: For each type of sheet metal flashing, trim, and accessory indicated with factory-applied color finishes involving color selection.
- G. Submit sample prefinished metal color warranty.

1.5 QUALITY ASSURANCE

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

- A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
- B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.
- C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.
 - 1. Build mockups including but not limited to, typical roof eave, fascia, gutter, coping, scupper, collector head and downspouts, approximately 10 feet long or per individual item, including supporting construction cleats, seams, attachments and accessories.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- D. Pre-installation Conference:
 - 1. Meet with Owner, Architect, Owner's insurer if applicable, Installer, and installers whose work interfaces with or affects sheet metal flashing and trim including installers of roofing materials, roof accessories, unit skylights, and roof-mounted equipment.
 - 2. Review methods and procedures related to sheet metal flashing and trim.
 - 3. Examine substrate conditions for compliance with requirements, including flatness and attachment to structural members.
 - 4. Review special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect sheet metal flashing.
 - 5. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
- B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

1.7 WARRANTY

- A. Warranty on Prefinished Metal: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.
 - 1. Exposed Finish: Deterioration includes, but is not limited to, the following:
 - a. Color fading more than 5 Hunter units when tested according to ASTM D 2244.
 - b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
 - c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.
 - 2. Finish Warranty Period: 20 years from date of Substantial Completion.

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

PART 2 - PRODUCTS

2.1 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.
- B. Sheet Metal Types:
 - 1. Galvanized Steel: Lock-forming quality G90, meeting ASTM A-653, in 12-, 22- and 24-gauge thickness, unless otherwise indicated below or on the Drawings.
 - 2. Stainless Steel: 24-gauge, ASTM A240, Type 304, fully annealed for fabrication of receivers for rooftop mechanical equipment where shown on the drawings.
 - 3. Prefinished Metals: 24-gauge, Galvalume® steel, treated, primed and prefinished under precision conditions.
 - a. Exposed Finish: Kynar 500® Fluorocarbon coating. Bottom or unexposed side: manufacturer's standard primer coat. Use for metals indicated on the Drawings and shown hereafter to be exposed to view, and not designated for other metal types.
 - b. Color: Color selection by Architect and/or Owner from manufacturer's standard colors unless custom colors are indicated elsewhere in the Contract Documents.
 - c. Provide pre-finished metal with manufacturer's standard twenty (20) year finish warranty.
 - d. Deliver pre-finished metal to site with factory-applied protective plastic film, to be removed immediately upon installation.

2.2 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Sheet: Minimum 30 to 40 mils thick, consisting of slip-resisting polyethylene-film top surface laminated to layer of butyl or modified asphalt adhesive, with release-paper backing; cold applied. Provide primer when recommended by underlayment manufacturer.
 - 1. Thermal Stability: ASTM D 1970; stable after testing at 240 deg F.
 - 2. Low-Temperature Flexibility: ASTM D 1970; passes after testing at minus 20 deg F.
 - 3. Products: Subject to compliance with requirements, provide one of the following:
 - a. Carlisle Coatings & Waterproofing Inc.; CCW WIP 300HT.
 - b. Grace Construction Products, a unit of W. R. Grace & Co.; Ultra.

2.3 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads.
- C. Fastener Types:
 - 1. Blind Rivets: Stainless steel, Series 44. Rivet and mandrel: Stainless steel. Use stainless steel pop rivets for galvanized, stainless steel, copper and pre-finished

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

- metals.
 - 2. Exposed Fasteners: Exposed fasteners to receive metal-jacketed neoprene or EPDM washers.
 - a. Sheet metal fasteners shall be stainless steel.
 - b. Omit washers where fasteners attach counterflashing to receivers, straps to gutters and downspouts to walls.
 - c. Exposed horizontal surface fasteners are unacceptable.
 - d. Other cleats, screws, rivets, bolts, etc.: Matching material to which they attach, or be galvanically compatible to the surface to which they are secured.
 - 3. Neoprene-Head Screws: #10 or #12 stainless steel screws, with hexagonal heads and matching color metal jacketed neoprene rubber washer.
 - 4. Stainless Steel Masonry Nailer Washers: EPDM sealing washers bonded to Type 304 stainless steel jackets; Rawl EPDM Sealing Washers or approved equal; 3/4-inch diameter.
 - 5. Steel Masonry Nails: Steel pin and zinc-jacketed fastener; Zamac "Hammer Screw," or approved equal. Size: 1/4-inch x 1-1/2 inches.
 - 6. Roofing Nails:
 - a. Stainless steel for fastening into treated lumber.
 - b. Size as required to suit application; minimum 11-gauge with 3/8-inch diameter head.
 - 7. For Galvanized Steel Sheet: Series 300 stainless steel or hot-dip galvanized steel in accordance with ASTM A153 or ASTM F2329.
 - 8. For Stainless Steel Sheet: Series 300 stainless steel.
- D. Miscellaneous Sheet Metal-Related Materials:
- 1. Lead Drain Flashing: 36" x 36" x 4# sheet lead.
 - 2. Lead Vent Flashings: 4# sheet lead preformed vent flashing with 4-inch-wide roof flange, minimum finished height of 8 inches above roof surface, and minimum 1-inch turn down into top of pipe.
 - 3. Asphalt Roofing Cement: ASTM D4586, asbestos free, of consistency required for application.
 - 4. Sealant: Sonneborn NP-1, or an approved equal. One component urethane gun-grade sealant, meeting ASTM C-920, Type S, Grade NS.
 - 5. Solder:
 - a. Galvanized steel: ASTM B32, Grade Sn50, 50% tin and 50% lead.
 - b. Stainless steel: ASTM B32, Grade Sn60 or Sn96, with acid flux of type recommended by stainless steel sheet manufacturer.
 - c. Aluminum: ASTM B907, 60% tin and 40% zinc.

2.4 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.
- B. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
 - 1. Obtain field measurements for accurate fit before shop fabrication.
- C. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

1. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.
- D. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in SMACNA.
- E. Sealed Joints: Form non-expansion but movable joints in metal to accommodate elastomeric sealant.
- F. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with elastomeric sealant concealed within joints.
- G. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal or as shown in the drawings.

2.5 SHEET METAL FABRICATIONS

- A. Galvanized Sheet Metal Items:
 1. General: Where applicable, match existing screw and nail attachments with fasteners that are one size larger than existing.
 2. Counterflashings and Receivers (except at Rooftop Units): Attach receivers as shown on Drawings and noted hereafter. Attach counterflashings to receivers with sheet metal screws spaced at 16 inches on centers or as indicated on Contract Drawings.
 3. Hook Strips: Minimum 22-gauge. Nail at 8 inches on centers, with roofing nails.
 4. Termination Bars: 12-gauge or 1/8-inch x 1 inch hot-dipped galvanized bar stock fastened with specified drive pins spaced at 12 inches on centers with minimum 3/4-inch embedment.
 5. Downspout Boots: 12-gauge with continuous welded or seamed connection.
 - a. Anchor to walls with 12-gauge x 2-inch straps placed top and bottom of boot, and at mid-point when boots exceed 72 inches in length.
 - b. Anchor straps to masonry walls with 1/4-inch expansion sleeve bolts.
 - c. Anchor brackets to boot with four (4) stainless steel sheet metal screws, length as required, per bracket. Provide two (2) screws each side, anchoring bracket to boot.
 - d. Make boots 96-inches maximum length and include required bends, changes in direction and other accompaniments as required by the Work.
 6. Downspout Drops: 24-gauge with joints fully soldered.
- B. Stainless Steel Sheet Metal items:
 1. General: Where applicable, match existing screw and nail attachments with fasteners that are one size larger than existing.
 2. Counterflashings and Receivers at Rooftop Units: Where shown on the Drawings, attach counterflashings to receivers with sheet metal screws spaced at 16-inches on center.
 3. Equipment Curb Caps: Joints fully soldered. Attach to curbs per Drawings.
 4. Flanged Vents: Joints fully soldered.
 - a. Provide with minimum 4-inch-wide flange for stripping into new roof assembly.
 - b. Attach flange to substrate wood blocking with stainless steel roofing nails spaced at 3-inches on center, staggered.
 5. Metal Splash Pans: 24-gauge, galvanized steel, formed to shape shown on

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

Drawings.

C. Pre-Finished Sheet Metal Items:

1. General: Where applicable, match existing screw and nail attachments with fasteners that are one size larger than existing.
2. Copings: Hook at outside face on continuous 22-gauge galvanized cleat. Secure back leg with neoprene-head screws at 12 inches on centers. Provide 1-inch-high standing seams at corners and joints.
3. Counterflashings except at Rooftop Units & Exhaust Fans: Attach receivers as shown in Drawings and noted hereafter. Attach counterflashings to receivers with sheet metal screws spaced at 16 inches on centers.
4. Gutters: Fastened at 6 inches on center to substrate wood nailers with stainless steel wood screws and having 12-gauge x 1-inch galvanized steel straps spaced at 30 inches on centers. Straps shall be anchored with stainless steel sheet metal screws to gutter front edge and back face.
5. Downspouts: Transition from downspout to gutter with 24-gauge galvanized fully soldered drops.
 - a. Attach downspouts to masonry walls with 12-gauge x 1-inch galvanized steel "U" shaped brackets with two (2) zinc-jacketed masonry drive pins per bracket.
 - b. Anchor brackets to downspouts with four (4) stainless steel sheet metal screws, 1/2-inch maximum length, per bracket. Provide two (2) screws each side, anchoring bracket to downspout. Space brackets uniformly at 60 inches on centers
 - c. Extend minimum 2-inches into downspout boots. Cover straps with prefinished metal.
6. Downspout Boot Covers: Wrap new downspout boots with continuous sheet of pre-finished metal.
7. Expansion Joint Covers.
8. Expansion Joint Hook Strips (Cleats): Attach with neoprene-head screws spaced at 12 inches on centers.
9. Fascia Metal Below Edge Metal: Hook at face on continuous 22-gauge galvanized cleat and nail upper flange at 12-inches on centers, with specified roofing nails. Lap joints 3 inches, with concealed sealant pressed between components. Do not rivet or otherwise fix laps.
10. Edge Metal and Cover Plates: Hook at face on continuous 22-gauge galvanized cleat and nail flange at 3-inches on centers, staggered, with stainless steel roofing nails.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Coordinate sheet metal Work with other roofing Work and other trades on this Project with correct sequencing of items making up the entire Project.
- B. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.
 1. Verify compliance with requirements for installation tolerances of substrates.
 2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

- A. General: Install underlayment as indicated on Drawings.
- B. Self-Adhering Sheet Underlayment:
 - 1. Install self-adhering sheet underlayment, wrinkle free.
 - 2. Apply primer if required by underlayment manufacturer.
 - 3. Comply with temperature restrictions of underlayment manufacturer for installation; use primer rather than nails for installing underlayment at low temperatures.
 - 4. Apply in shingle fashion to shed water, with end laps of not less than 6-inches staggered 24-inches between courses.
 - 5. Overlap side edges not less than 3-1/2 inches.
 - 6. Roll laps with roller.
 - 7. Cover underlayment within 14 days.

3.3 INSTALLATION

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
 - 1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
 - 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
 - 3. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
 - 4. Install sealant tape where indicated.
 - 5. Torch cutting of sheet metal flashing and trim is not permitted.
- B. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10-feet with no joints allowed within 24-inches of corner or intersection. Expansion joint covers, expansion breaks or other devices needing these shall be fitted with watertight standing seam joints allowing for lateral expansion as dictated by gauge of metal, "stretch out" or exposure, and latest printed SMACNA guidelines and criteria.
- C. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches, except reduce pre-tinning where pre-tinned surface would show in completed Work.
- D. Rivets: Rivet joints connected by stainless steel rivets spaced at 2-inches on center where indicated and where necessary for strength.
- E. Splash Pans: Anchor to downspouts with 24 ga. X 1-inch galvanized straps with pop rivets. Adhere splash pan to granular surfaced traffic pad set in full bed of flashing cement.
- F. Metal flanges, flashings and other metal items in contact with bituminous roof assembly are to be completely primed with asphalt cut back type primer and, as applicable, set in

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

uniform bed of plastic cement for horizontal surfaces or flashing cement for vertical surfaces.

1. Strip-in metal flanges with specified stripping plies on the same day they are installed.
 2. When gutters are included in the roof edge assembly, the gravel guard metal must be installed simultaneously with the gutter and flashed with specified stripping plies on the same day they are installed.
- G. Joints, other than those receiving standing seam or cover and back plates, in galvanized sheet metal edgings, accessories, flanges and umbrellas, etc. shall be connected by stainless steel blind rivets spaced at 2 inches on center and fully soldered completely watertight.
- H. Fabricate new metal in longest practical lengths up to ten feet, to minimize joints.
- I. Counterflashing and receiver joints shall be lapped a minimum of 4 inches and have a 1/4-inch bead of sealant pressed between the pieces.
1. The sealant shall not be visible from the exterior.
 2. The bottom hemmed edge of the counterflashing shall be neatly hooked in bayonet fashion.
 3. Metal counter-flashings shall completely cover fasteners used to hold in place top terminations of composition base flashings.
- J. Install sheet metal flashings and accessories in accordance with the latest printed SMACNA guidelines and in accord with recognized roofing and sheet metal industry standards.
1. Fit flashings tightly in place using square and true mitered corners.
 2. Surfaces shall be true and straight and lines accurate to profiles encountered.
- K. Install new 6-inch-wide cover and backer plates at new edge metal.
1. Fabricate of matching metal and suitable profile to ensure complete and permanent watertight integrity of metal joint.
 2. Fasten adjoining 10-foot metal gravel guard sections as per most current SMACNA requirements.
 3. New cover plates shall be set in specified sealant. Mastic shall not be used in the jointing of edge metal corners or cover and backer plates.
 4. Cover plates shall be neatly bent along the edges to hug the gravel guard over which they are installed. Gaps of more than 1/16 inch are not permitted.
 5. Nail edge metal in place not more than 3 inches on centers; in a staggered pattern.
 6. Cover plate joints shall be symmetrically laid out so that opposite end sticks of metal are of the same length with lengths in between being the same. Prepare sample layouts in the field for the Architect's approval prior to proceeding with the Work.
- L. Lay out cover plate joints symmetrically, so that opposite end sticks of metal are of the same length with lengths in between being the same. Provide sample layouts in the field for the Architect's approval.

3.4 CLEANING

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.
- D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in Manufacturer's written installation instructions. On completion of installation, remove unused materials and clean finished surfaces.
- E. Do not use touch-up paint to cover any fasteners, metal or other component unless specifically approved in writing in advance of the Work. Any use of touch-up paint without prior approval shall result in affected components being removed and replaced at Contractor's expense.

END OF SECTION 076200

SECTION 077200 - ROOF ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 through Division 26 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Pipe supports.
 - 2. Roof curbs.
 - 3. Equipment supports.
 - 4. Exterior aluminum roof ladders.
- B. Related Sections
 - 1. Section 075216 - Modified Bitumen Roof System
 - 2. Section 076200 - Flashing and Sheet Metal
 - 3. Section 220000 - Common Work Results for Plumbing
 - 4. Section 230000 - Common Work Results for Mechanical
 - 5. Section 260000 - Common Work Results for Electrical

1.3 PERFORMANCE REQUIREMENTS

- A. General Performance: Roof accessories shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.
- B. Structural Performance of Aluminum Ladders: Ladders, including landings shall withstand the effects of loads and stresses within limits and under conditions specified in ANSI A14.3.

1.4 SUBMITTALS

- A. Comply with provisions of Division 01.
- B. Mark each product data cut-sheet by circling or highlighting and affix the corresponding Article and Paragraph designations from this Specification Section. Product data not so marked will be returned without review, for re-submittal complying with the above requirements.
- C. Product Data: For each type of roof accessory indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.
- D. Submit shop drawings for aluminum ladders.
- E. Submit sample warranties for all products listed in Article 1.6.

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Materials shall be delivered in bulk as necessary without hindrance of the Work.
 - 1. Schedule and coordinate with Owner necessary deliveries to cause the least amount of inconvenience to Owner's daily activities.
 - 2. Deliveries and unloading or loading activities shall be the responsibility of the Contractor. The Owner will not take any responsibility for Contractor's deliveries.
- B. Store necessary materials in such a manner to keep from damage by elements or construction and other traffic. Storage of materials on the roof surface is prohibited without adequate blocking to prevent damage to the existing or new roof surfaces.
- C. Fit accessory Work to other Work. Scribe and cope as required for accurate fit.

1.6 WARRANTY

- A. Pipe Supports: Provide manufacturer's standard warranty.
- B. Roof Curbs: Provide manufacturer's standard warranty.
- C. Equipment Supports: Provide manufacturer's standard warranty.
- D. Exterior Aluminum Roof Ladders: Provide manufacturer's five (5) year warranty covering defects in materials and workmanship, or deterioration of material and surface performance. Manufacturer shall, at its option, repair or replace the defective ladder. Refunding of original purchase price will not be an acceptable alternative.

PART 2 - PRODUCTS

2.1 PIPE SUPPORTS

- A. General:
 - 1. Reuse of existing pipe supports or support pads is not acceptable.
 - 2. Construction trades including plumbing, mechanical and electrical shall provide pipe supports from the same manufacturer.
 - 3. Piping supported on the roof surfaces shall be one of the systems specified herein, with the hardware for each system being provided by this Contractor.
 - 4. Furnish and install curbs and flashings, traffic support pads, sheet metal flashings, etc., as required for the proper installation of these systems.
 - 5. Piping and conduit should be elevated a minimum of 12 inches above the roof surface, unless otherwise noted.
 - 6. Piping and conduit should be clamped down with retainer brackets or channel clamps.
- B. Pipe Support – Type "A": Provide for support of single condensate lines and electrical conduit 1-1/2 inch outside diameter and less, and PVC lines.
 - 1. Manufacturer / Model(s):
 - a. nVent Caddy (ERICO), www.erico.com or approved equal.
 - i. Pyramid ST Fixed Strut Support (Where positive slope is provided in structure / roofing system.)
 - ii. Pyramid ST Adjustable Strut Support (Where positive slope is not provided)

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

- in structure / roofing system.)
 - b. OMG Roofing Products, www.omgroofing.com or approved equal.
 - i. OMG Pipeguard® 'Mini' (Where positive slope is provided in structure / roofing system.)
 - ii. OMG Pipeguard® 'Height Adjustable Strut' (Where positive slope is not provided in structure / roofing system.)
 - c. PHP Systems/Design, www.phpsd.com or approved equal.
 - i. SS8-CL (Where positive slope is provided in structure / roofing system.)
 - ii. SS8-C (Where positive slope is not provided in structure / roofing system.)
 - 2. Support assembly is to be composed of:
 - a. Base: Molded polyethylene and/or polypropylene base with UV inhibitors.
 - b. Rod: Galvanized steel 1/2"Ø threaded rods, nuts and washers.
 - c. Channel: Galvanized steel 12-gauge perforated channel.
 - d. Bracket: Galvanized steel retainer bracket.
 - 3. Space supports at maximum distance of 8'-0" on center or less to prevent sag or deflection.
 - 4. Place supports within 12 to 18 inches of "ell" corners, pipe bends, tee intersections and below each pipe or conduit joint.
- C. Pipe Support – Type "B": Provide for support of single hydronic pipe and gas pipe and multiple (3 maximum) electrical conduit 2 inch outside diameter and less.
 - 1. Manufacturer / Model(s):
 - a. PHP Systems/Design, www.phpsd.com or approved equal.
 - i. Hydronic Pipe: PP-10-R with roller support and insulation shield.
 - ii. Gas Pipe: PP-10-R with roller support.
 - iii. Electrical Conduit: PP-10-C with channel.
 - 2. Support assembly is to be composed of:
 - a. Base: Molded high density/high impact polypropylene base with UV inhibitors and antioxidants.
 - b. Base Footprint: 10" x 16" minimum.
 - c. Rod: Galvanized steel 1/2"Ø threaded rods, nuts and washers.
 - d. Roller: Cast iron roller with malleable sockets (gas pipe only). Nylon or synthetic compound rollers are not acceptable.
 - e. Channel: Galvanized steel 12-gauge perforated channel (electrical conduit only).
 - f. Bracket: Galvanized steel retainer bracket.
 - g. Insulation Shield: Galvanized steel.
 - 3. Space supports at maximum distance of 8'-0" on center or less to prevent sag or deflection where piping or conduit is greater than 1-1/4 inches outside diameter.
 - 4. Space supports at maximum distance of 6'-0" on center or less to prevent sag or deflection where piping or conduit is equal to or less than 1-1/4 inches outside diameter.
 - 5. Place supports within 12 to 18 inches of "ell" corners, pipe bends, tee intersections and below each pipe or conduit joint.
 - 6. Provide retainer bracket to prevent pipe from lifting from the rollers.
- D. Pipe Support – Type "C": Provide for support of single or multiple hydronic pipes / gas piping / electrical conduit in excess of 3-1/2 inch outside diameter.
 - 1. Manufacturer / Model(s):
 - a. Eaton (formerly Cooper Industries), www.eaton.com or approved equal.
 - i. B-Line Series base/pipe stand, adjusters and supports, as detailed.

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

- ii. Provide insulation shield for hydronic piping.
 - 2. Support assembly is to be composed of:
 - a. Frame: Galvanized steel 12-gauge perforated channel with galvanized brackets welded to strut and mounted with galvanized steel bolts through neoprene washers into metal-capped curb assembly.
 - b. Rod: Galvanized steel 1/2"Ø threaded rods, nuts, axle and retainer bracket.
 - c. Roller: Cast iron roller with malleable sockets. Nylon or synthetic compound rollers are not acceptable.
 - d. Bracket: Galvanized steel retainer bracket.
 - e. Insulation Shield: Galvanized steel.
 - 3. Space supports at maximum distance of 8'-0" on center or less to prevent sag or deflection.
 - 4. Place supports within 12 to 18 inches of "ell" corners, pipe bends, tee intersections and below each pipe or conduit joint.
- E. Pipe Support Protection Pads:
- 1. Type A: Protection pad below pipe support base.
 - a. Derbigum Derbicolor P FR
 - b. Johns Manville DynaWeld Cap FR
 - c. Siplast Paradiene 30 FR
 - d. Soprema Elastophene Flam FR
 - e. U.S. Ply DuraFlex G4 FR SBS
 - 2. Type B & C: Protection pad below pipe support base.
 - a. Derbigum Derbicolor P FR (2 layers)
 - b. Johns Manville DynaTred
 - c. Siplast ParaTread
 - d. Soprema Sentinel
 - e. U.S. Ply USP SBS Walkboard

2.2 ROOF CURBS

- A. Pre-manufactured Steel Curbs: Internally reinforced metal equipment supports capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings.
- 1. Manufacturer: Thybar Corp., www.thybar.com or approved equal.
 - 2. Model: Model TC-3.
 - 3. Shop Fabrication: Shop fabricated curbs are not acceptable.
 - 4. Coordinate with Mechanical Contractor as to which mechanical equipment is being provided with pre-manufactured curbs. If so, those curbs shall be installed by the Mechanical Contractor; flashing, counterflashing and sealing of roof system to the curbs shall be by Roofing Contractor.
- B. Construction:
- 1. Frames: 18-gauge G90 hot-dipped galvanized sheet steel and base plate with joints fully welded complying with ASTM A653. Bolted connections are not acceptable.
 - 2. Wood Nailers: Factory installed; pressure treated. Size and width as suitable for support of mechanical equipment mounted on curbs.
 - 3. Reinforcement: Internally reinforce curbs exceeding 3-foot length and as required to support mechanical equipment.
 - 4. Gasketing: 1/4-inch thick x 1-inch wide at rooftop units.
 - 5. Counterflashing: As indicated on the drawings.

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

6. Insulation: 1-1/2" thick 3-pound density rigid insulation.
7. Curb Height: Coordinate curb height to comply with roofing drawings. Minimum height above roof surface shall be measured from the highest side of sloped roof.
8. Roof Slope: Curbs shall be constructed to match roof slope with plumb and level top surface for mounting mechanical equipment.

2.3 EQUIPMENT SUPPORTS

- A. Equipment Supports: Internally reinforced metal equipment supports capable of supporting superimposed live and dead loads, including equipment loads and other construction indicated on Drawings.
 1. Manufacturer: Thybar Corp., www.thybar.com or approved equal.
 2. Model: Model TEMS-3.
 3. Size: Coordinate dimensions with roughing-in information or Shop Drawings of equipment to be supported.
 4. Shop Fabrication: Shop fabricated equipment supports are acceptable if they meet the requirements of the specifications and drawings.
 5. Coordinate with mechanical contractor to determine if any equipment supports are being furnished with respective equipment. If so, those curbs shall be installed by the Mechanical Contractor; flashing, counterflashing and sealing of roof system shall be by Roofing Contractor.
- B. Construction:
 1. Material: Galvanized steel sheet, 18 gauge with welded joints.
 2. Insulation: Fill curb with fiberglass batt insulation.
 3. Factory-installed continuous wood nailers at tops of equipment supports.
 4. Provide a 24-gauge galvanized sheet metal cap with fully soldered or welded joints.
 - a. Secure caps with stainless steel screws with neoprene-head washers spaced at 16-inches on center max. with a minimum of two screws on each side.
 - b. Curb sides with dimensions of less than 8 inches require one fastener per side.
 5. Fabricate equipment supports to minimum height of 12 inches above the finished high side roof surface unless otherwise indicated.
 6. Roof Slope: Equipment supports shall be constructed to match roof slope with plumb and level top surface for mounting equipment.

2.4 EXTERIOR ALUMINUM ROOF LADDERS

- A. General:
 1. Comply with ANSI A14.3 and OSHA 1910.27.
 2. Field Measurements: Verify dimensions by field measurement before fabrication.
- B. Manufacturer: O'Keeffe's, Inc.; 100 N Hill Drive, Suite 12, Brisbane, CA 94005. Toll Free Tel: (888) 653-3333. Tel: (415) 824-4900. Fax: (415) 824-5900. Email: info@okeeffes.com. Web: <http://www.okeeffes.com> or an approved equal.
- C. Fixed Access Vertical Ladder:
 1. Tubular rail low-parapet access ladder with platform and return.
 2. Model 503 as manufactured by O'Keefe's Inc. and modified to comply with Contract Drawing arrangements.
- D. Materials:

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

1. Aluminum Plate and Sheet: ASTM B209, Alloy 5005-H34.
 2. Aluminum Extrusions: ASTM B221, Alloy 6063-T6.
 3. Aluminum Alloy Rolled Tread Plate: ASTM B632, Alloy 6061-T6.
 4. Aluminum Castings: ASTM B26, Alloy 443.0-F.
- E. Finish: Mill finish, as extruded.
- F. Fabrication:
1. Rungs: Not less than 1-1/4 inches in section and 24 inches long, formed from tubular aluminum extrusions. Squared and deeply serrated on sides.
 - a. Rungs shall withstand a 1,000-pound load without deformation or failure.
 2. Channel Side Rails: Not less than 1/8-inch wall thickness by 6 inches wide.
 3. Heavy Duty Tubular Side Rails: Assembled from two interlocking aluminum extrusions no less than 1/8-inch wall thickness by 3 inches wide. Construction shall be self-locking stainless-steel fasteners, full penetration TIG welds and clean, smooth and burr-free surfaces.
 4. Walk-Through Rail and Roof Rail Extension: Not less than 3 feet 6 inches above the landing and shall be fitted with deeply serrated tubular grab rails.
 5. Landing Platform: 1-1/2 inches or greater diameter, tubular aluminum guardrails and decks of serrated aluminum treads.
 6. Security Door (Ground-to-Roof Ladder Only): Formed 1/8-inch-thick aluminum sheet. Security panels shall extend on both sides, perpendicular to the door face, to within 2" of the wall. Security door shall be furnished with continuous aluminum piano hinge and heavy duty forged steel locking hasps.
- G. Anchorage:
1. Notify manufacturer that anchorage to the roof system differs from manufacturer's standard details and components.
 2. Provide anchorage materials to comply with the Drawings.
 3. Fasteners: Provide Type 316 stainless steel fasteners for exterior use as indicated on the Drawings.
- H. Curb Tread:
1. Provide abrasive tread atop aluminum curb channel cap. Tread can be one of the following:
 - a. Pre-fabricated aluminum tread provided by the ladder manufacturer for field welding to the aluminum curb channel cap.
 - b. Pre-manufactured reflective anti-slip tread tape field adhered to the aluminum curb channel cap. Tread tape shall be 6 in. wide x 24 in. long x 37 mils thick minimum, field trimmed as required, equal to Skid Guard™ as manufactured by Menards®, www.menards.com.

PART 3 - EXECUTION

3.1 INSTALLATION - GENERAL

- A. Inspect existing conditions to determine that Work preceding this installation is as intended and is of sound construction. Proceeding with the Work of this Section indicates acceptance of conditions.
- B. Installations shall be in accordance with the manufacturer's printed instructions and as

JERRY WARE TERMINAL & ARFF STATION REHABILITATION
JEFFERSON COUNTY

shown on the Drawings.

3.2 PIPE SUPPORT INSTALLATION

- A. Non-Penetrating Pipe Supports (Types A & B):
 - 1. Assemble pipe supports with protection pad as shown on the Drawings. Adhere supports solid to protection pads in specified sealant.
 - 2. Set pad assemblies on the roof membrane. Do not adhere to roof system.
 - 3. Securely strap electrical conduit or Unistrut carrying electrical conduit to supports with galvanized steel straps.
 - 4. Loosely strap gas piping to support with galvanized steel straps. Straps shall allow free movement of piping, but not allow piping to lift more than 1 inch from support.
- B. Penetrating Curbed Roller Pipe Supports (Type C):
 - 1. Anchor new curbs to existing deck or wood blocking using #12 coated insulation screws spaced at 8 inches on center, or a minimum of two per side.
 - 2. Flash curbs to the roof per the respective Section.
 - 3. Set new galvanized metal caps as shown on the Drawings.
 - 4. Set new roller assemblies and anchor securely to curbs with neoprene-head screws.
 - 5. Strap tops of pipes to roller assemblies.

3.3 OTHER ASSEMBLY INSTALLATION

- A. Equipment Supports and Curbs: Anchor supports and curbs to deck or wood blocking as shown on the Drawings using #12 coated insulation screws or lag bolts spaced at 8-inches on centers, or minimum of two per side.
- B. Exterior Aluminum Roof Ladders:
 - 1. Install according to manufacturer's instructions except for roof base mounting.
 - 2. Ladder roof base mounting indicated on Drawings differs from manufacturer's standard hardware. Provide alternative mounting brackets and anchors as indicated on Drawings.
- C. Other Assemblies: Install as indicated on the Drawings, as required by the manufacturer or as designated above.

3.4 CLEANING

- A. Clean items of this Section in accordance with the respective manufacturer's instructions.

END OF SECTION 077200