SECTION 072200 - ROOF INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY:

A. This section includes information for the installation of the tapered polyisocyanurate insulation system, and roof recovery board, over the properly installed and prepared metal deck substrate section for the Modified Bituminous Membrane Roof System.

B. The Contractor shall install the specified tapered polyisocyanurate roof insulation over the properly prepared metal roof deck. The new polyisocyanurate insulation shall be mechanically fastened to the roof deck in accordance with the project specifications to meet or exceed the wind uplift requirements. On top of the polyisocyanurate insulation, a non-structural, high density, fiberboard recovery board shall be installed and adhered with the specified insulation adhesive in accordance with the project specifications. Where the tapered insulation system is too thick to be mechanically attached, the base layer(s) should be mechanically attached to the metal roof deck, and the subsequent layer(s) shall be adhered in the specified insulation adhesive.

I. Install specified tapered crickets/saddles at all roof top equipment and between scuppers and drains where necessary.

J. Install specified tapered insulation at first four (4) feet of new gutter line. **Gutter will be accepted without additional tapered insulation.**

K. Smooth any build up of materials along the insulation to prevent air pockets. Shave, trim and grind down any irregularitites to make all new insulation fit properly.

1.3 RELATED SECTIONS

A. Division 07 10 00 “Modified Bituminous Membrane Re-Roofing Procedures
B. Division 07 55 00 “Modified Bituminous Membrane Roofing – Torch Applied)
C. Division 07 60 00 “Sheet Metal Flashing and Trim”.

1.4 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM C-1289, Specification for Faced Rigid Polyisocyanurate Thermal Insulation
   2. ASTM D-312-00, Specification for Asphalt Used in Roofing.
   3. ASTM D-1863, Specification for Mineral Aggregate Used on Built-Up Roofs.
   4. ASTM D-2178, Standard Specification for Asphalt Glass Felts used in Roofing and Waterproofing.

5. ASTM D-4601, Specification for Asphalt-Coated Glass Fiber Base Sheet Used in Roofing.
6. ASTM D-5147, Sampling and Testing Modified Bituminous Sheet Material.
7. ASTM E108-00, Test Methods for Fire Test of Roof Coverings.

B. Cast Iron Soil Pipe Institute, Washington, D.C. (CISPI)

C. Factory Mutual Research (FM):
1. Roof Assembly Classifications.

D. National Roofing Contractors Association (NRCA):
1. Roofing and Waterproofing Manual.

E. Underwriters Laboratories, Inc. (UL):
1. Fire Hazard Classifications.

F. Warnock Hersey (WH):
1. Fire Hazard Classifications.

G. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)

H. Steel Deck Institute, St. Louis, Missouri (SDI)

I. Southern Pine Inspection Bureau, Pensacola, Florida (SPIB)

J. Insulation Board, Polyisocyanurate (FS HH-I-1972)

K. Insulation Board, Thermal (Fiberboard) (FS LLL-1-535B)

1.5 SUBMITTALS

A. Product Data: Provide manufacturer's specification data sheets for each product in accordance with this specification.

B. Provide approval letters from insulation manufacturer for use of their insulation within this particular roofing system type.

C. Provide a sample of each insulation type.

D. Shop Drawings

1. Submit four (4) copies of manufacturer's shop drawings indicating complete installation details of flat insulation system, drain location, sump, roof slopes, thicknesses, tapered crickets and saddles.

2. Shop drawing shall include: Outline of roof, location of drain, sump, complete board layout of tapered insulation components (crickets and saddles), thickness and the minimum and average "R" value for the completed insulation system.

1.6 QUALITY ASSURANCE

A. Certify that roof system furnished is approved by an approved third party testing facility in accordance with ASTM E108, Class A for external fire and meets local or nationally recognized building codes.

B. Pre-installation Meeting: Refer to Division 7 Section Modified Bituminous Membrane Roofing specifications for pre-installation meeting requirements.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver products to site with seals and labels intact, in manufacturer's original containers, dry and undamaged.

B. Store all insulation materials in a manner to protect them from the wind, sun and moisture damage prior to and during installation. Any insulation that has been exposed to any moisture shall be removed from the project site.

C. Keep materials enclosed in a watertight, ventilated enclosure (i.e. tarpaulins).

D. In accordance with the manufacturer’s recommendations, immediately remove the plastic wrapping on the recovery boards and cover with a watertight, ventilated enclosure (i.e. tarpaulins). Prevent the formation of condensation on the boards.

E. Store materials off the ground and roof surfaces. Any warped, broken or wet insulation boards shall be removed from the site.

F. Do not leave unused materials on the roof overnight or when roofing work is not in progress unless protected from weather and other moisture sources.

G. It is the responsibility of the contractor to secure all material and equipment on the job site. If any material or equipment is stored on the roof, the contractor must make sure that the integrity of the deck is not compromised at any time. Damage to the deck caused by the contractor will be the sole responsibility of the contractor and will be repaired or replaced at his expense.

PART 2 - PRODUCTS

2.1 APPROVED EQUIVALENT

A. Basis of Design: Materials, manufacturer’s product designations, and/or manufacturer's names specified herein shall be regarded as the minimum standard of quality required for work of this Section. Comply with all manufacturer and contractor/fabricator quality and performance criteria specified in Part 1.

B. Contractor must submit any product not specified to Architect in order for product to be considered for approval. The Architect will notify Contractor in writing of decision to accept or reject request.

C. Substitutions: Products proposed as equal to the products specified in this Section shall be submitted in accordance with Bidding Requirements and Division 1 provisions.

1. Equivalency of performance criteria, warranty terms, submittal procedures, and contractual terms will constitute the basis of acceptance.

2. The Architect's decision regarding substitutions will be considered final. Unauthorized substitutions will be rejected.

2.2 INSULATION MATERIALS

A. Thermal Insulation Properties and Approved Insulation Boards.

1. Tapered Polyisocyanurate Roof Insulation; ASTM C-1289:

Qualities:	Factory Tapered, closed cell polyisocyanurate foam core bonded to heavy duty glass fiber mat facers.
Thickness:	Minimum 5" (3" @ Gutter)
R-Value:	Minimum 30 (5.2" Thickness)
Compressive Strength:	Minimum 20 psi
Tapered Slope:	1/4": 1'
Source of Supply:	Tapered H-Shield; Hutter Panels Tapered E'NRG'Y-3; Johns Manville EnergyGuard; GAF Approved Equivalent

Insulation board shall meet the following requirements:
UL, WH or FM listed under Roofing Systems
Federal Specification HH-I-1972, Class 1

2. Non-structural, water-resistant, fiber-reinforced gypsum substrate recovery board:

Qualities:	*Non-structural, water-resistant, fiber-reinforced gypsum roof board*
Board Size:	*Four feet by four feet (4' x 4')*
Thickness:	*One-Half (1/2) inch*
R-Value:	*0.50*
Source:	*Securock by United States Gypsum Company (USG)*

Insulation board shall meet the following requirements:
UL, WH, FM listed under Roofing Systems.
Federal Specification LLL-I-535-B.

2.3 RELATED MATERIALS

A. Fiber Cant and Tapered Edge Strips: Preformed perlite (torch applied system), or fiberboard (cold applied system) insulation units of sizes/shapes indicated as per the approved manufacturer.

1. Acceptable Manufacturers:

Johns Manville
GAF
Approved Equivalent

B. Crickets: Shall be fabricated from tapered polyisocyanurate insulation and shall ensure complete drainage of the roof system.

1. Shall be fabricated from 1/2":1' tapered polyisocyanurate.

C. Gutter: First four (4) feet of roof from gutter line shall be fabricated from tapered polyisocyanurate insulation and shall ensure complete drainage of the roof system. The additional tapered insulation shall be shall be four (4) feet wide, run the entire length of the gutter and fabricated from ½":1' tapered polyisocyanurate

D. Asphalt Primer**:** V.O.C. compliant, ASTM D41.

E. Cold Applied Insulation Adhesive **-** INSUL-LOCK HR or approved equal; Cold applied, highly elastomeric, high rise, fast setting, two-component with a one step application mechanism, VOC compliant, foamable insulation adhesive that contains no solvents and sets in minutes. Designed to adhere approved insulation to insulation, structural decks, base sheets, smooth and graveled surfaced built-up roofs.

1. Tensile Strength (ASTM D 412-92)	250 psi
2. Density (ASTM D 1875-90)	8.5 lbs/gal
3. Viscosity (ASTM D 2556-93a)	22,000-60,000 cP
4. Peel Strength (ASTM D 903)	17 lb/in
5. Flexibility (ASTM D 816-82)	Pass @ -70°F

F. Roof Insulation Fasteners:

1. OMG Standard corrosion resistant roofing screw fastener with Sentri coating as recommended by roof membrane manufacturer.

2. Approved fasteners with three (3) inch coated disc to meet or exceed the specific project wind uplift requirements listed in Section 1.16 "Design and Performance Criteria" of Division 7 Section "Modified Bituminous Membrane Roofing". Length as required to penetrate roof deck per the screw manufacturers recommendation or one (1) inch if not listed.

G. Roof Board Joint Tape: Six (6) inches wide glass fiber mat with adhesive compatible with insulation board facers.

PART 3 - EXECUTION

3.1 INSPECTION OF SURFACES

A. Roofing contractor shall be responsible for preparing an adequate substrate to receive insulation.

1. Verify that deck surfaces and project conditions are ready to receive work of this section.
2. Verify that deck is supported and secured to structural members.
3. Verify that drain bowl assemblies are installed and set at proper height to permit a slope of ½" per foot within the sump. The sump shall be a four (4) foot square sump, unless noted otherwise and/or required to be smaller or larger to accommodate drainage around equipment.
4. Verify that work which penetrates roof deck has been completed.
5. Verify that wood nailers are properly and securely installed.
6. Examine surfaces for defects, rough spots, ridges, depressions, foreign material, moisture, and unevenness.
7. Verify that existing wood blocking and nailers that are of the size and type specified to be used are sound and not rotted or detiorated. Replace deteriorated wood with new wood of like kind, size and configuration per the project details and specifications. Install new wood blocking as specified in the project documents.
8. Verify that deck surfaces are dry, free of snow or ice, not corroded/rotten or deteriorated, and are structurally sound. **Replace decking that is deteriorated or is not structurally sound in like kind to match existing.**
9. Do not proceed until defects are corrected.
10. Do not apply insulation until substrate is dry. Confirm that moisture content of the concrete roof deck, wood blocking and nailers does not exceed twelve (12) percent by moisture meter tests.
11. Broom or air blow clean substrate immediately prior to application.
12. Use additional insulation to fill depressions and low spots that would otherwise cause ponding water.
13. Verify that vapor barrier has been completed, prepared and ready for application of the insulation system on top.
14. Contractor is responsible to verify existing and new substrates are sloped as stated in/on the project documents prior to installation of insulation system. All defects in roof pitch to be accommodated with tapered insulation to ensure a positive pitch to all roof drains.

3.2 INSTALLATION

A. Mechanically Fastened Polyisocyanurate Insulation System to Metal Deck.

1. Approved polyisocyanurate insulation boards shall be installed with joints in continuous straight lines, perpendicular to roof slopes with joints staggered between rows. Tightly butt substrate boards together. Boards shall be fully attached to the deck with an approved mechanical fastening system. As a minimum, the amount of fasteners shall be in accordance with the following:

- Six (6) fasteners per 4' x 4' board in Zone 1 (field of roof)
- Nine (9) fasteners per 4' x 4' board in Zone 2 (perimeter of roof)

- Twelve (12) fasteners per 4' x 4' board in Zone 3 (corners of roof)

Zones 2 & 3 must extend from the roof edge onto the roof area a minimum distance of 10% of the building width.

2. Filler pieces of insulation require at least two fasteners per piece if size of insulation is less than four square feet.

3. Placement of any fastener from edge of insulation board shall be a minimum of three inches, and a maximum of six (6) inches.

4. **Minimum penetration into deck shall be per the screw manufacturer's field confirmed pull tests, but not less than one and one-half (1.5) inches.**

B. Recovery Board Attachment with Cold Applied Insulation Adhesive:

1. The surface must be thoroughly cleaned using compressed air, vacuum equipment or hand/power brooms to remove dust, loose dirt or debris.

2. Apply specified insulation adhesive directly to the insulation board, in a ribbon pattern in 3/4" beads, using an automatic applicator, at the maximum spacing listed below. Immediately place the recovery board into the wet adhesive. Do not slide the recovery board into the adhesive. Do not allow the adhesive to skin over. Briefly step each board into place to ensure contact with the adhesive. Substrates with irregular of uneven surfaces may prevent the insulation from making positive contact with the adhesive. In these cases, relief cuts or a temporary weight may be required.

- Beads shall be at 12 inches o.c. maximum per 4' x 4' board in Zone 1 (field of roof)
- Beads shall be at 9 inches o.c. maximum per 4' x 4' board in Zone 2 (perimeter of roof)
- Beads shall be at 6 inches o.c. maximum per 4' x 4' board in Zone 3 (corners of roof)

C. General Installation Requirements.

1. Approved insulation shall be sumped and tapered around roof drains. Ensure the roof drains are set at the proper height to provide a smooth transition from the roof insulation system into the sump. Tapered insulation sump shall start at the drain with a thickness required to achieve ½" per foot slope for the specified minimum dimension two (2) feet from the center line of the drain. Install tapered insulation sump in such a way to provide proper slope for runoff. Shape insulation with tool as required so completed surface is smooth and flush with ring of drain. Under no circumstances will the membrane be left unsupported in an area greater than one quarter (¼) inch. Install recovery board over tapered insulation sump as required.

2. All boards shall be cut and fitted where the roof deck intersects a vertical surface. The boards shall be cut to fit a minimum of one quarter (¼) inch away from the vertical surface.

3. Install no more insulation at one time than can be roofed on the same day.

4. Install temporary water cut-offs at completion of each day's work and remove upon resumption of work. Install an envelope water stop at the edge of insulation to prevent water infiltration into new insulation/roof system.

5. Cant Strips/Tapered Edge Strips: Install preformed fourty five (45) degree cant strips at junctures of vertical surfaces. Provide preformed, tapered edge strips at perimeter of edges of roof that do not terminate at vertical surfaces and/or indicated on the drawings. Tape joints of insulation as per manufacturer's requirements. The wall/cant juncture will be examined for air passage. If airflow is present, joint between cant and wall will be sealed with closed cell joint backing and joint sealant.

3.4 CLEANING

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

END OF SECTION 072200