SECTION 07 22 16

ROOF AND DECK INSULATION

PART 1 – GENERAL

1.1 PURPOSE

A. This guideline is intended to provide useful information to the Professional Service Provider (PSP) to establish a basis of design. PSP is to apply the principles of this section such that the University of Texas at Arlington (UTA) may achieve a level of quality and consistency in the design and construction of their facilities. Deviations from these guidelines must be approved by UTA and may require justification through Life Cycle Cost (LCC) analysis and submitted to UTA for approval.

1.2 LESSONS LEARNED AND DESIGN CONSIDERATIONS

A. See additional comments throughout section below in yellow italics.

B. *Specifier Note: There are numerous types of roof insulation, some which are installed in multiple-layer roof assemblies. Specifier to verify Project requirements related to roof deck, drainage, fire resistance, wind uplift, surfacing, logistics and other items*

1.3 SECTION INCLUDES

A. Roof Insulation
B. Roof Insulation Fasteners and Adhesive
C. Tapered Insulation
D. Tapered Edge

1.4 RELATED WORK *Verify related Sections titles and names.*

A. Section 06 10 00 – Rough Carpentry
B. Section 07 51 00 – Built-Up Asphalt Roofing
C. Section 07 52 00 – Modified Bituminous Membrane Roofing
D. Section 07 62 00 – Sheet Metal Flashing and Trim

1.5 REFERENCES *Verify appropriate reference standards. Typically winds loads are determined by using the American Society of Civil Engineers – Minimum Design Loads for Buildings and Other Structures (ASCE 7 – verify version) document. Verify special wind zone requirements, such as coastal.*

A. National Roofing Contractors Association (NRCA) Roofing and Waterproofing Manual; current edition.
B. Underwriters Laboratories (UL)
   1. Roofing Materials and Systems Directory; current edition.
   2. Fire Resistance Directory; current edition.
C. ASTM D41 - Asphalt Primer Used in Roofing; current edition.
D. ASTM D312 - Asphalt Used in Roofing; current edition. *Use if hot asphalt is used in roof system. This specification includes hot asphalt as an adhesive for attaching second layer of roof insulation.*
E. ASTM C 728 - Perlite Thermal Insulation Board; current edition.
F. ASTM C 1289 - Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; current edition. *The below ASTM Standards are listed for information only - delete the following ASTM listing if not used. This specification does **not** include products listed by these standards. If a particular Project requires a different type of roof insulation, consult UTA Project Manager for prior review.*
G. ASTM C 208 - Cellulosic Fiber Insulating Board; current edition.
H. ASTM C 552 - Cellular Glass Thermal Insulation; current edition.
I. ASTM C 578 - Rigid, Cellular Polystyrene Thermal Insulation; current edition.
J. ASTM C 726 - Mineral Fiber Roof Insulation Board; current edition.
K. ASTM C 984 - Perlite Board and Rigid Cellular Polyisocyanurate Composite Roof Insulation; current edition.

1.6 SUBMITTALS

A. Submit under provisions of SPECIAL CONDITIONS requirements and Division 01. *Verify Division 1 Section number reference and submittal requirements.*
B. Prior to pre-roofing meeting, submit the following:

1. Manufacturer's Certification: Letter from manufacturer, on letterhead, and signed by authorized representative that roof insulation meets requirements for required warranties and is compatible with roof membrane products.
2. Product Literature: Submit product literature on roof system and accessory components.

C. Asphalt Fume Control Plan: Submit equipment data, and proposed loading and heating procedures to limit ground-level asphalt fumes. *Verify need for fume control depending on site location, Owner preference, and roof insulation adhesive type.*

D. Shop Drawings: Submit shop Drawings for approval prior to Pre-roofing Conference and start of work. Include the following Drawings: *Certain Projects may require a detailed Shop Drawing submittal. Below requirements illustrate a comprehensive approach to Shop Drawings.*
1. Roof Plan(s):
   a. Include on roof plan tapered insulation locations at field, perimeter, and roof curbs. Indicate insulation thickness at high and low points, cricket's pattern, and drain or scupper sumps.
   b. Outline roof dimensions, including all levels.
2. Provide scaled insulation attachment plan for each roof area indicating perimeter and corner requirements to achieve specified wind uplift resistance. Provide insulation fastening pattern Drawing for corner, perimeter, and field zones.

E. Product data:
1. Insulation products: Submit manufacturer's data sheets for each component required including insulation boards, adhesives, fasteners, plates and bitumen or adhesive. Provide roofing system manufacturer's written acceptance of proposed insulation board, adhesives, fasteners, and procedures for installation. Coordinate with roof membrane Specification Section(s). *Verify Section number*.
2. Material Safety Data Sheets: Provide manufacturer's MSDS information for all materials proposed for use.
3. Provide evidence of specified fire and wind uplift ratings for proposed insulation.
4. ASTM Compliance Sheet: Submit product material list with corresponding ASTM standard(s) each product complies with. Include Specification paragraph reference number that relates to each product.

1.5 QUALIFICATIONS

A. Installer: Company specializing in performing the work of this Section and approved by roof manufacturer for installation of specified roof system.

B. Installer should a minimum of 5 years documented successful experience with installation of products specified in this Section.

1.6 REGULATORY REQUIREMENTS

A. Fire Resistance:
1. UL Class A Fire Hazard Classification. *Roof insulation is an integral component in the UL tested assemblies. Insulation is tested with roof membranes at specific slopes. Verify insulation, in combination with roof deck and membrane assembly, meets UL Class A.*
2. UL Roof Ceiling Assembly Rating. *Verify roof-ceiling assembly rating requirements for particular Project – NR, 1 hour, 2 hour, etc. Roof insulation is an integral component in the UL tested assemblies. Certain UL assemblies are specific to size, thickness, type and other insulation properties. Several tested assemblies require the use of accessory products, such as gypsum board. Recommend inclusion (or reference) of accessory products in this section if accessory products are required.*

1.7 TOLERANCES

A. Comply with tolerances listed in this Section.

B. Where tolerances are not expressly stated in these Specifications, or by the manufacturer, perform work within tolerances specified in the NRCA Roofing and Waterproofing Manual.

1.8 PRE-ROOFING CONFERENCE

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

B. Comply with requirements of roof membrane Specification Section(s).

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products according to manufacturer's recommendations.

B. Deliver products in original containers, dry, undamaged, with seals and labels intact.

C. Storage: *Verify particular jobsite conditions as related to material storage.*
   1. Roof-top storage of weather-sensitive material is not permitted. Material stored overnight on roof-top will be considered defective.
   2. Store weather-sensitive products in enclosed storage trailers. *Or, if site conditions do not allow storage trailers.* Store weather-sensitive products on pallets, clear of ground, and cover with secure breathable canvas tarps. *Or, if site conditions do not allow site storage.* Store weather-sensitive products in an enclosed warehouse, or in storage trailers off-site. Deliver products in quantity that can be used each day, without roof-top storage. Products must be returned to warehouse, or storage trailer, each day.

D. Store related materials within temperature ranges recommended by the manufacturer(s) of each product.

1.10 ENVIRONMENTAL REQUIREMENTS

A. Comply with manufacturer's environmental requirements for storage and application of products.

B. Verify existing and forecasted weather conditions and determine when conditions are acceptable for roof work within the guidelines as follows:
   1. Do not proceed with work when ambient air temperature falls below 40˚ F.
   2. Do not proceed with roof application when excessive moisture is present. Excessive moisture is that which may be detected by sight or touch, or that which results in visible foaming of hot asphalt.

C. Do not expose materials sensitive to water, or sunlight, damage in quantities greater than can be weatherproofed during each day.

1.11 COORDINATION

A. Coordinate work with installation of associated metal flashings as the work of this Section proceeds.

1.12 INSPECTION BY MANUFACTURER

A. Comply with requirements of roof membrane Specification Section(s).

B. Provide manufacturer's field inspection reports within 5 days of each site visit.

1.13 ROOF SYSTEM WARRANTY *Verify Owner preferences for roof warranty.*

A. Provide manufacturer's roof system warranty according to roof membrane Specification Section(s).

B. Warranty shall include coverage for roof insulation, either as part of original warranty language, or by attachment.

1.14 INSTALLER WARRANTY

A. Roof Installer Warranty: Provide under provisions of Division 01.

B. Coordinate with requirements of roof membrane Specification Section(s).

PART 2 – PRODUCTS *Verify Owner preferences and Project requirement for roof insulation assembly.*

2.1 GENERAL

A. Roof Insulation: Obtain written approval from roof membrane manufacturer for use of insulation products incorporated into roof system, which are not supplied by roof membrane manufacturer.

B. Substitutions:
   1. Where specific products are listed in this Specification, the referenced manufacturer's systems are to establish a level of quality.
   2. Requests for substitutions to listed products shall be submitted during the bidding phase.
   3. Consideration of requests for substitution is at the sole discretion of the A/E and Owner, and approvals shall be issued in writing by the A/E with Owner concurrence.

2.2 BITUMINOUS MATERIALS

A. Asphalt Bitumen: ASTM D312, Type IV, special steep, as supplied or specifically approved by membrane manufacturer. *Verify hot bitumen use for roof insulation application. Certain Projects may be sensitive to asphalt flames (SEE FUME CONTROL ABOVE) or limited access for asphalt kettle. Other means of insulation attachment are available.*

B. Asphalt Primer: ASTM D41, as supplied or specifically approved by insulation manufacturer.

2.3 INSULATION *Verify insulation requirements to meet particular Project requirements. Below two layers of 2"-3" thick polyisocyanurate (4.6" thick insulation – plus thickness of cover board) insulation assembly is designed to provide an approximate Long Term Thermal Resistance (LTTR) R-value of 30. Also, verify if other products*

are needed to meet required fire (gypsum board?) or other rating(s).

A. First Layers: 2 layers, [2"-3"] thick polyisocyanurate, non-organic fiberglass facers top and bottom, as supplied by, or approved by roof membrane manufacturer for use in their warranted roof system, mechanically fastened to roof deck. *Verify attachment method, (type of roof deck dictates attachment method) thickness and number of layers of polyisocyanurate.*
   1. Polyisocyanurate Board Insulation: ASTM C 1289, [Type II, Class 1, Grade 2] [Type II, Class I, Grade 3], felt or glass-fiber mat facer on both major surfaces.
   2. Extruded Polystyrene Board for metal roofing assemblies: Extruded-Polystyrene Board Insulation: ASTM C 578, [Type IV, 1.6-lb/cu. ft. (26-kg/cu. m)] [Type X, 1.3-lb/cu. ft. (21-kg/cu. m)] minimum density, square edged.
   3. Recovery Board for Hot-Applied Systems: Cellular-Glass Board Insulation: ASTM C 552, Type IV, rigid, cellular-glass thermal board insulation faced with manufacturer's standard kraft-paper sheets.

B. Insulation Fasteners: ensure plates and screws meet wind uplift rating and warranty requirements. *Verify attachment method. Screws and plates are typically used over metal decks. Revise fastening method if particular Project has a different roof deck type.*
   1. Plates: Galvalume-coated steel, in size, type, and configuration to meet uplift requirements.
   2. Screws: Stainless-steel or polymer-coated steel shank, meeting Factory Mutual 4470 corrosion-resistance. Length sufficient to penetrate ¾ inch through top flute of roof deck.

C. Cover board: ASTM C728, one layer, ¾" thick perlite, supplied, or recommended by roof membrane manufacturer, set in hot asphalt. *Verify attachment method, and type of cover board. Perlite is listed here as cover board, although other types of insulation, gypsum board or other material can provide an adequate top layer substrate. Verify other material can provide an adequate top layer substrate. Verify compatibility with roof membrane type, insulation value, attachment method and warranty provisions.*

2.4 TAPERED CRICKETS AND TAPERED EDGE

A. Tapered Crickets:
   1. First course: ASTM C728, perlite tapered edge, minimum 12" wide, in thickness to match butt edge of tapered insulation, set in hot asphalt.
   2. Remaining courses: ASTM C728, perlite, ½" per foot tapered, set in hot asphalt. *Verify attachment method and slope of tapered roof insulation required to provide positive slope to drain. Typically ½" per foot tapered roof insulation is required to provide positive slope when installed on a roof deck sloped ¼" per foot.*

B. Tapered Edge: ASTM C728, perlite. Provide in widths and thicknesses indicated on Drawings.

C. Roof Drain & Scupper Sumps: minimum 1½" to 0, 24" wide tapered perlite.

2.5 SPECIAL BITUMEN HEATING EQUIPMENT *Verify Project Requirement for fume control.*

A. Provide ground-level filtering, or after-burning asphalt fume system equipment.

B. Equip kettle with carton loader device.

C. Ensure positive seals at kettle lid, loader, and piping, to ensure containment of ground-level asphalt fumes.

PART 3 – EXECUTION

3.1 GENERAL

A. Work of this Section shall be performed in accordance with quality workmanship standards as defined by NRCA.

B. The roof systems manufacturer's technical specifications shall be considered a part of this Section and shall be used as a minimum standard in conjunction with this Section. If this Section conflicts with, or exceeds manufacturer's minimum requirements the more rigid standard shall apply and be enforced.

3.2 COORDINATION

A. Ensure proper sequencing of roof insulation and to allow installation of roof and flashings as detailed, without damage.

B. Coordinate activities to prevent damage to roof assemblies.

3.3 EXAMINATION & PREPARATION

A. Do not store, stage activities, or allow construction traffic over roof areas, unless protection plan is approved in advance by A/E or Owner.

B. Contractor is responsible for maintaining insulation in good condition.

C. Verify that surfaces and site conditions are ready to receive work. Verify that debris has been completely removed from roof area and broom clean the deck immediately prior to insulation application.
D. Verify deck is clean, sound, smooth, and dry enough for covering with roof insulation. Report decking not serviceable for covering with roof insulation. Do not install finish application of roof insulation over unserviceable roof deck area(s).
E. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, and wood components are in place.
F. Install nailers and blocking immediately prior to application of roof insulation.
G. Construct and install nailers and blocking under provisions of Section 06 10 00.

3.4 TEMPORARY WATERPROOFING
A. Provide water stops and temporary tie-ins daily to prevent moisture penetration into building interior or installed assemblies.
B. Seal roofing temporarily to the deck where leakage could penetrate installed assemblies. Remove upon resumption of work.
C. Provide permanent, or temporary, counter flashing daily.
D. Install membrane assemblies complete with strip-in plies each day. Use mastic seals only in such a manner that mastic does not remain between finished modified bitumen plies at cant strips and membrane terminations. Provide seal at all terminations, both vertical and horizontal.
E. Provide temporary seals which do not soil finished work surfaces or contaminate surfaces intended to receive sealants.
F. Remove temporary seals from completed work.

3.5 BITUMEN HEATING *Verify hot bitumen use – see comments above.*
A. Comply with manufacturer's requirements for heating, and applying bitumen.
B. Heat asphalt bitumen to achieve EVT at point of application, as stamped on asphalt carton, plus or minus 25˚ F.
C. Use insulated tubing and luggers during cold weather to maintain correct temperature at the point of application.
D. Verify accurate temperature readings at point of application to ensure compliance. Establish proper temperature at kettle, hold time on roof, and substrate type and temperature to achieve proper application temperature.
E. Measure temperature periodically, minimum one reading every 2 hours or when conditions change. Contractor to provide accurate temperature measuring device for verification.
F. Adjust temperature, equipment, or procedure to maintain proper application temperature.
G. Do not heat bitumen above finished blowing temperature for more than 3 hours, unless bitumen is under continuous use.
H. Provide fume control equipment to minimize asphalt fumes during the work. Comply with fume control requirements of this Specification and submitted Fume Control Plan. *Verify need for fume control depending on site location, Owner reference, and system type.*

3.6 APPLICATION IN COLD WEATHER
A. Comply with manufacturer's special recommendations for membrane application during cold weather.
B. Discontinue installation if asphalt temperature cannot be maintained at EVT at point of application.

3.7 INSULATION APPLICATION - GENERAL
A. Apply insulation in accordance with insulation and insulation and membrane manufacturer's recommendations.
B. Install so that boards are in moderate and continuous contact with adjacent boards, but not jammed or forced.
C. Ensure that starter row is straight. Realign boards if perceptible gaps or spaces occur. Fill ¼" and greater gaps with loose perlite insulation before covering.
D. Cut individual boards if necessary, to conform to humps or depressions in deck. Miter edges to prevent open joints at penetrations, Projections, and terminations.
E. Install boards with joints staggered in the cross direction.
F. Protect installed insulation from damage and moisture infiltration.

3.8 FIRST LAYER(S) INSULATION APPLICATION *Verify roof deck type. Below application is for direct application to a metal deck. Other roof decks will require alternate means of installation, and require editing of below requirements. The use of gypsum board over a metal deck to achieve a specific fire rating would require editing the below information.*
A. Position boards to ensure bottom board edges bear on top flange of metal deck, minimum 1", at areas where

board is directly over metal deck. Cut, and realign boards which do not bear sufficiently on top flange of metal deck.

B. Stagger board joints from gypsum board joints minimum 6” in both directions, where insulation is installed over gypsum board.
C. Install boards with joints staggered in the cross direction.
D. Fasten first layer insulation with screw and plates to metal deck. Ensure fasteners engage top of deck flute, and penetrate deck minimum ¾”.
E. Ensure screws engage deck properly. Remove unengaged screws and reposition new screws to engage deck.

3.9 SECOND LAYER INSULATION APPLICATION *Verify top layer insulation type and attachment.*

A. Set second layer insulation into full bed of asphalt over first layer insulation.
B. Install one layer cover board over first layer insulation where roof deck is sloped.
C. Install tapered insulation over first layer insulation in areas where roof deck is not sloped. *Verify tapered insulation requirements.*
D. Stagger joints, minimum 6”, in both directions, from first layer insulation. Remove and replace insulation with improper staggering of joints.
E. Step-in each board, while asphalt is still molten, to ensure full embedment.
F. Set loose, cut boards, at overnight tie-ins, to provide uninterrupted staggering of insulation joints, upon resumption of Work.

3.10 APPLICATION OF TAPERED EDGE

A. Apply tapered edge into solid mopping’s of asphalt and step in completely.
B. Make straight, neat cuts and miter corners without perceptible gaps, or open joints.
C. Stagger joints minimum 6” between layers.
D. Cut, shave, modify and combine various sized tapered materials, to provide smooth, uniform transitions.
E. Install 1½” to 0”, 2’ square tapered edge at scupper and 4’ square roof drain sumps. *Verify sump requirements.*

3.11 PROTECTION

A. Protect stored insulation prior to installation according to provisions of this Section. Do not install improperly stored materials into the Work.
B. Cover roof insulation with waterproof roof membrane daily. Install according to roof membrane Specification Section(s).
C. Do not expose roof insulation overnight. Remove and replace roof insulation exposed overnight.
D. Remove and replace roof insulation that has been wetted, damaged or is otherwise unserviceable.
E. Include removal and replacement of wet roof insulation in roof membrane warranty.

END OF SECTION