

# DIVISION 7 - THERMAL AND MOISTURE PROTECTION

## 07100 -WATERPROOFING

**1. Intent:** Prevent the infiltration of moisture through the portion of the building envelope that occurs below grade or below a wearing surface.

**1.1. PROHIBITED:** Installing any insulation, asphalt fill, cellular glass foam or any other absorbing material under the waterproofing membrane.

**1.2. PROHIBITED:** Waterproofing products that rely on the biodegradation of one or more of the components of the product. For example, cardboard panels that contain bentonite are prohibited.

**1.3. PROHIBITED:** Damp-proofing.

1.4. Prevent the infiltration of moisture for a minimum of 50 years.

1.5. Provide provisions for subsurface drainage against the waterproofing membrane.

1.6. Do not allow water to migrate between the waterproofing material and the structural substrate.

1.7. Protect the waterproofing material against damage during and after construction.

## 2. System Selection/Design/Documents

2.1. The waterproofing system shall have a minimum of five years of successful performance and have the following properties:

- A. Extremely minimal permeability
- B. Extremely minimal emulsification or degradation in a constant water environment
- C. Elasticity
- D. Crack bridging ability
- E. Leak location characteristics by preventing the migration of water under the waterproofing material

2.2. Whenever possible and appropriate, the waterproofing system shall respond to project-specific conditions including, but not limited to, the following:

- A. Resistance to the effects of de-icing chemicals

- B. Watertight compatibility at tie-in to existing systems
- C. Fumes minimized during installation
- D. High-static loading so drainage composite sheet dimples are not driven into insulation, including damage to the membrane itself. The structural integrity shall be greater than the structural burden, including anticipated live loading.
- E. Long-term deleterious effects of dynamic loading
- F. Evaluation to make sure waterproofing anchorage does not impede the integrity of the structure. For example, termination bars shall not be anchored into pre-stressed or post-tensioned structural concrete.

4.3. Details of each typical waterproofing condition shall be drawn at 3 inches equals 1 foot. Scale all system components so they are clearly shown and labeled.

4.4. The university may retain a waterproofing consultant to review the waterproofing system and details.

## **5. Material Supplier Requirements**

5.1. Intent: Due to the high cost of repeated accessing, repairing or replacing waterproofing systems, the waterproofing manufacturer shall examine and accept the design and installation of its material so that the warranty will remain valid.

5.2. Represent someone onsite to qualify and verify the use of the manufacturer's materials for the project purpose and conditions. In addition, the contractor shall receive and provide a record of inspection to the owner. The contractor and subcontractor also shall provide verification and acceptance of the use and installation of their products from the material suppliers.

5.2.1. Submit the manufacturer's financial and performance history and standing.

5.2.2. Present product appropriateness for design, purpose, details and climate.

5.2.3. Confirm with the manufacturer that the installation contractor has been accepted.

5.2.4. Present quality assurance program for product installation.

5.2.5. Manufacturer: As appropriate to project size, inspect installation and verify monthly in writing that the product is being installed in conformance with your requirements and warranty.

5.2.6. Verify that the product is available to meet project schedule.

## **6. Installation Contractor Requirements**

6.1. Present product appropriateness for design, purpose, details and climate.

6.2. Present evidence that the contractor has a quality assurance program, as well as previous experience installing said product.

**7. Walls:** Wall shall protect the structure and ensure air quality. They also shall protect exterior walls of all space below-grade and provide continuous waterproofing. All below-grade construction joints in cast-in-place concrete walls shall contain continuous bentonite waterstops.

**8. Floors:** Slabs on grade in areas subject to flooding, a high water table or soil with poor drainage shall be poured over a continuous waterproofing membrane. Construction joints in slabs and joints between slabs and walls shall contain continuous bentonite waterstops when below slab waterproofing is deemed necessary.

**9. Plaza Decks:** Earth-covered decks or plaza decks that form a roof over an enclosed space shall be protected with continuous waterproofing.

## **10. Application**

10.1. All components of the system shall be compatible products that the waterproofing manufacturer recommends. The components shall be applied according to the manufacturer's instructions.

10.2. During the construction phase, the university shall require a waterproofing consultant to be at the construction site full-time to observe critical waterproofing operations.

10.3. All waterproofing membranes, except fluid, sprayed or crystalline materials, shall be terminated with a non-corroding metal bar. The bar shall be subject to the membrane manufacturer's approval.

**11. Testing:** Horizontal waterproofing surfaces with occupied space below shall be flood-tested prior to back-filling or other overburden installation. To ensure that the university property is not damaged during flood testing, the contractor shall provide personnel on-site during the entire flood test. If the contractor hires a professional security service, university campus police must authorize the service.

**12. Protection:** Protect waterproofing from puncture or abrasion during subsequent placement of overburden materials or back-filling.

**13. Warranty:** The contractor shall provide a warranty against leakage for five years for plaza deck waterproofing materials and application. The contractor also shall provide a warranty against leakage for two years for other waterproofing applications. Warranties

shall cover the entire cost of repairs or replacement of defective work during the warranty period, exclusive of the costs associated with exposing the waterproofing and replacing all materials to their original condition. This includes, but is not limited to, concrete wearing surfaces and backfill.

## **07200 - THERMAL INSULATION**

Because of its moisture-resistant properties, all below-grade insulation shall be extruded polystyrene.

## **07250 - SPRAYED FIREPROOFING**

1. Underwriter's Laboratories shall test and approve products in accordance with ASTM E 84-91a, surface burning; ASTM E -119, fire tests; ASTM E 605-77, thickness/density; ASTM E 736-86, cohesion/adhesion; ASTM E 759-86, deflection effects; ASTM E 761-86, compressive strength; ASTM E 859-82, air erosion; and ASTM E 937-83, corrosion of steel.
2. New and replacement sprayed fireproofing shall be integrally colored blue or blue-green to identify it as material that does not contain asbestos.
3. Provide a single source of specification responsibility with clear coordination of all fireproofing activities.
4. Provide details of all concealed and exposed fireproofing conditions on the contract document construction drawings. The details shall include identification of the assembly, necessary dimensions, the UL design and test numbers, the approved fire and time rating, and identification of all fireproofing products and accessories. All details shall be posted at the job site so applicators and inspectors can easily reference them.
5. A single manufacturer shall supply all fireproofing materials and accessories for each application. Materials and accessories shall be compatible.
6. All fireproofing materials shall remain in place and intact when subjected to anticipated exposure to elements that may dislodge, crack, delaminate or erode the fireproofing.
7. An independent testing agency shall test and approve all fireproofing measures. Refer to Division 1, Section 01400 - Quality Control Services. University Building Code officials may review and approve all fireproofing measures.

## **07270 - FIRESTOPPING**

1. The Underwriter's Laboratories shall test and approve all systems and products in accordance with ASTM E 84, ASTM E 119, ASTM E 814, ANSI/UL 263, ANSI/UL 1479, NFPA 101 - Life Safety Code and the National Electric Code (NEC).
2. Through penetration fire-stopping is required at all penetrations of fire-rated and time-rated walls, floors, structural floors and roof decks, ceilings and partition assemblies.
3. Construction gap/joint sealant fire-stopping is required at all penetrations that permit building movement and/or sound/vibration absorption at all connections of the same or different materials. The sealant also is required at the top of all fire-rated and time-rated walls; all conditions occurring within fire-rated and time-rated walls, structural floors and roof decks, and floors/ceilings; and partition assemblies.
4. Through penetration and construction gap smoke-stopping is required in all smoke assemblies.
5. Provide a single source of specification responsibility with clear coordination of all fire-stopping activities of all disciplines and trades.
6. Provide details of all fire-stopping and smoke-stopping conditions on the contract document construction drawings. The details shall include identification of the assembly, necessary dimensions, identification of the penetrating item, the UL system and test numbers, the approved fire rating and time rating, and identification of all fire-stopping products and accessories. All details shall be posted on the job site so applicators and inspectors can easily reference them.
7. A single manufacturer shall supply all fire-stopping materials for each application. The materials shall be compatible.
8. University Building Code officials may review and approve all fire-stopping and smoke-stopping measures.

## **07300 - ASPHALT SHINGLES**

### **1. System Selection/Design/Review**

- 1.1. All typical flashing, corners, edges, gutters, valleys, dormers, ridges and penetrations on roofs shall be drawn at 3 inches equals 1 foot. All components shall be clearly shown and labeled.
- 1.2. The university may retain a roofing consultant to review the roofing system and details.

### **2. Slopes and Drainage**

**2.1. PROHIBITED:** Asphalt shingles used on slopes less than 4:12.

2.2. Provide special provisions in high-wind areas and slopes greater than 18 inches per foot.

2.3. Provide gutters and downspouts where runoff affects pedestrian traffic, foundation drainage or splash on building surfaces.

### **3. Roofing Materials and Accessories**

**3.1. PROHIBITED:** Staples.

3.2. Asphalt shingles

3.2.1. Asphalt organic shingles shall have three tabs, be self-sealing, comply with ASTM D225 and have minimum tear strength of 1700g when tested in accordance with ASTM D1922. All shingles shall be from the same run and lot number. The owner shall approve the color selection. Provide the manufacturer's 25-year warranty.

3.2.2. Asphalt fiberglass shingles shall have three tabs, be self-sealing, and comply with ASTM D3018 Type 1, ASTM D3161 Type 1, ASTM D3462, and UL 790 and UL 997, Class A. All shingles shall be from the same run and lot number. The owner shall approve the color selection. Provide the shingle manufacturer's 25-year warranty.

3.3. Underlayment felt shall be minimum 15# non-perforated organic.

3.4. Specify a self-adhering rubberized membrane that has a polyethylene-backed sheet and is 40 mils thick.

3.5. Specify hot-dip galvanized steel fasteners or aluminum nail fasteners with a minimum 3/8-inch diameter head.

3.6. Asphalt plastic cement shall comply with ASTM 4586 and not contain asbestos.

3.7. Attic ventilation shall have a continuous ridge with exterior baffle and continuous eave vents.

3.8. Flashing that penetrates roofs shall be constructed of corrosion-resistant metal.

### **4. Installation**

- 4.1. Installation shall be placed over a solid deck that can withstand nails. For reroofing, old roofing shall be removed to a deck that can withstand nails.
- 4.2. A self-adhering membrane shall be used at eaves, valleys, walls and dormers. Metal trim flanges shall be stripped in with an additional self-adhering membrane at eaves, valleys and penetrations.
- 4.3. Felt underlayment shall cover the entire roof area and extend a minimum of 3 inches on to the vertical surface.
- 4.4. Install asphalt shingles and roof accessories per the manufacturer's printed instructions.
- 4.5. Install shingles using a diagonal sequence, unless the manufacturer indicates otherwise.
- 4.6. Special precautions are required when the ambient temperature is below 40 degree F.

## **07500 - MEMBRANE ROOFING AND ROOF INSULATION**

1. Roof system design shall not cause the dew point to occur at or near the surface of the roof deck.

### **2. System Selection/Design/Review**

2.1. To minimize maintenance and life cycle costs, roofs shall be built up with four-ply asphalt and have an aggregate surface membrane unless special circumstance dictate otherwise. The owner's representative may approve special circumstances such as when asphalt fumes are used, and when access and staging, structural limitations or unique designs apply.

2.2. The university may retain a roofing consultant to review the roofing system and details.

#### **2.3. Installation Contractor Requirements**

2.3.1. Intent: Due to the high cost of repairing and replacing roofing systems, the installation contractor shall examine and accept the design and installation of the roofing system so that the warranty will remain valid. In addition, the installation contractor shall:

2.3.1.1. Prove the appropriateness of the product for design, purpose, details and climate.

2.3.1.2. Implement a quality assurance program and previous experience for product installation.

2.3.1.3. Prove that an adequate labor force is available to meet the project schedule.

### **3. Roof Slope, Area and Drainage**

**3.1. PROHIBITED:** Self-leveling drainage with caulk or connections with gaskets from drain to piping.

3.2. Roof areas shall be sloped for positive drainage.

3.3. Control joints shall be provided at angles, changes in roof dimension, and other locations as appropriate to the project, and shall divide roofs into areas not exceeding 150 feet in length in either direction. Provide full-height wood blocking expansion joints where there are building expansion joints.

3.4. Overflow scuppers or overflow roof drains shall be incorporated into the roofing design for each roof drainage area. Overflow drains are to be located a minimum of 3 feet from the main drain.

3.5. Where downspouts are used, they shall be open-faced and have splash blocks at grade. Provide sheet metal splash pans at the discharge ends on adjacent built-up roof areas.

3.6. Primary and overflow drains shall be a minimum of 3 feet from any vertical transition.

### **4. Roof Insulation Materials**

**4.1. PROHIBITED:** Insulating fills that require mechanical compaction over metal roof deck systems.

4.2. Insulation products shall have a five-year performance record.

4.3. Tapered insulation shall conform to 45-degree/90-degree layout. Exception: crickets and saddles.

### **5. Vapor Retardant**

**5.1. PROHIBITED:** Vapor retardant that is combustible and applied directly to metal deck.

5.2. Roof systems shall incorporate a vapor retardant on the warm side of the roof insulation. The vapor retardant shall provide a vapor transmission rating not to exceed 0.25 perms per ASTM Test Method E-96, Procedure A.

## **6. Roofing Accessories and Details**

**6.1. PROHIBITED:** Equipment runners, rails or pads resting on top of roofing material.

**6.2. PROHIBITED:** Stripped-in gravel stop details.

6.3. Roof-mounted equipment shall rest on minimum 8-inch high curbs that extend 8 inches above the roof membrane. Coordinate design with mechanical systems to ensure adequate accessibility for maintenance.

6.4. Roof penetrations for pipes and ducts shall have minimum 8-inch high sleeves, boots or curbs with overlapping flashing, hoods and/or drawbands with caulking flanges. Sleeves, boots and curbs shall be properly flashed and tied into the roofing system.

6.5. Membrane flashing (built-up and single-ply) on vertical surfaces shall terminate under metal counter-flashing.

6.6. Traffic areas from access doors to mechanical equipment and areas around equipment shall have additional plies, flood coat and gravel.

## **7. Observation**

7.1. The contractor shall give the A/E one-week notice prior to commencing roofing work.

7.2. During the construction phase, the university may require that a roofing consultant inspect or observe the roofing process full-time. If so, the university shall approve the consultant.

**8. Warranty:** The roofing contractor shall provide a warranty that guarantees that the roof membrane and flashing will remain watertight for five years. The contractor also shall repair any defects that result from faulty craftsmanship or defective materials without further cost to the university, including replacing any wet insulation caused by such defects.

## **07530 - ELASETOMERIC MEMBRANE ROOFING**

1. The design of the roof system shall not cause the dew point to occur at or near the surface of the roof deck.

## 2. System Selection/Design/Review

2.1. The owner's representative may approve special circumstances or designs.

2.2. The university may retain a roofing consultant to review the roofing system and details.

### 2.3. Installation Contractor Requirements

2.3.1. Intent: Due to the high cost of repairing and replacing roofing systems, the installation contractor shall examine and accept the design and installation of the roofing system so that the warranty will remain valid and in accordance with the membrane manufacturer's requirements. In addition, the installation contractor shall:

2.3.1.1. Prove that the product is appropriate for design, purpose, details and climate.

2.3.1.2. Implement a quality assurance program and provide previous experience for product installation.

2.3.1.3. Prove that an adequate labor force is available to meet the project schedule.

2.3.1.4. Be licensed by the membrane manufacturer.

## 3. Roof Slope, Area and Drainage

**3.1. PROHIBITED:** Self-leveling drainage with caulk or connections with gaskets from the drain to piping.

3.2. Roof areas shall be sloped for positive drainage.

3.3. Control joints shall be provided and shall divide roofs into areas not exceeding 150 feet in length in either direction. Provide full-height wood blocking expansion joints where there are building expansion joints.

3.4. A primary roof drain shall be provided for each roof area per Minnesota State Plumbing codes. Overflow scuppers or overflow roof drains shall be incorporated into the roofing design for each roof drainage area. Overflow drains shall be located a minimum of 3 feet from the main drain.

3.5. Downspouts shall be open-faced and have splash blocks at grade. Provide sheet metal splash pans at the discharge ends on adjacent built-up roof areas.

3.6. Primary and overflow drains shall be a minimum of 3 feet from any vertical transition.

#### **4. Roof Insulation Materials**

**4.1. PROHIBITED:** Insulating fills that require mechanical compaction over metal roof deck systems.

4.2. Insulation products shall have a five-year performance record.

4.3. Tapered insulation shall conform to 45-degree/90-degree layout. Exception: crickets and saddles.

4.4. A thermal barrier shall be applied to steel decks when applicable.

#### **5. Vapor Retardant**

**5.1. PROHIBITED:** Vapor retardant of a combustible material applied directly to metal deck.

5.2. Roof systems shall incorporate a vapor retardant on the warm side of the roof insulation. The vapor retardant shall provide a vapor transmission rating not to exceed 0.23 perms per ASTM Test Method E-96, Procedure A.

#### **6. Roofing Accessories and Details**

**6.1. PROHIBITED:** Equipment runners, rails or pads resting on top of roofing material.

**6.2. PROHIBITED:** Stripped-in gravel stop details.

6.3. Roof-mounted equipment shall rest on minimum 8-inch high curbs, extending 8 inches above the roof membrane. Coordinate design with mechanical systems to ensure adequate accessibility for maintenance.

6.4. Walkway protection shall be per manufacturer's requirements.

#### **7. Observation**

7.1. The contractor shall give the A/E one-week notice prior to commencing roofing work.

7.2. During the construction phase, the university may require that a roofing consultant inspect or observe the roofing process full-time. If so, the university shall approve the consultant.

## 8. Warranty

8.1. The membrane manufacturer shall provide a warranty for the roof system that guarantees that it will remain watertight for 10 years. The manufacturer shall repair any defects that result from faulty craftsmanship or defective materials without further cost to the university, including replacing any wet insulation caused by such defects.

8.2. The membrane manufacturer shall provide a warranty for the membrane sheet for 20 years.

## 07600 - FLASHING AND SHEET METAL

Project-specific details of each contraction and expansion shall be drawn at 3 inches equals 1 foot. All system components shall be clearly shown and labeled.

### 2. Materials

**2.1. PROHIBITED:** Copper where concrete, masonry or stone may be stained by drainage from oxidized copper members.

**2.2. PROHIBITED:** Pre-finished galvanized steel flashing where it extends either belowground or below wearing surface on waterproofing projects.

2.3. See Division 4 - Masonry for through-wall flashing in masonry construction.

2.4. Visible sheet metal items such as roofing, counter flashing, copings, fascias, scuppers, gutters, leaders, sills and related fastening devices shall be fabricated from pre-finished galvanized steel with Kynar 500 coating. Other sheet metal items shall be minimum 24-gauge galvanized steel. Where other sheet metal items are to be field-painted, they shall be injected with phosphate at the mill and shop-primed for optimum ability to hold paint.

### 3. Workmanship

3.1. Seams may be sealed except where the pitch is less than 3 inches per foot, in which case they must be soldered.

3.2. Wherever possible, fastening shall be concealed with hook strips or cleats.

### 4. Warranty

4.1. Flashing and sheet metal work shall be warranted for five years. The contractor shall maintain systems and repair all defects that result from faulty

workmanship or defective materials without further cost to the university, including replacing any wet insulation caused by such defects.

4.2. Provide a 20-year written manufacturer's warranty for pre-finished sheet metal to cover color fade, chalk and film integrity.

## **07900 - JOINT SEALERS**

1. Refer to Division 8 - Doors and Windows for sealant work related to window systems and curtain wall systems. To ensure that a single source is responsible for performance, sealant work for all other critical systems shall be specified as part of the installation of those systems.

**2. Materials:** Caulking and sealant materials for exterior use shall conform to U.S. Federal Specification TT-S-0023OC, Type II, Class A and ASTM-C920-94, Type S Grade NS, Class 25, use NT, M,T,A, and O. USDA-approved.

### **3. Application**

3.1. Sealant shall be applied in strict accordance with the sealant manufacturer's recommendations for the specific material used and conditions of application.

3.2. Follow the manufacturer's recommendation for the inclusion and installation of backer rod.

**End of Division 7 - Thermal and Moisture Protection**  
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