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The Description of the Project  
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**SPECIFICATION DIVISION 7**

NUMBER            SECTION DESCRIPTION

**DIVISION 07 THERMAL AND MOISTURE PROTECTION**

SECTION 075316 - CHLOROSULFONATE-POLYETHYLENE (CSPE) ROOFING

**END OF CONTENTS TABLE**



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*UPDATED 2/1/2002 TO REVISE FM APPLICATION PROCEDURES AND STANDARDS*

**PART 1 - GENERAL**

**1.1 SUMMARY**

- A. This Section includes single-ply membrane roofing system as follows:
  - 1. System Type: Mechanically fastened.
  - 2. Membrane Type: Chlorosulfonated polyethylene (CSPE).
- B. Roof insulation related to flexible sheet roofing is specified in this section.
- C. Wood nailers, blocking and other related items are specified in this section.

*INCLUDE OR DELETE ELEMENTS LISTED BELOW, OR ADD NEW ELEMENTS TO SUIT PROJECT.*

- D. Removal of existing roofing system is specified in Division 02 Section "Selective Demolition".
- E. Concrete for patching work is specified in Division 03 Section "Miscellaneous Cast-In-Place Concrete".
- F. Structural steel required for equipment supports and framing members is specified in Division 05 Section "Structural Steel Framing".
- G. Steel deck units are specified in Division 05 Section "Steel Decking".
- H. Wood sheathing and framing is specified in Division 06 Section "Rough Carpentry".

**1.2 SUBMITTALS**

- A. Comply with submittal requirements indicated in Standard General Conditions, Division 01 Section "Submittal Procedures" and requirements of this Article.
  - 1. Submit product data, test data, samples, and shop drawings not less than 3 weeks prior to beginning roofing work.
  - 2. In addition to Owner's routine submittal process indicated in Standard General Conditions, submit design information and Factory Mutual roof acceptance form simultaneously and directly to Factory Mutual for review and approval at the following address:
    - FM Global
    - 25050 Great Northern Corporate Center, Suite 300
    - North Olmsted, OH 44070
    - Attn: Ms. Dawn Peger

3. Upon completion of Factory Mutual review the Contractor is responsible for providing the Owner with a copy of the review comments and corresponding actions taken.
- B. Product data, installation instructions, and general recommendations from manufacturer of single ply roofing membrane system for type of roofing required. Include data substantiating that materials comply with requirements.
1. For each of the following items, provide manufacturer's name, product name or model number:
    - a. Roofing membrane.
    - b. Insulation.
    - c. Flashing.
    - d. Adhesive.
    - e. Fasteners and Plates.
    - f. Vapor/Air Retarder (if applicable).

**USUALLY DELETE THE FOLLOWING, UNLESS UNFAMILIAR MATERIALS ARE SPECIFIED.**

- C. Samples of finished roofing sheets, including T-shaped side and end-lap seam. Also include the following:
1. Samples of required insulation.
- D. Shop drawings showing roof configuration, dimensions, height above grade, sheet layout, seam locations, flashing details, attachment details, membrane color (as applicable), details at perimeter, and special conditions.
1. Indicate insulation fastening rate in the field, at corners, and around perimeter of the roof. Include width of perimeter and corners.
  2. Indicate layout of tapered insulation materials.

**INCLUDE BELOW WHERE FASTENING THROUGH QUESTIONABLE SUBSTRATES.**

- E. Test data for pullout resistance of fastening systems.

### **1.3 QUALITY ASSURANCE**

- A. Manufacturer: Obtain primary flexible sheet roofing from a single manufacturer. Provide secondary materials as recommended by manufacturer of primary materials.
- B. Installer: Engage an Installer to apply single ply membrane roofing who has not less than 3 years experience in application of roofing systems similar to those required for this project. Installer must be acceptable to or licensed by manufacturer of primary roofing material.
1. Work associated with single ply membrane roofing, including (but not limited to) insulation, flashing, and counterflashing, expansion joints, and joint sealers, is to be performed by Installer of this work.

- C. Pre-Roofing Conference: One week prior to installation of roofing and associated work, meet at project site, or other mutually agreed location, with Installer, roofing sheet manufacturer, installers of related work, and other entities concerned with roofing performance, including Owner's insurer, test agencies, Owner's Representative, and Architect. Owner's Representative will conduct meeting, record discussions and agreements reached, and furnish a copy of meeting record to each participant.
  - 1. Provide at least 24 hours' advance notice to Owner's Representative prior to performing roofing installation.
- D. UL Listing: Provide labeled materials that have been tested and listed by UL in "Building Materials Directory" with "Class A" rated materials and system for roof slopes shown.

**SELECT CLASS 1-60 OR 1-90 (OR OTHER CLASSIFICATION) AS APPROPRIATE.**

- E. Factory Mutual: Provide materials with fuel contribution permitted for FM Class I Rating. Installation shall comply with recommendations of applicable FMRC data sheets and "Approval Guide." Comply with standards for FM Class 1-60 (1-90).
- F. Final Inspection: Require a factory representative of the membrane manufacturer to perform a final inspection of the roof installation, and to submit to the Owner a written report, signed by the manufacturer.

**1.4 PROJECT CONDITIONS**

- A. Weather: Proceed with roofing work only when existing and forecasted weather conditions permit work to be performed in accordance with manufacturers' recommendations and warranty requirements.
- B. Substrate Conditions: Do not begin roofing installation until substrates have been inspected by Owner's Roofing Department and are determined to be in satisfactory condition.

**1.5 WARRANTY**

- A. Special Project Warranty: Submit two executed copies of single source warranty, signed by manufacturer of roofing membrane, agreeing to replace or repair defective materials and workmanship on the total system, including leakage of water, abnormal aging or deterioration of materials, and other failures of sheet roofing system within warranty period. Repairs and replacements required because of acts of God and other events beyond Contractor's, Installer's, and manufacturer's control (and which exceed performance requirements) shall be completed by Contractor and Installer, and paid for by Owner, at prevailing rates.
  - 1. Warranty Period: 15 years after date of Substantial Completion.

**PART 2 - PRODUCTS**

**2.1 GENERAL**

- A. Performance: Provide roofing materials recognized to be of generic type indicated and tested to show compliance with indicated performances, or provide other similar materials certified in writing by manufacturer to be equal to, or better than, materials specified in every significant respect and acceptable to Architect.
- B. Compatibility: Provide products that are recommended by manufacturers to be fully compatible with indicated substrates, or provide separation materials as required to eliminate contact between incompatible materials.

**2.2 CHLOROSULFONATED POLYETHYLENE (CSPE) MEMBRANE**

- A. General: Hypalon synthetic rubber as produced by E. I. du Pont de Nemours & Co., formed into uniform flexible sheets, complying with the following:
  - 1. Tensile Strength (ASTM D 412): 1000 psi.
  - 2. Ultimate Elongation (ASTM D 412): 350 percent.
  - 3. Brittleness Temperature (ASTM D 746): Minus 40 deg F (minus 40 deg C).
  - 4. Resistance to Heat Aging (ASTM D 573): Retains 100 percent of tensile strength (14 days at 212 deg F/100 deg C).
  - 5. Thickness: 45 mils, minimum.
  - 6. Reinforcing Scrim: Polyester or nylon.
  - 7. Exposed Face Color: White.
- B. Mechanically Fastened CSPE Membrane: Manufacturer's standard installation.
- C. Manufacturers: Subject to compliance with requirements, provide products of one of the following:  
Carlisle SynTec Systems, Carlisle Corporation  
Stevens Roofing Systems Div., JPS Elastomerics Corp.

**2.3 AUXILIARY MATERIALS**

**SELECT PERLITE BOARD FOR NEW ROOFS AND TEAR-OFFS. SELECT "RECOVERY" BOARD FOR ROOFING OVER EXISTING ROOFING MATERIALS.**

- A. Gypsum Board: Fire rated, complying with ASTM C 36, Type X; 5/8 inch thick.
- B. "Recovery" Board: Manufacturer's standard board, recommended for application indicated.
- C. Sheet Seaming System: Manufacturer's standard materials for sealing lapped joints, including edge sealer to cover exposed spliced edges as recommended by membrane manufacturer.
  - 1. Provide solvent splice wash, splicing primer, splicing cement, night seal, and pourable seal products recommended by the membrane manufacturer and compatible with the materials with which they are is used.

- D. Cant Strips Tapered Edge Strips, and Flashing Accessories: Types recommended by membrane manufacturer, including adhesive tapes, flashing cements, and sealants.
- E. Nailing Strips and Fasteners: Extruded nailing strips and fasteners recommended by membrane manufacturer.
- F. Wood Nailers: Spruce-pine-fir dimensional lumber, preservative treated.
- G. Flashing Material: Manufacturer's standard systems compatible with flexible sheet membrane, "Hypalon" coated metal where recommended by manufacturer.
- H. Metal Gravel Stop: As recommended by membrane manufacturer for indicated installation.

**SELECT ONE OF THE WALKWAY PROTECTION TYPES LISTED BELOW, OR DELETE IF NOT REQUIRED.**

- I. Walkway Protection: "Hypalon" rubber membrane as approved by the membrane manufacturer. Locate as indicated on drawings.
  - 1. Thickness: Not less than 100 mil.
- J. Walkway Protection: Prefabricated concrete pavers designed specifically for ballasting single ply membranes. Provide interlocking units with subsurface drainage channels, weighing approximately 12 psf with minimum 2500-psi compressive strength.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - "Roofcap Paver"; IDR Div. National Concrete Masonry Assoc.
    - "Roofblock Ballast System"; Roofblok Ltd.
- K. Slip Sheet: Type recommended by membrane manufacturer for protecting membrane from incompatible substrates.
- L. Protective Coating: Liquid-applied "Hypalon" finish coat for application to exposed membrane, in color selected by Architect from manufacturer's standard colors.
- M. Mechanical Fasteners: Metal plates, caps, battens, accessory components, fastening devices, and adhesives to suit substrate and as recommended by manufacturer.

**2.4 INSULATING MATERIALS**

- A. General: Provide insulating materials to comply with requirements indicated for materials and compliance with referenced standards in sizes to fit applications indicated, selected from manufacturer's standard thicknesses, widths, and lengths.
  - 1. Provide tapered boards where indicated for sloping to drain. Fabricate with indicated taper, unless otherwise indicated.

**DESIGN FOR SLOPE OF ¼ INCH PER FOOT IF POSSIBLE.**

**SELECT MAXIMUM POSSIBLE SLOPE PERMITTED BY SITE CONDITIONS.**

- a. Slope: 1/16 inch per foot.
- b. Slope: 1/8 inch per foot.
- c. Slope: 1/4 inch per foot.

**SELECT ONE OF THE FOLLOWING INSULATION TYPES, OR INCLUDE BOTH AS "CONTRACTOR'S OPTION" - COORDINATE K FACTOR VARIATION OF MATERIALS WITH RESULTING EQUIVALENT THICKNESSES AND SITE CONDITIONS BEFORE SELECTING VALUES.**

- B. Extruded Polystyrene Board Insulation: Rigid, cellular thermal insulation with closed cells and integral high-density skin, complying with ASTM C 578 for Type IV and as follows:
1. Compressive Strength: 25-psf min. per ASTM D 1621.
  2. 5-Year Aged k Factor: 0.20 at 75 deg F, and 0.185 deg F per ASTM C 518-76.
  3. Surface Burning Characteristics: Maximum flame spread and smoke developed values of 5 and 165, respectively.

**REVISE THICKNESS VALUE INDICATED BELOW. USUALLY KEEP MINIMUM THICKNESS OF 1-1/2 INCHES, UNLESS NOT PERMITTED BY SITE CONDITIONS.**

4. Thickness: 1-1/2 inch, exclusive of tapered insulation course.
  5. Product: Provide units recommended and approved by membrane manufacturer, with aged R-value equal to Dow Chemical Co. "Styrofoam SM or TG".
- C. Polyisocyanurate Board Roof Insulation: Rigid cellular thermal insulation with polyisocyanurate closed-cell foam core and manufacturer's standard matt facing laminated to both sides; complying with FS HH-I-1972/2, Class 1.

**REVISE THICKNESS VALUE INDICATED BELOW. USUALLY KEEP MINIMUM THICKNESS OF 1-1/2 INCHES, UNLESS NOT PERMITTED BY SITE CONDITIONS.**

1. Minimum Compressive Strength: 25 psi.
2. Thickness: 1-1/2 inch, exclusive of tapered insulation course.
3. Product: Provide units recommended and approved by membrane manufacturer, with aged R-value equal to Celotex Corp. "Energy-Lok".

## **2.5 AUXILIARY INSULATION MATERIALS**

- A. Adhesive for Bonding Insulation: Where required, type recommended by insulation manufacturer, approved by the membrane manufacturer and complying with fire resistance requirements.
- B. Mastic Sealer: Type recommended by insulation manufacturer for bonding edge joints and filling voids, if required.
- C. Mechanical Anchors: Corrosion-resistant type as recommended by membrane manufacturer for deck type and complying with fire and insurance uplift rating requirements.

**SELECT ONE OF THE FOLLOWING THREE.**

1. Fasten insulation into concrete decks.
2. Fasten insulation through metal decks.
3. Fasten insulation through wood decks.

**ALWAYS INCLUDE BELOW.**



4. Provide system tested and approved for the following Factory Mutual wind uplift rating:

*SELECT ONE OF THE FOLLOWING BASED ON FM RECOMMENDATIONS.*

### **PART 3 - EXECUTION**

#### **3.1 PREPARATION OF SUBSTRATE**

- A. General: Comply with manufacturer's instructions for preparation of substrate to receive single ply membrane system.
  1. Verify that penetrations, expansion joints, and blocking are placed and secured and that roof drains are properly clamped into position.
- B. Clean substrate of dust debris, and other substances detrimental to single ply roofing system work. Remove sharp projections.
- C. Install flashings and accessory items as shown, and as recommended by manufacturer if not shown.

#### **3.2 INSPECTION OF SUBSTRATE**

- A. Inspection: Inspect substrate and conditions under which roofing work is to be performed in presence of Installer. Notify Owner in writing of unsatisfactory conditions. Do not proceed with roofing work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

#### **3.3 INSULATION INSTALLATION**

*REVISE THE FOLLOWING PARAGRAPH TO SELECT EITHER ONE OR MULTIPLE LAYERS. AS WRITTEN, PARAGRAPH GIVES CONTRACTOR THE OPTION TO DO EITHER.*

- A. General: Extend insulation full thickness in one layer, or in multiple layers over entire surface to be insulated, cutting and fitting tightly around obstructions. Form cant strips, crickets, saddles, and tapered areas with additional material as shown and as required for proper drainage of membrane.
  1. Stagger joints in one direction for each course. For multiple layers, stagger joints in both directions between courses with no gaps, to form a complete thermal envelope. Use the largest sheets possible as determined by job conditions to minimize the amount of joints.

*INCLUDE THE FOLLOWING IF VAPOR BARRIER IS INCLUDED.*

2. Install vapor barrier under insulation. Lap edges min. 3 inches and tape seams.
- B. Do not install more insulation each day than can be covered with membrane before the end of day or before start of inclement weather. Insulation shall be clean and dry when installed.

C. Secure roof insulation to substrate with mechanical anchors of type and spacing recommended by manufacturer, but in no case provide less than required by the latest version of FM "Loss Prevention Data Sheet 1-29," including perimeter and corner enhancements.

1. Tar Kettle/Pots are required to be equipped with fume recovery system.

### 3.4 MEMBRANE INSTALLATION

A. General: If required for warranty, start installation only in presence of manufacturers technical representative. Use only installation techniques and details acceptable to the membrane manufacturer and that qualify installation for required warranty.

1. Cut out and repair membrane defects at end of each day's work.

B. Mechanically Fastened Membrane: Install membrane by unrolling over prepared substrate, lapping adjoining sheets as recommended by manufacturer, and bonding and sealing seams. Install mechanical fasteners at spacing recommended by manufacturer, covering with adhesive-applied membrane so that no fastenings are exposed. Install flashings and counterflashings, as shown or recommended by manufacturer.

1. Splicing: Splice in accordance with the manufacturer's recommendations. Clean membrane and counterflashing splices with a solvent wash and prime with splicing primer prior to application of adhesive.
2. Perimeter Nailing: Mechanically fasten nailing strips through the membrane and into the roof deck. Seal with flashing at the perimeter, curb flashing, expansion joints, and obstructions. Provide 6 inch wide separations where water flow is interrupted.
3. Flashing: Use longest pieces possible for perimeter flashing and flashing around penetrations, mechanical systems, and similar obstructions. Fabricate flashings and terminations in accordance with standard details. Flash items passing through the membrane. Flash pipes with molded pipe flashing. Where installation of molded pipe flashing is not possible, install field fabricated pipe seals. Do not allow flashing to bridge any change in direction.
4. Clusters of Pipes: Seal unusual shaped penetrations using pitch pocket type seal as shown in manufacturer's standard details.
5. Expansion Joints: Comply with roof manufacturer's recommendations.
6. Daily Seal: Exercise care to ensure that the water does not flow beneath any completed sections of roof. Temporarily seal loose edge of membrane according to manufacturer's recommendations at the end of each working day provide edge weighting. When work is resumed, pull sheet free before continuing installation. Provide seals to existing deck and to existing roofing to prevent water bypass into new roofing system.

7. Laps: No buck water laps are permitted, and no field seams within 3 feet of a roof sump will be allowed.

*SELECT ONE OF THE FOLLOWING TO SUIT PROJECT, OR DELETE BOTH IF NO WALKWAY PROTECTION INCLUDED.*

- C. Walkway Protection: Adhere "Hypalon" walkway membrane to roof membrane in accordance with manufacturer's written instructions.
- D. Walkway Protection: Install paver units at locations shown and where required for access to roof-mounted equipment. Place protection boards carefully to avoid damage to roofing system.

### **3.5 PROTECTION OF ROOFING**

- A. Upon completion of roofing (including associated work), institute appropriate procedures for surveillance and protection of roofing during remainder of construction period. At end of construction period, or at time when remaining construction will in no way affect or endanger roofing, make a final inspection of roofing and prepare a written report to Owner, describing nature and extent of deterioration or damage found.
- B. Repair or replace deteriorated or defective work found at time of final inspection, as required to provide a condition free of damage and deterioration at time of Substantial Completion and in accordance with requirements of specified warranty.

**END OF SECTION 075316**