

Owens Corning® Enclosure Solutions
FOAMULAR® 400/600/1000
Extruded Polystyrene Roof Board Insulation
Exterior Enclosure Specification

GUIDE SPECIFICATIONS

Owens Corning® FOAMULAR® 400/600/1000 Extruded Polystyrene Insulation
Specification Guide

This specification guide presents in 3-part format Extruded Polystyrene Roof Board Insulation for protected roof membrane assemblies. The components are presented in MasterFormat Division: **Division 07 Thermal and Moisture Protection**.

System performance requirements are presented in **Division 01 Exterior Enclosure Performance Requirements** where all components are specified as a single system.

The major section headings provided are outlined below. Sections that require editing by the specifier are marked in **[highlighted bold with brackets]**. Notes to the specifier are marked in **[PINK with brackets.]** Please note that edits to all Divisions are required to ensure complete performance of the system.

Division 01 General Requirements:

Divisions 07 provided in this document outline complete 3-part MasterFormat sections for FOAMULAR® Extruded Polystyrene Roof Board Insulation.

Each of those sections cross reference back to the Division 01 Exterior Enclosure Performance Requirements to ensure that complete system performance requirements for building code compliance are concisely stated in the construction documents.

Include this section in your Project Manual to establish code compliance and complete system performance requirements.

SECTION 01 83 16 EXTERIOR ENCLOSURE PERFORMANCE REQUIREMENTS

This section includes Owens Corning® (OC) FOAMULAR® Extruded Polystyrene Roof Board Insulation. This section outlines those products where they are commonly placed in the thermal insulation MasterFormat section:

SECTION 07 22 16 ROOF BOARD INSULATION

Alternatively, the text for each product may be cut & pasted into their general MasterFormat Sections if desired:

SECTION 07 21 00 THERMAL INSULATION

PROJECT ARCHITECT RESPONSIBILITY: This is a general specification guide, intended to be used by experienced construction professionals, in conjunction with good construction practice and professional judgment. This guide is to aid in the creation of a complete roof system specification that is to be fully reviewed and edited by the Architect of Record. Sections of this guide should be included, or edited, or omitted based on the requirements of a specific project. It is the responsibility of both the specifier and the purchaser to determine if a product or system is suitable for its intended use. Neither Owens Corning®, Thermafiber®, nor any of their subsidiary or affiliated companies, assume any responsibility for the content of this specification guide relative to actual projects, and specifically disclaim any and all liability for any errors or omissions in design, detail, structural capability, attachment details, shop drawings or other construction related details, whether based upon the information provided by the aforementioned companies or otherwise.

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SECTION 01 83 16 EXTERIOR ENCLOSURE PERFORMANCE REQUIREMENTS

PART 1 – GENERAL

1.1 SUMMARY

Tested Roof System Description: Furnish and install specified products that have been tested to meet specified performance requirements for thermal, air, water, and fire resistance.

A. SECTION INCLUDES:

1. The complete roof system shall include the following:
 - a. Reinforced [built-up bituminous, modified bituminous, elastomeric, thermoplastic, fluid-applied, hot-applied rubberized asphalt] protected membrane roofing applied over [concrete, steel] roof deck by contractors creating a fully-adhered, water and air tight roof allowing for the relative movement of systems due to thermal and moisture variations and capable of withstanding positive and negative combined wind and other live load pressures on the building envelope without damage or displacement.
 - b. [Roof deck sheathing] (as required by roof membrane manufacturer for steel decks)
 - c. [Root barrier protection layer over the roof membrane assembly.] (As required by roof membrane assembly manufacturer for vegetative roof assemblies)
 - d. [Drain assembly & inspection chamber.]
 - e. [Aeration and drainage composite] (Required for vegetative roof assemblies. May be required to create a vapor diffusion open roof assembly. See [Owens Corning PRMA Technical Bulletin ES-PRMA-01.](#))
 - f. Extruded polystyrene insulation placed over the roof membrane.
 - g. [Growing media & vegetation], [pavers and/or pedestals], [concrete topping slab], and/or [stone ballast] overburden.
 - h. [Safing and sealant for sealing gaps between exterior wall and floor edge, perimeter fire containment system.]

2. All joints, penetrations, and gaps of the roof membrane assembly shall be made water and air tight.

1.2 RELATED SECTIONS

Refer to the following Sections for additional requirements for each component in the assembly: [Delete section from the list below that are not required by the project.]

1. Section 01 83 16 [Project Specific], Exterior Enclosure Performance Requirements
2. Section 03 15 00 [Project Specific], Concrete Accessories
3. Section 03 30 00 [Project Specific], Cast-in-Place Concrete
4. Section 03 40 00 [Project Specific], Precast Concrete
5. Section 03 50 00 [Project Specific], Cast Decks & Underlayment
6. Section 05 31 00 [Project Specific], Steel Decking
7. Section 06 16 00 [Project Specific], Sheathing
8. Section 07 21 00 [Project Specific], Thermal Insulation
9. Section 07 22 16 [Project Specific], Roof Board Insulation
10. Section 07 27 00 [Project Specific], Air Barriers
11. Section 07 55 00 [Project Specific], Protected Membrane Roofing
12. Section 07 55 63 [Project Specific], Vegetated Membrane Roofing
13. Section 07 62 00 [Project Specific], Sheet Metal Flashing and Trim
14. Section 07 63 00 [Project Specific], Sheet Metal Roofing Specialties
15. Section 07 65 00 [Project Specific], Flexible Flashings
16. Section 07 70 00 [Project Specific], Roof Specialties
17. Section 07 72 00 [Project Specific], Roof Accessories
18. Section 07 72 73 [Project Specific], Vegetated Roof Systems
19. Section 07 76 00 [Project Specific], Roof Pavers
20. Section 07 84 00 [Project Specific], Firestopping
21. Section 07 90 00 [Project Specific], Joint Protection
22. Section 09 29 00 [Project Specific], Gypsum Board
23. Section 22 14 00 [Project Specific], Facility Storm Drainage

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24. **Section 32 10 00 [Project Specific]**, Bases, Ballasts, and Paving
25. **Section 32 80 00 [Project Specific]**, Irrigation
26. **Section 32 90 00 [Project Specific]**, Planting
27. **Section 48 14 00 [Project Specific]**, Solar Energy Electrical Power Generation Equipment
28. **Section 48 15 00 [Project Specific]**, Wind Energy Electrical Power Generation Equipment
29. **Section xx xx xx [Project Specific]**, LEED Requirements

1.3 ADMINISTRATIVE REQUIREMENTS

A. COORDINATION

Coordinate installation roof membrane system with installation of roof deck, insulation, roof accessories, air barrier membrane, **[paver assembly]**, **[vegetative roof components]**, and other moisture protection work.

B. PREINSTALLATION

Convene a meeting of involved sub-contractors a minimum of two weeks prior to commencing Work described in this Section.

1. Attendance is required by representatives of related trades including Owner's Representative, Contractor, Architect, Installer, Air Barrier Membrane System Manufacturer, Roofing and Waterproofing Subcontractor, mechanical subcontractor, electrical contractor, and all subcontractors who have materials penetrating the roof membrane system or overburden covering the membrane system. Manufacturer's Representative is available upon request with minimum two-week notice.
2. Contractor shall notify **[Architect, Engineer, Consultant]** at least 14 days prior to time for meeting.
3. Contractor shall record minutes of meeting and distribute to attending parties.
4. The agenda shall include at a minimum:
 - a. Materials proposed for use.
 - b. **[Verification of eligibility for any warranty]**.
 - c. Sequence of construction.
 - d. Coordination with substrate preparation, condition, and pretreatment.
 - e. Compatibility of materials.
 - f. Roof membrane requirements and installation.
 - g. Mechanical and electrical requirements and installation.
 - h. Minimum curing period.
 - i. Special details.
 - j. Mockups.
 - k. Water leakage and adhesion testing and inspection.
 - l. Roof membrane protection and repair.
 - m. Work scheduling that covers insulation coordination with installation of adjacent and covering materials.
 - n. **[Work scheduling that covers installation of vegetation and care and maintenance prior to project completion]**.
 - o. Air barrier installation.

1.4 SUBMITTALS

Provide the following information in accordance with **Section 01 33 00 [Project Specific]** Submittal Procedures.

A. PRODUCT DATA:

Submit product data of each component in tested roof assembly as required per **[Sections 07 22 16 Roof Board Insulation, 07 55 00 Protected Membrane Roofing, 07 72 73 Vegetated Roof Systems, 07 76 00 Roof Pavers, 32 90 00 Planting]**. **[Insert all that apply from 1.2 RELATED SECTIONS.]**

B. SHOP DRAWINGS (project-specific to roof assembly)

Submit shop drawings demonstrating tested roof assembly components as specified in per **[Sections 07 22 16 Roof Board Insulation, 07 55 00 Protected Membrane Roofing, 07 72 73 Vegetated Roof Systems, 07 76 00 Roof Pavers, 32 90 00 Planting]**. **[Insert all that apply from 1.2 RELATED SECTIONS.]**

C. SAMPLES:

Submit product minimum **[three]** samples of each component of the tested roof assembly system as required by this Section.

D. CERTIFICATES:

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Submit documentation, signed by manufacturers, that products in tested roof assembly meet Quality Assurance Requirements as required in this Section.

E. TEST AND EVALUATION REPORTS:

Submit manufacturer's verification, test reports, or third-party engineering analysis that the proposed materials assembled as a tested roof system comply with the specified PERFORMANCE/ DESIGN CRITERIA of this Section.

F. MANUFACTURER'S INSTRUCTIONS

Provide installation instructions for all products in tested roof assembly as required in this Section.

G. SUSTAINABLE DESIGN SUBMITTALS:

Provide documentation of required Quality Assurance Sustainability Standards Certifications for all products in tested roof assembly as required in this Section.

H. SPECIAL PROCEDURE SUBMITTALS

[None.]

I. QUALIFICATION STATEMENTS

Provide documentation of required Quality Assurance Qualifications for Manufacturers and Installers for all products in tested roof assembly as required in this Section.

J. WARRANTY DOCUMENTATION

Submit sample warranties as required by this Section.

1.5 QUALITY ASSURANCE

A. QUALIFICATIONS

Manufacturers and Installers of specified products in the tested roof assembly shall meet Quality Assurance Qualifications requirements per **[Sections 07 22 16 Roof Board Insulation, 07 55 00 Protected Membrane Roofing, 07 72 73 Vegetated Roof Systems, 07 76 00 Roof Pavers, 32 90 00 Planting]**. **[Insert all that apply from 1.2 RELATED SECTIONS.]**

B. CERTIFICATIONS

1. Provide Manufacturer's written certification that tested roof assembly components are compatible **[and provided as a single-source from the manufacturer]**.
2. Provide Manufacturer's written certification that components are compatible with all adjacent materials that come into contact with the materials during construction and throughout the life of the building including insulation and attached membranes.
3. Provide Manufacturer's written certification that products are for the intended purpose as described in this Section.

C. SUSTAINABILITY STANDARDS CERTIFICATIONS

Provide documentation that specified products of the tested assembly meet Product Design/ Performance Criteria and Product Materials requirements of this Section and Quality Assurance Sustainability Standards Certifications of **[Sections 07 22 16 Roof Board Insulation, 07 55 00 Protected Membrane Roofing, 07 72 73 Vegetated Roof Systems, 07 76 00 Roof Pavers, 32 90 00 Planting]**. **[Insert all that apply from 1.2 RELATED SECTIONS.]**

D. MOCK-UPS

Construct a roof assembly sample minimum 100 square feet that includes waterproofing membrane system, flashings, extruded polystyrene (XPS) continuous insulation, drainage and air layers, and overburden **[such as pavers, vegetation]**. The mock-up shall also include a pipe penetration, drainage assembly, and vertical transition detailed with flashings and terminations to demonstrate surface preparation, crack and joint treatment, application of roof membrane system, and sealing of gaps, terminations, and penetrations of the roof assembly.

1. Coordinate construction of mockups to permit inspection by Owner's testing agency of roof membrane before external insulation and overburden are installed.
2. Include transitions to air barrier membrane, penetrations, and edge of wall condition.

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3. **[Architect, Engineer, Consultant]** approval of mockup is required. If it is determined that mockup does not comply with requirements, affected details must be reconstructed until mockups are approved.
 4. Locate as directed and remove upon review and approval.
 5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless **[Architect, Engineer, Consultant]** specifically approves such deviations in writing. **[Indicate portion of roof represented by mockup on Drawings or draw mockup as separate element.]**
 6. **[Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.]**
 7. **[Preconstruction Testing Service: Owner will engage a qualified testing agency to perform preconstruction testing on field mockups.]**
- E. DELIVERY, STORAGE, AND HANDLING
For specified products in the tested roof assembly, follow Delivery, Storage, and Handling requirements per **[Sections 07 22 16 Roof Board Insulation, 07 55 00 Protected Membrane Roofing, 07 72 73 Vegetated Roof Systems, 07 76 00 Roof Pavers, 32 90 00 Planting]**. **[Insert all that apply from 1.2 RELATED SECTIONS.]**
- F. FIELD CONDITIONS
For specified products in the tested roof assembly, follow Field Conditions requirements per **[Sections 07 22 16 Roof Board Insulation, 07 55 00 Protected Membrane Roofing, 07 72 73 Vegetated Roof Systems, 32 90 00 Planting]**. **[Insert all that apply from 1.2 RELATED SECTIONS.]**
- G. WARRANTY
1. PRODUCT WARRANTY
Provide product warranties as required by **[Sections 07 22 16 Roof Board Insulation, 07 55 00 Protected Membrane Roofing, 07 72 73 Vegetated Roof Systems, 07 76 00 Roof Pavers, 32 90 00 Planting]**. **[Insert all that apply from 1.2 RELATED SECTIONS.]**
 2. SYSTEM WARRANTY
Provide system warranty as required by **[Sections 07 22 16 Roof Board Insulation, 07 55 00 Protected Membrane Roofing, 07 72 73 Vegetated Roof Systems]**. **[Insert all that apply from 1.2 RELATED SECTIONS.]**
 3. INSTALLATION WARRANTY
Provide installation warranty as required by **[07 55 00 Protected Membrane Roofing, 07 72 73 Vegetated Roof Systems, 07 76 00 Roof Pavers]**. **[Insert all that apply from 1.2 RELATED SECTIONS.]**

PART 2 – PRODUCTS

2.1 TESTED ROOF ASSEMBLY

A. MANUFACTURERS

BASIS-OF-DESIGN: PRMA Roof System.

1. Substitution Limitations

The “Basis of Design” products listed in this Section are tested and warranted as a system. The Contractor shall provide the products of the named manufacturers without substitution, unless a written request for an “or equal complete system substitution” has been approved in writing by the **[Architect, Engineer, Consultant]**. Substitution requests must be accompanied by the following to be considered for substitution:

- a. Verification that proposed products meet published product performance criteria.
- b. Verification from the proposed manufacturers of independent third-party listings or engineering judgements that the proposed system substitution meets the **[UL 1256/NFPA 276, ASTM E108, ASTM E119 (fire resistance), ANSI/SPRI RP-4/ RP-14, ASCE 7, and/or FM4480]** requirements.
- c. Verification from proposed manufacturers that the proposed substitution is tested with the other assembly components to meet Division 01, EXTERIOR ENCLOSURE PERFORMANCE REQUIREMENTS, **Section 01 83 16 [Project Specific]**.

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B. DESCRIPTION

Provide and install protected fully adhered reinforced roof membrane **[fire classified] [class A, B, C] and/or [fire resistance rated, non-rated]** assembly over **[concrete, steel]** roof deck, with extruded polystyrene (XPS) roof board insulation and **[vegetative roof assembly, pavers, concrete topping slab, and/or stone ballast]** overburden, that effectively controls thermal, air, and water performance, resists wind pressures, and provides continuous insulation and continuity of the building envelope.

C. PERFORMANCE/ DESIGN CRITERIA

1. FIRE CONTAINMENT AND RESISTANCE

- a. **[UL1256/ NFPA 276: Provide documentation from qualified testing agency or fire engineer that the roof deck, roof membrane, insulation, and overburden as components of the designed roof assembly have been tested and passed UL1256/NFPA 276 or approved by third-party engineering judgement.] [Required for steel decks. If needed, refer to applicable building code for requirements.]**
- b. **[ASTM E108: Provide documentation from qualified testing agency or fire engineer that the roof deck, roof membrane, insulation, and overburden as components of the designed roof assembly have been tested and passed ASTM E108 or approved by third-party engineering judgement.] [If needed, refer to applicable building code for requirements.]**
- c. **[ASTM E119: Provide documentation from qualified testing agency or fire engineer that the interior ceiling finish, roof deck, roof membrane, insulation, and overburden as components of the designed roof assembly have been tested and passed ASTM E119 or approved by third-party engineering judgement.] [If needed, refer to applicable building code for requirements.]**

2. WIND PRESSURE RESISTANCE

- a. **[ANSI/SPRI RP-4 or ANSI/SPRI RP-14: Provide documentation from qualified engineer that the roof deck, roof membrane, insulation, and overburden as components of the designed roof assembly meet the requirements for wind uplift resistance.] (This may be used for building up to 150'. See [Owens Corning PRMA Technical Bulletin ES-PRMA-01.](#))**
- b. **[ASCE 7 and/or wind study: Provide documentation from qualified engineer that the roof deck, roof membrane, insulation, and overburden as components of the designed roof assembly meet the requirements for wind uplift resistance.] (See [Owens Corning PRMA Technical Bulletin ES-PRMA-01.](#))**

3. THERMAL RESISTANCE

Provide a tested or modeled roof system that meets or exceeds code required R-value for PRMA roof assemblies in the jurisdiction of the project. Submit manufacturer product data sheets and test reports prepared by a qualified testing agency to verify properties for insulation including R-value and other physical properties. (Refer to [Technical Bulletin for IBC Prescriptive Requirements for Roof Construction with Insulation Entirely Above the Roof Deck.](#))

4. INDOOR AIR QUALITY

- a. Provide **[mineral wool, fiberglass]** insulation products that are formaldehyde free.
- b. Provide **[extruded polystyrene (XPS), fiberglass]** insulation products that are formaldehyde free.

5. RECYCLED CONTENT

Provide insulation products **[extruded polystyrene, fiberglass, and/or mineral wool]** whose recycled content is verified via third party certification.

6. THIRD PARTY LISTING, CERTIFICATION, AND ENGINEERING JUDGEMENTS

Provide independent third-party verification listings or engineering judgements for the primary code requirements of **[UL 1256/NFPA 276 (roof deck flame spread)], [ASTM E108 (flame spread & penetration)], [ASTM E119 (fire resistance)], [ANSI/SPRI RP-4], [ANSI/SPRI RP-14], and/or [ASCE 7].**

D. MATERIALS

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1. Reinforced **[built-up bituminous, modified bituminous, elastomeric, thermoplastic, fluid-applied, hot-applied rubberized asphalt]** protected membrane roofing applied over **[concrete, steel]** roof deck by contractors creating a fully-adhered, water and air tight roof allowing for the relative movement of systems due to thermal and moisture variations and capable of withstanding positive and negative combined wind and other live load pressures on the building envelope without damage or displacement.
2. **[Roof deck sheathing]** (as required by roof membrane manufacturer for steel decks)
3. **[Root barrier protection layer over the roof membrane assembly.]** (As required by roof membrane assembly manufacturer for vegetative roof assemblies)
4. **[Drain assembly & Inspection chamber.]**
5. **[Aeration and drainage composite]** (Required for vegetative roof assemblies. May be required to create a vapor diffusion open roof assembly. See [Owens Corning PRMA Technical Bulletin ES-PRMA-01.](#))
6. Extruded polystyrene insulation placed over the roof membrane.
7. **[Growing media & vegetation], [pavers and/or pedestals], [concrete topping slab], and/or [stone ballast]** overburden.
8. **[Safing and sealant for sealing gaps between exterior wall and floor edge, perimeter fire containment system.]**

PART 3 – EXECUTION- NOT USED

END OF SECTION 01 83 16

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SECTION 07 22 16 ROOF BOARD INSULATION

PART 1 – GENERAL

1.1 SUMMARY

See Division 01, EXTERIOR ENCLOSURE PERFORMANCE REQUIREMENTS, Section 01 83 16, **[including mandatory roof system compliance with [UL 1256/NFPA 276 (roof deck flame spread)], [ASTM E108 (flame spread & penetration)], [ASTM E119 (fire resistance)], [ANSI/SPRI RP-4], [ANSI/SPRI RP-14], and/or [ASCE 7]. All proposed product substitutions must comply to be considered.**

A. SECTION INCLUDES

1. Provide and install protected fully adhered reinforced roof membrane **[fire classified] [class A, B, C] and/or [fire resistance rated, non-rated]** assembly over **[concrete, steel]** roof deck, with extruded polystyrene (XPS) roof board insulation and **[vegetative roof assembly, pavers, concrete topping slab, and/or stone ballast]** overburden, that effectively controls thermal, air, and water performance, resists wind pressures, and provides continuous insulation and continuity of the building envelope. Provide labor, materials, tools and equipment necessary to complete the Work of this Section including, but not limited to, the following:
 - a. Extruded Polystyrene continuous insulation for roof application.
2. The complete roof system shall include the following:
 - a. Reinforced **[built-up bituminous, modified bituminous, elastomeric, thermoplastic, fluid-applied, hot-applied rubberized asphalt]** protected membrane roofing applied over **[concrete, steel]** roof deck by contractors creating a fully-adhered, water and air tight roof allowing for the relative movement of systems due to thermal and moisture variations and capable of withstanding positive and negative combined wind and other live load pressures on the building envelope without damage or displacement.
 - b. **[Concrete, steel]** roof deck to resist live, dead, and wind loads.
 - c. **[Roof deck sheathing]** (as required by roof membrane manufacturer for steel decks)
 - d. **[Root barrier protection layer over the roof membrane assembly.]** (As required by roof membrane assembly manufacturer for vegetative roof assemblies)
 - e. **[Drain assembly & Inspection chamber.]**
 - f. **[Aeration and drainage composite]** (Required for vegetative roof assemblies. May be required to create a vapor diffusion open roof assembly. See [Owens Corning PRMA Technical Bulletin ES-PRMA-01.](#))
 - g. Extruded polystyrene insulation placed over the roof membrane.
 - h. **[Growing media & vegetation], [pavers and/or pedestals], [concrete topping slab], and/or [stone ballast]** overburden.
 - i. **[Safing and sealant for sealing gaps between exterior wall and floor edge, perimeter fire containment system.]**
3. All joints, penetrations, and gaps of the roof membrane system shall be made water and air tight.

B. RELATED SECTIONS

The items listed are not included in this Section, but are specified in the Section listed: **[Delete section from the list below that are not required by the project.]**

1. **Section 01 83 16 [Project Specific]**, Exterior Enclosure Performance Requirements
2. **Section 03 15 00 [Project Specific]**, Concrete Accessories
3. **Section 03 30 00 [Project Specific]**, Cast-in-Place Concrete
4. **Section 03 40 00 [Project Specific]**, Precast Concrete
5. **Section 03 50 00 [Project Specific]**, Cast Decks & Underlayment
6. **Section 05 31 00 [Project Specific]**, Steel Decking
7. **Section 06 16 00 [Project Specific]**, Sheathing
8. **Section 07 21 00 [Project Specific]**, Thermal Insulation
9. **Section 07 22 16 [Project Specific]**, Roof Board Insulation
10. **Section 07 27 00 [Project Specific]**, Air Barriers
11. **Section 07 55 00 [Project Specific]**, Protected Membrane Roofing

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12. **Section 07 55 63 [Project Specific]**, Vegetated Membrane Roofing
13. **Section 07 62 00 [Project Specific]**, Sheet Metal Flashing and Trim
14. **Section 07 63 00 [Project Specific]**, Sheet Metal Roofing Specialties
15. **Section 07 65 00 [Project Specific]**, Flexible Flashings
16. **Section 07 70 00 [Project Specific]**, Roof Specialties
17. **Section 07 72 00 [Project Specific]**, Roof Accessories
18. **Section 07 72 73 [Project Specific]**, Vegetated Roof Systems
19. **Section 07 76 00 [Project Specific]**, Roof Pavers
20. **Section 07 84 00 [Project Specific]**, Firestopping
21. **Section 07 90 00 [Project Specific]**, Joint Protection
22. **Section 09 29 00 [Project Specific]**, Gypsum Board
23. **Section 22 14 00 [Project Specific]**, Facility Storm Drainage
24. **Section 32 10 00 [Project Specific]**, Bases, Ballasts, and Paving
25. **Section 32 80 00 [Project Specific]**, Irrigation
26. **Section 32 90 00 [Project Specific]**, Planting
27. **Section 48 14 00 [Project Specific]**, Solar Energy Electrical Power Generation Equipment
28. **Section 48 15 00 [Project Specific]**, Wind Energy Electrical Power Generation Equipment
29. **Section xx xx xx [Project Specific]**, LEED Requirements

1.2 REFERENCES

A. REFERENCE STANDARDS

Materials shall meet the property requirements of one or more of the following specifications as applicable to the specific product or end use. ~~[Delete references from the list below that are not required by the text of the edited Section.]~~

1. American Society of Civil Engineers (ASCE)
 - a. ASCE 7 Minimum Design Loads and Associated Criteria for Buildings and other Structures
2. American Society for Testing of Materials (ASTM)
 - a. ASTM A272: Standard Test Method for Water Absorption of Core Materials for Structural Sandwich Constructions.
 - b. ASTM C518: Standard Test Method for Steady-State Thermal Transmission Properties by Means of Heat Flow Meter Apparatus.
 - c. ASTM C578: Standard Specification for Rigid Cellular Polystyrene Thermal Insulation.
 - d. ASTM D1621: Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
 - e. ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials.
 - f. ASTM E96: Standard Test Methods for Water Vapor Transmission of Materials.
 - g. ASTM E108: Standard Test Methods for Fire Tests of Roof Coverings.
 - h. ASTM E119: Standard Test Methods for Fire Tests of Building Constructions and Materials.
3. Factory Mutual Insurance (FM)
 - a. FM 4470 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
4. National Fire Protection Association (NFPA)
 - a. NFPA 276: Standard Method of Fire Test for Determining the Heat Release Rate of Roofing Assemblies in Combustible Above Deck Roofing Components.
5. Single Ply Roofing Industry (SPRI)
 - a. ANSI/SPRI RP-4 Wind Design Standard for Ballasted Single-Ply Roofing Systems
 - b. ANSI/SPRI RP-14 Wind Design Standard for Vegetative Roofing Systems
6. Underwriters Laboratories (UL)
 - a. UL 1256: Standard for Fire Test of Roof Deck Constructions.

1.3 ADMINISTRATIVE REQUIREMENTS

A. COORDINATION

Coordinate installation of insulation and accessories with roof membrane system, air barrier membrane, **[paver assembly]**, **[vegetative roof components]**, and other moisture protection work.

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B. PREINSTALLATION MEETINGS

Convene a meeting of involved sub-contractors a minimum of two weeks prior to commencing Work described in this Section.

1. Attendance is required by representatives of related trades including Owner's Representative, Contractor, Architect, Installer, Air Barrier Membrane System Manufacturer, Roofing and Waterproofing Subcontractor, mechanical subcontractor, electrical contractor, and all subcontractors who have materials penetrating the roof membrane system or overburden covering the membrane system. Manufacturer's Representative is available upon request with minimum two-week notice.
2. Contractor shall notify **[Architect, Engineer, Consultant]** at least 14 days prior to time for meeting.
3. Contractor shall record minutes of meeting and distribute to attending parties.
4. The agenda shall include at a minimum:
 - a. Materials proposed for use.
 - b. **[Verification of eligibility for any warranty].**
 - c. Sequence of construction.
 - d. Coordination with substrate preparation, condition, and pretreatment.
 - e. Compatibility of materials.
 - f. Roof membrane requirements and installation.
 - g. Mechanical and electrical requirements and installation.
 - h. Minimum curing period.
 - i. Special details.
 - j. Mockups.
 - k. Water leakage and adhesion testing and inspection.
 - l. Roof membrane protection and repair.
 - m. Work scheduling that covers insulation coordination with installation of adjacent and covering materials.
 - n. **[Work scheduling that covers installation of vegetation and care and maintenance prior to project completion].**
 - o. Air barrier installation.

1.4 SUBMITTALS

Provide the following information in accordance with **Section 01 33 00 [Project Specific]** Submittal Procedures.

- A. **PRODUCT DATA:** Manufacturers' data on each type of product furnished including:
 1. Preparation instructions and recommendations.
 2. Technical data and tested physical and performance properties of products.
 3. Storage, handling requirements, and recommendations.
- B. **SHOP DRAWINGS** (project-specific to overburden)
 1. Show locations and extent of insulation and any tapered insulation. Indication slope and direction of slope. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, flashing transition assemblies, and tie-ins with adjoining construction.
 2. Include details of interfaces with other materials that form part of building enclosure.
- C. **SAMPLES:** Submit product minimum **[three]** samples of the following:
 1. Extruded Polystyrene Insulation minimum **[three inches by three inches].**
 2. Any fasteners, hardware, and adhesives recommended by manufacturer.
- D. **CERTIFICATES:**

Submit documentation signed by Manufacturer that products meet Quality Assurance Certification requirements of this Section.
- E. **TEST AND EVALUATION REPORTS:**
 1. **[UL1256/ NFPA 276: Provide documentation from qualified testing agency or fire engineer that the roof deck, roof membrane, insulation, and overburden as components of the designed roof assembly have been tested and passed UL1256/NFPA 276 or approved by third-party engineering judgement.]** [Required for steel decks. If needed, refer to applicable building code for requirements.]

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2. **[ASTM E108: Provide documentation from qualified testing agency or fire engineer that the roof deck, roof membrane, insulation, and overburden as components of the designed roof assembly have been tested and passed ASTM E108 or approved by third-party engineering judgement.] [If needed, refer to applicable building code for requirements.]**
 3. **[ASTM E119: Provide documentation from qualified testing agency or fire engineer that the interior ceiling finish, roof deck, roof membrane, insulation, and overburden as components of the designed roof assembly have been tested and passed ASTM E119 or approved by third-party engineering judgement.] [If needed, refer to applicable building code for requirements.]**
 4. **[ANSI/SPRI RP-4 or ANSI/SPRI RP-14: Provide documentation from qualified engineer that the roof deck, roof membrane, insulation, and overburden as components of the designed roof assembly meet the requirements for wind uplift resistance.] (This may be used for building up to 150'. See [Owens Corning PRMA Technical Bulletin ES-PRMA-01.](#))**
 5. **[ASCE 7 and/or wind study: Provide documentation from qualified engineer that the roof deck, roof membrane, insulation, and overburden as components of the designed roof assembly meet the requirements for wind uplift resistance.] (See [Owens Corning PRMA Technical Bulletin ES-PRMA-01.](#))**
- F. MANUFACTURER'S INSTRUCTIONS
Provide Manufacturer's installation instructions for each product specified in this Section.
- G. SUSTAINABLE DESIGN SUBMITTALS
Submit material health and recycled content of each product specified as required in Quality Assurance Sustainability Standards Certification of this Section.
[LEED: Provide product prerequisite and/or credit summaries for each product specified as applicable including recycled content and Health Product Transparency information.]
- H. SPECIAL PROCEDURE SUBMITTALS
[None.]
- I. QUALIFICATION STATEMENTS
Provide documentation of required Quality Assurance Qualifications for Manufacturers and Installers for all products in roof assembly as required in this Section.
- K. WARRANTY DOCUMENTATION
Submit sample warranties as required by this Section.
- 1.5 QUALITY ASSURANCE
- A. QUALIFICATIONS
1. MANUFACTURERS
Insulation systems shall be manufactured and marketed by a firm with a minimum of **[20]** years' experience in the production and sales of insulation materials. Obtain continuous insulation material through one source from a single manufacturer. Manufacturers proposed for use, but not named in these specifications shall submit evidence of ability to meet all requirements specified and include a list of projects of similar design and complexity completed within the past **[five]** years.
 2. INSTALLERS
The installation work of this section shall be performed by one entity, an experienced contractor that employs installers and supervisors who are trained and authorized by manufacturer, with a minimum **[two]** years' record of successful installations on projects of similar scope.
- B. CERTIFICATIONS
1. Provide Manufacturer's written certification that any attachment methods specified are compatible.
 2. Provide Manufacturer's written certification that assembly components are compatible with all adjacent materials that come into contact during construction and throughout the life of the building.
 3. Provide Manufacturer's written certification that products are for the intended purpose as described in this Section.
- C. SUSTAINABILITY STANDARDS CERTIFICATIONS

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1. **[GREENGUARD Indoor Air Quality Certified by independent third-party testing (XPS Insulation.)]**
2. Minimum recycled content Certified by independent third-party testing.
3. Environmental Product Declaration validated by Underwriters Laboratories.

D. **MOCK-UPS**

Construct a roof assembly sample minimum 100 square feet that includes waterproofing membrane system, flashings, extruded polystyrene (XPS) continuous insulation, drainage and air layers, and overburden **[such as pavers, vegetation]**. The mock-up shall also include a pipe penetration, drainage assembly, and vertical transition detailed with flashings and terminations to demonstrate surface preparation, crack and joint treatment, application of roof membrane system, and sealing of gaps, terminations, and penetrations of the roof assembly.

1. Coordinate construction of mockups to permit inspection by Owner's testing agency of roof membrane before external insulation and overburden are installed.
2. Include transitions to air barrier membrane, penetrations, and edge of wall condition.
3. **[Architect, Engineer, Consultant]** approval of mockup is required. If it is determined that mockup does not comply with requirements, affected details must be reconstructed until mockups are approved.
4. Locate as directed and remove upon review and approval.
5. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless **[Architect, Engineer, Consultant]** specifically approves such deviations in writing. **[Indicate portion of roof represented by mockup on Drawings or draw mockup as separate element.]**
6. **[Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.]**
7. **[Preconstruction Testing Service: Owner will engage a qualified testing agency to perform preconstruction testing on field mockups.]**

1.6 **DELIVERY, STORAGE, AND HANDLING**

- A. Deliver and store products in Manufacturer's unopened packaging until ready for installation.
- B. Store and protect products in accordance with manufacturer's instructions. Store in a dry area and protect from water, direct sunlight, flame, and ignition sources.
- C. Remove and replace materials that are damaged.
- D. In the event the extruded polystyrene insulation board becomes wet, wipe dry prior to installation.

1.7 **FIELD CONDITIONS**

A. **AMBIENT CONDITIONS**

1. Apply products within the range of ambient and substrate temperatures recommended by manufacturer.
2. Protect substrates from environmental conditions that affect insulation performance.

1.8 **WARRANTY**

A. **MANUFACTURER WARRANTY**

1. **Product Warranty**
Provide Manufacturer's standard limited warranty against manufacturing defects.
2. **Provide Manufacturer's Lifetime Limited Warranty for ASTM C578 performance properties including retaining 90% thermal performance for the life of the product. (See [Owens Corning FOAMULAR® Sample Warranty.](#))**
3. **Provide Thermal Overlay Warranty for wind uplift resistance up to 72mph. (Roof must be designed in accordance with ANSI/SPRI RP-4/RP-14 or meet ASCE 7 requirements per engineering analysis. Application must be submitted to Owens Corning and approved during design process and inspection required during construction. See Owens Corning FOAMULAR® Sample Thermal Overlay Warranty. See [Owens Corning Thermal Overlay Warranty Project Profile](#) for application.)**

PART 2 – PRODUCTS

2.1 **EXTRUDED POLYSTYRENE INSULATION**

A. **MANUFACTURERS**

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BASIS-OF-DESIGN: Owens Corning® (www.owenscorning.com/insulation/commercial) FOAMULAR® [400, 600,1000] or equal product from one of the following:

1. **[Insert acceptable alternate supplier.]**
2. **[Insert acceptable alternate supplier.]**
3. Substitution Limitations

The “Basis of Design” products listed in this Section are tested and warranted as a system. The Contractor shall provide the products of the named manufacturers without substitution, unless a written request for an “or equal complete system substitution” has been approved in writing by the **[Architect, Engineer, Consultant]**. Substitution requests must be accompanied by the following to be considered for substitution:

- a. Verification that proposed products meet published product performance criteria.
- b. Verification from the proposed manufacturers of independent third-party listings or engineering judgements that the proposed system substitution meets the **[UL 1256/NFPA 276, ASTM E108, ASTM E119 (fire resistance), ANSI/SPRI RP-4/ RP-14, ASCE 7, and/or FM4480]** requirements.
- c. Verification from proposed manufacturers that the proposed substitution is tested with the other assembly components to meet Division 01, EXTERIOR ENCLOSURE PERFORMANCE REQUIREMENTS, **Section 01 83 16 [Project Specific]**.

B. DESCRIPTION

Provide continuous extruded polystyrene insulation, unfaced. Each insulation board must be labeled with manufacturer's name, product brand name, ASTM material specification reference, and identification of the third-party inspection agency used for building code qualification.

C. PERFORMANCE/ DESIGN CRITERIA

1. Type **[VI, VII, V]** per ASTM C578 certified by independent third-party testing agency. (See [Owens Corning ASTM C578 Types & Properties Technical Bulletin](#) for more information.)
2. Compressive Strength: **[40, 60, 100]** psi, minimum per ASTM D1621.
3. Thermal Resistance (180 day real-time aging as mandated by ASTM C578, measured per ASTM C518 at mean temperature of 75F): R-5.0 per inch of thickness, with 90% lifetime limited warranty on thermal resistance.
4. Water Absorption (ASTM C272): Maximum 0.30 percent by volume.
5. Surface Burning Characteristics (ASTM E84): Flame spread less than 25; smoke developed less than 450, certified by independent third-party testing agency.
6. **[Classified per UL1256/NFPA 276 as part of specified tested roof assembly.]**
7. **[Class A, B, or C per ASTM E108 as part of specified tested roof assembly.]**
8. **[Hourly rated per ASTM E119 as part of specified tested roof assembly.]**
9. **[Assembly # per FM 4470.]**
10. Assembly compliant with ASCE 7.
11. **[Assembly compliant with ANSI/SPRI RP-4 and/or ANSI/SPRI RP-14.]** (This may be used for building up to 150'. See [Owens Corning PRMA Technical Bulletin ES-PRMA-01.](#))

D. MATERIALS

1. Compliance certified by independent third party such as GREENGUARD Indoor Air Quality Certified® and/or GREENGUARD GoldSM.
2. Contains no HCFCs.
3. Zero ozone depleting blowing agent.
4. Recycled Content: Minimum 20%, certified by independent third party such as SCS Global Services.
5. Provide R-5 per inch of thickness; **[1”, 1-1/2”, 2”, 3”, 4”]** thick; 24”x96”; square edge.
6. Bottom layer of insulation to be channeled FOAMULAR® **[404, 604]** to promote drainage. (See [Owens Corning FOAMULAR® data sheet for more information.](#))
7. Top layer of insulation below vapor diffusion closed pavers or similar surfaces to be ribbed and channeled FOAMULAR® **[404RB,604RB]** to promote drainage and vapor diffusion. (See [Owens Corning FOAMULAR® data sheet for more information.](#) See [Owens Corning PRMA Technical Bulletin ES-PRMA-01.](#))
8. Provide standard tapered material **[1/8” in 12”], [1/4” in 12”], and/or [1/2” in 12”]** where indicated to promote drainage or create preferred surface. (FOAMULAR® 400, 600, 1000 XPS available in 24” x 96” square edged tapered pieces beginning at 1/2” thickness. See [Owens Corning FOAMULAR® tapered insulation data sheet for more information.](#))

PART 3 – EXECUTION

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3.1 EXAMINATION

- A. Verify that roof deck and other framing support members and anchorage have been installed per requirements of the Project.
- B. Verify adjacent roof membrane and materials are dry and ready to receive insulation.
- C. Do not begin installation until substrates have been properly prepared. If substrate preparation is the responsibility of another installer, notify owner's agent and **[Architect, Engineer, Consultant]** of unsatisfactory preparation in writing before proceeding. Do not proceed with work until unsatisfactory conditions have been corrected.
- D. Installation of products specified in this Section constitutes acceptance of existing conditions and assumption of responsibility for satisfactory performance.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. EXTRUDED POLYSTYRENE CONTINUOUS INSULATION

1. Verify manufacturer recommended cure time for roof membrane system before installing continuous insulation board.
2. Verify all roof membrane testing has been satisfactorily completed prior to beginning installation.
3. Verify root barrier is installed correctly if required prior to installation of extruded polystyrene insulation.
4. Install extruded polystyrene (XPS) insulation boards over the root barrier and roof membrane layer in accordance with manufacturers' written recommendations.
5. Install XPS insulation board in maximum sizes to minimize joints.
6. Locate joints square to structure.
7. Install insulation with long edges of XPS in continuous straight lines with edge joints staggered.
8. Stagger joints in subsequent layers.
9. Insulation board edges shall be butted together tightly and fit around openings and penetrations. Install square edges to fit square and tight.
10. Where channeled boards are used, install as first layer on top of roof membrane assembly to promote drainage.
11. Where ribbed boards are used, install as top layer immediately under vapor diffusion closed overburden such as pavers.
12. Install in one or more layers to meet thickness indicated to envelop entire area to be insulated. **[Owens Corning® does not require a particular method of securing FOAMULAR® Insulation, nor does Owens Corning® require joint sealing.]**
13. Apply single layer of insulation boards to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.
14. **[When installing tapered insulation, begin at low point building insulation away from lowest point.] (See Owens Corning FOAMULAR® Tapered Insulation Technical Bulletin.)**
15. **[Fastening requirements may be revised per job site conditions. Contractor must receive written confirmation from the [Architect, Engineer, Consultant] before altering fastener requirements.]**
16. Install overburden immediately after installation of insulation as described in **[Section 07 55 55 00- Protected Roof Membrane Assembly, 07 72 73 Vegetated Roof Systems – Project Specific].**

3.4 REPAIR

A. FILL ERRANT PUNCTURES, PENETRATIONS, AND HOLES

1. If fasteners are removed or penetrations are created leaving penetration into the roof membrane system beneath, the affected area must be detailed according to roof membrane manufacturer's recommendations see **[Section 07 55 00 Protected Roof Membrane Assembly- Project Specific]** **[Note: Fill of errant punctures, penetrations, and holes may be included in two separate specification sections and therefore the responsibility of two separate trades. Identify the responsible trade according to project specific requirements.]**
2. Completely fill the hole in the continuous insulation board to full depth to create a fully flush outer face of the insulation capable of accommodating overburden. Replace complete insulation boards as necessary.

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3.5 CLEANING

- A. Prior to project closeout, remove all related rubbish, excess material, scaffolding, tools, and equipment from the site. Dispose of waste material in a manner approved by applicable jurisdictions.

3.6 PROTECTION

- A. Protect insulation from damage due to weather and physical abuse until protected by permanent construction.
- B. If black tape or coatings are installed over the XPS insulation board, cover the black surfaces as soon as possible to avoid damage due to potential solar heat build-up on the black surface.
- C. Do not permit extruded polystyrene insulation board to come in contact with surfaces or temperatures in excess of 165°F.
- D. Touch-up, repair, or replace damaged products before Substantial Completion.

END OF SECTION 07 22 16

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