

**OWENS CORNING® ENCLOSURE SOLUTIONS FOR CONCRETE DECK
WITH FOAMGLAS® CELLULAR GLASS ROOF BOARD INSULATION
EXTERIOR ENCLOSURE SPECIFICATION**

GUIDE SPECIFICATIONS

**Owens Corning® Enclosure Solutions Roof System for Concrete Roof Deck with
FOAMGLAS® Cellular Glass Roof Board Insulation
Specification Guide**

This specification guide presents in 3-part format all of the components of the Enclosure Solutions Roof System for Concrete Roof Deck with FOAMGLAS® Cellular Glass Roof Board Insulation Assembly. The components are presented in two MasterFormat Divisions: **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:

Division 07 provided in this document outlines complete 3-part MasterFormat sections for all components of a Roof System for Concrete Roof Deck with FOAMGLAS® Cellular Glass Roof Board Insulation Assembly.

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

Division 07 Insulation Components:

This section includes Owens Corning® (OC) FOAMGLAS® Cellular Glass 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® nor any of its 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.

Note to Specifier: Horizontal waterproofing applications incorporating FOAMGLAS® cellular glass insulation products include the use of built-up asphalt, hot fluid-applied asphalt, or modified bituminous membranes.

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Note to Specifier: Consult local building code for applicable requirements regarding underdeck fire propagation, (UL 1256/FM 4450), rooftop exterior surface spread of flame or fire penetration, (ASTM E108), structural fire resistance, (ASTM E119), wind uplift resistance, or other requirements if applicable.

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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, wind, water, and fire resistance.

A. SECTION INCLUDES:

1. The complete roof system shall include the following:
 - a. Reinforced **[built-up asphalt, hot-applied asphalt, modified bituminous membrane]** applied over concrete 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. **[Vapor retarder]** *[Required where humidity levels in the building exceed 50% RH and less than two layers of cellular glass insulation are used.]*
 - c. Concrete roof deck to resist live, dead, and wind loading.
 - d. One or more layers of cellular glass insulation embedded in the roof membrane.
2. All joints, penetrations, and gaps of the roof membrane system 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 03 00 00 [Project Specific]**, Concrete
2. **Section 07 10 00 [Project Specific]**, Dampproofing and Waterproofing
3. **Section 07 21 00 [Project Specific]**, Thermal Insulation
4. **Section 07 22 16 [Project Specific]**, Roof Board Insulation
5. **Section 07 50 00 [Project Specific]**, Membrane Roofing
6. **Section 07 62 00 [Project Specific]**, Sheet Metal Flashing and Trim
7. **Section 07 65 00 [Project Specific]**, Flexible Flashings
8. **Section 07 84 00 [Project Specific]**, Firestopping
9. **Section 07 92 00 [Project Specific]**, Joint Sealants
10. **Section xx xx xx [Project Specific]**, LEED Requirements

1.3 ADMINISTRATIVE REQUIREMENTS

A. COORDINATION

Coordinate installation of roof membrane, insulation, firestopping, and accessories with air barrier membrane, roofing, fenestration, and other moisture protection work.

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, Roof Membrane System Manufacturer, Roofing Subcontractor, mechanical subcontractor, electrical contractor, and all subcontractors who have materials penetrating the roof membrane system or ballast and 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.

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- f. Roof membrane requirements and installation.
- g. Air barrier requirements and installation.
- h. Mechanical and electrical requirements and installation.
- i. Minimum curing period.
- j. Special details.
- k. Mockups.
- l. Water leakage and adhesion testing and inspection.
- m. Roof membrane protection and repair.
- n. Work scheduling that covers roof membrane coordination with installation of adjacent and covering materials.

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 wall assembly as required in **[07 10 00 Dampproofing and Waterproofing, 07 21 00 Thermal Insulation, 07 22 16 Roof Board Insulation, 07 50 00 Membrane Roofing, 07 62 00 Sheet Metal Flashing and Trim, 07 65 00 Flexible Flashings, 07 84 13 Penetration Firestopping, and 07 92 00 Joint Sealants]**. **[Insert all that apply from 1.2 RELATED SECTIONS.]**

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

Submit shop drawings demonstrating tested wall assembly components as specified in **[07 10 00 Dampproofing and Waterproofing, 07 21 00 Thermal Insulation, 07 22 16 Roof Board Insulation, 07 50 00 Membrane Roofing, 07 62 00 Sheet Metal Flashing and Trim, 07 65 00 Flexible Flashings, 07 84 13 Penetration Firestopping, and 07 92 00 Joint Sealants]**. **[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:

Submit documentation, signed by manufacturers, that products in tested wall 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 wall system comply with the specified PERFORMANCE/ DESIGN CRITERIA of this Section.

F. MANUFACTURER'S INSTRUCTIONS

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

G. SUSTAINABLE DESIGN SUBMITTALS:

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

J. WARRANTY DOCUMENTATION

Submit sample warranties as required by this Section.

1.5 QUALITY ASSURANCE

A. QUALIFICATIONS

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Manufacturers and Installers of specified products in the tested roof assembly shall meet Quality Assurance Qualifications requirements per [07 10 00 Dampproofing and Waterproofing, 07 21 00 Thermal Insulation, 07 22 16 Roof Board Insulation, 07 50 00 Membrane Roofing, 07 62 00 Sheet Metal Flashing and Trim, 07 65 00 Flexible Flashings, 07 84 13 Penetration Firestopping, and 07 92 00 Joint Sealants]. [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 [07 10 00 Dampproofing and Waterproofing, 07 21 00 Thermal Insulation, 07 22 16 Roof Board Insulation, 07 50 00 Membrane Roofing, 07 62 00 Sheet Metal Flashing and Trim, 07 65 00 Flexible Flashings, 07 84 13 Penetration Firestopping, and 07 92 00 Joint Sealants]. [Insert all that apply from 1.2 RELATED SECTIONS.]

D. MOCK-UPS

Construct a roof system sample minimum [10] feet long x [10] feet wide that includes substrate, roof membrane, cellular glass insulation, [parapet flashing, roof stop, roof edge treatment], [termination bars], sealants, [expansion joints], [perimeter fire rated joint], and overburden. The mock-up shall also include a penetration, drain assembly detailed with flashings, and demonstrate surface preparation, crack and joint treatment, application of waterproofing, and sealing of gaps, terminations, and penetrations of roof membrane assembly.

1. Coordinate construction of mockups to permit inspection by Owner's testing agency of roof membrane before overburden is installed.
2. Include transitions to roofing membrane and building corner 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 wall 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 wall assembly, follow Delivery, Storage, and Handling requirements per [07 10 00 Dampproofing and Waterproofing, 07 21 00 Thermal Insulation, 07 22 16 Roof Board Insulation, 07 50 00 Membrane Roofing, 07 62 00 Sheet Metal Flashing and Trim, 07 65 00 Flexible Flashings, 07 84 13 Penetration Firestopping, and 07 92 00 Joint Sealants]. [Insert all that apply from 1.2 RELATED SECTIONS.]

F. FIELD CONDITIONS

For specified products in the tested wall assembly, follow Field Conditions requirements per [07 10 00 Dampproofing and Waterproofing, 07 21 00 Thermal Insulation, 07 22 16 Roof Board Insulation, 07 50 00 Membrane Roofing, 07 62 00 Sheet Metal Flashing and Trim, 07 65 00 Flexible Flashings, 07 84 13 Penetration Firestopping, and 07 92 00 Joint Sealants]. [Insert all that apply from 1.2 RELATED SECTIONS.]

G. WARRANTY

1. PRODUCT WARRANTY

Provide product warranties as required by [07 10 00 Dampproofing and Waterproofing, 07 21 00 Thermal Insulation, 07 22 16 Roof Board Insulation, 07 50 00 Membrane Roofing, 07 62 00 Sheet Metal Flashing and

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Trim, 07 65 00 Flexible Flashings, 07 84 13 Penetration Firestopping, and 07 92 00 Joint Sealants]. [Insert all that apply from 1.2 RELATED SECTIONS.]

2. SYSTEM WARRANTY

Provide system warranty as required by **[07 10 00 Dampproofing and Waterproofing, 07 21 00 Thermal Insulation, 07 22 16 Roof Board Insulation, 07 50 00 Membrane Roofing, 07 62 00 Sheet Metal Flashing and Trim, 07 65 00 Flexible Flashings, 07 84 13 Penetration Firestopping, and 07 92 00 Joint Sealants].** [Insert all that apply from 1.2 RELATED SECTIONS.]

3. INSTALLATION WARRANTY

Provide installation warranty as required by **[07 10 00 Dampproofing and Waterproofing, 07 21 00 Thermal Insulation, 07 22 16 Roof Board Insulation, 07 50 00 Membrane Roofing, 07 62 00 Sheet Metal Flashing and Trim, 07 65 00 Flexible Flashings, 07 84 13 Penetration Firestopping, and 07 92 00 Joint Sealants].** [Insert all that apply from 1.2 RELATED SECTIONS.]

PART 2 – PRODUCTS

2.1 TESTED ROOF ASSEMBLY

A. MANUFACTURERS

BASIS-OF-DESIGN: Roof Assembly with Cellular Glass Insulation.

1. Substitution Limitations

The “Basis of Design” tested roof assembly listed in this Section is tested 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:

- 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/ FM4450 (underdeck fire propagation)], [ASTM E108 (rooftop exterior surface spread of flame or fire penetration)], [ASTM E119 (structural fire resistance)]**, wind uplift, and water penetration 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 and install concrete roof deck to resist live, dead, and wind loads, **[built-up asphalt, hot-applied asphalt, modified bituminous membrane]** roof membrane system with cellular glass insulation embedded in the membrane completely adhered over the surface that effectively controls thermal, air, water, and vapor performance and provides continuous insulation and continuity of the building envelope.

C. PERFORMANCE/ DESIGN CRITERIA

1. FIRE CONTAINMENT AND RESISTANCE

- a. **[UL 1256/ FM 4450 Under deck fire propagation:**
Provide products that as a complete roof system pass UL 1256/ FM 4450.] [If needed, refer to applicable building code for requirements.]
- b. **[ASTM E108 Rooftop exterior surface spread of flame or fire penetration:**
Provide products that as a complete roof system pass ASTM E108, Test Methods for Fire Tests of Building Construction and Materials.] [If needed, refer to applicable building code for requirements.]
- c. **[ASTM E119 Fire Resistance:**
Provide products that as a complete roof system pass ASTM E119, Test Methods for Fire Tests of Building Construction and Materials.] [If needed, refer to applicable building code for requirements.]

2. ASTM E2357 AIR LEAKAGE RESISTANCE

3. WATER PENETRATION

4. THERMAL RESISTANCE

Provide a tested roof system that meets or exceeds code required R-value for 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.

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5. RECYCLED CONTENT

Provide insulation products 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/FM4450 (underdeck fire propagation)]**, **[ASTM E108 (rooftop exterior surface spread of flame or fire penetration)]**, **[ASTM E119 (structural fire resistance)]**, (wind uplift), and (water penetration) requirements.

D. MATERIALS

1. Reinforced **[built-up asphalt, hot-applied asphalt, modified bituminous membrane]** applied over concrete 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. **[Vapor retarder]** *[Required where humidity levels in the building exceed 50% RH and less than two layers of cellular glass insulation are used.]*
3. Concrete roof deck to resist live, dead, and wind loading.
4. One or more layers of cellular glass insulation embedded in the roof membrane.

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 compliance with **[UL 1256/ FM4450 (underdeck fire propagation)]**, **[ASTM E108 (rooftop exterior surface spread of flame or fire penetration)]**, **[ASTM E119 (structural fire resistance)]**, wind uplift, and water penetration requirements.

All proposed product substitutions must comply to be considered.

A. SECTION INCLUDES

Provide and install concrete roof deck to resist live, dead, and wind loads in ambient temperature, **[built-up asphalt, hot-applied asphalt, modified bituminous membrane]** roof membrane system with cellular glass insulation embedded in the membrane completely adhered over the surface that effectively controls thermal, air, water, and vapor performance 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. **[Flat, Tapered, Flat & Tapered]** Cellular glass roof board insulation.
 - b. **[Adhesive]** as recommended by continuous insulation manufacturer.
1. The complete roof system shall include the following:
 - a. Reinforced **[built-up asphalt, hot-applied asphalt, modified bituminous membrane]** applied over concrete 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. **[Vapor retarder]** **[Required where humidity levels in the building exceed 50% RH and less than two layers of cellular glass insulation are used.]**
 - c. Concrete roof deck to resist live, dead, and wind loading.
 - d. One or more layers of cellular glass insulation embedded in the roof membrane.
 2. 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 03 00 00 [Project Specific]**, Concrete
2. **Section 07 10 00 [Project Specific]**, Dampproofing and Waterproofing
3. **Section 07 21 00 [Project Specific]**, Thermal Insulation
4. **Section 07 50 00 [Project Specific]**, Membrane Roofing
5. **Section 07 62 00 [Project Specific]**, Sheet Metal Flashing and Trim
6. **Section 07 65 00 [Project Specific]**, Flexible Flashings
7. **Section 07 84 00 [Project Specific]**, Firestopping
8. **Section 07 92 00 [Project Specific]**, Joint Sealants
9. **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 for Testing of Materials (ASTM)
 - a. ASTM C165 Standard Test Method for Measuring Compressive Properties of Thermal Insulations
 - b. ASTM C240: Standard Test Methods for Testing Cellular Glass Insulation Block
 - c. ASTM C518: Standard Test Method for Steady-State Thermal Transmission Properties by Means of Heat Flow Meter Apparatus.
 - d. ASTM C1338: Standard Test Method for Determining Fungi Resistance of Insulation Materials and Facings
 - 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 E119: Standard Test Methods for Fire Tests of Building Constructions and Materials

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- h. ASTM E136: Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C.

1.3 ADMINISTRATIVE REQUIREMENTS

A. COORDINATION

Coordinate installation of insulation and accessories with roof membrane system, air barrier membrane, and other moisture protection work.

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, Roof Membrane System Manufacturer, Roofing Subcontractor, mechanical subcontractor, electrical contractor, and all subcontractors who have materials penetrating the roof membrane system or ballast and 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. Air barrier requirements and installation.
 - h. Mechanical and electrical requirements and installation.
 - i. Minimum curing period.
 - j. Special details.
 - k. Mockups.
 - l. Water leakage and adhesion testing and inspection.
 - m. Roof membrane protection and repair.
 - n. Work scheduling that covers roof membrane coordination with installation of adjacent and covering materials

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 roofing assembly)

1. Show locations and extent of roofing and roof covering. Include details for substrate joints and cracks, counterflashing strips, penetrations, inside and outside corners, terminations, flashing transition assemblies, and tie-ins with adjoining construction as well as drain locations and drain heights.
2. Include details of interfaces with other materials that form part of building enclosure.
3. **[If a tapered insulation system is specified for the purpose of draining water off the roof system, the roofing contractor shall submit drawings reviewed by the insulation manufacturer.]** **[Contact CommercialRoofing@OwensCorning.com for assistance with estimating FOAMGLAS® tapered roofing applications.]**

C. SAMPLES: Submit product minimum **[three]** samples of the following:

1. Cellular Glass Insulation minimum **[four inches by six inches by specified thicknesses].**
2. Any fasteners, hardware, adhesive, or other attachment methods recommended by manufacturer.

D. CERTIFICATES:

Submit documentation signed by Manufacturer that products meet Quality Assurance Certification requirements of this Section.

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- E. TEST AND EVALUATION REPORTS:
1. **[UL 1256/ FM 4450 Under deck fire propagation:**
Provide products that as a complete roof system pass UL 1256/ FM 4450.] [If needed, refer to applicable building code for requirements.]
 2. **[ASTM E108 Rooftop exterior surface spread of flame or fire penetration:**
Provide products that as a complete roof system pass ASTM E108, Test Methods for Fire Tests of Building Construction and Materials.] [If needed, refer to applicable building code for requirements.]
 3. **[ASTM E119 Fire Resistance:**
Provide products that as a complete roof system pass ASTM E119, Test Methods for Fire Tests of Building Construction and Materials.] [If needed, refer to applicable building code for requirements.]
 4. **[ASTM E2307 Perimeter Fire Containment: Provide products that as a system passes ASTM E2307, Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multistory Test Apparatus]** [If needed, refer to applicable building code for requirements.]
- F. MANUFACTURER'S INSTRUCTIONS
Provide Manufacturer's installation instructions for each product specified in this Section.
- G. SUSTAINABLE DESIGN SUBMITTALS
Submit environmental product declaration 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.]
- 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.
- J. 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 roof 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 roof system components 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. Minimum **[60%]** recycled content Certified by independent third-party testing.
2. Environmental Product Declaration.

D. MOCK-UPS

Construct a roof system sample minimum **[10]** feet long x **[10]** feet wide that includes substrate, roof membrane, cellular glass insulation, **[parapet flashing, roof stop, roof edge treatment]**, **[termination bars]**, sealants, **[expansion joints]**, **[perimeter fire rated joint]**, and overburden. The mock-up shall also include a penetration, drain assembly detailed with flashings, and demonstrate surface preparation, crack and joint treatment, application of waterproofing, and sealing of gaps, terminations, and penetrations of roof membrane assembly.

8. Coordinate construction of mockups to permit inspection by Owner's testing agency of roof membrane before overburden is installed.
9. Include transitions to roofing membrane and building corner condition.
10. **[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.
11. Locate as directed and remove upon review and approval.
12. 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 wall represented by mockup on Drawings or draw mockup as separate element.]**
13. **[Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.]**
14. **[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 with adequate ventilation and protect from water and freezing.
- C. Handle all materials carefully to prevent damage to edges or ends.
- D. Remove and replace materials that are damaged.

1.7 FIELD CONDITIONS

A. AMBIENT CONDITIONS

1. Apply products within the range of ambient and substrate temperatures recommended by manufacturer.
2. Keep all materials dry before and during application.
3. Protect substrates from environmental conditions that affect insulation performance.

1.8 WARRANTY

A. MANUFACTURER WARRANTY

1. Product Warranty

Provide Manufacturer's 20 year warranty covering all performance criteria per 2.1 of this Section.

[Provide Manufacturer's 20-Year Limited Warranty which warrants that, for a period of 20 years from the date of substantial completion, the FOAMGLAS insulation installed will not absorb moisture, will retain its original insulating efficiency, compressive strength, dimensional stability, and will remain non-combustible.] [See Owens Corning 20 Year Limited Warranty].

PART 2 – PRODUCTS

2.1 CELLULAR GLASS ROOF BOARD INSULATION

A. MANUFACTURERS

BASIS-OF-DESIGN: Owens Corning® Pittsburgh Corning (www.owenscorning.com/insulation/commercial)

FOAMGLAS® T3+ Cellular Glass Insulation or equal product from one of the following:

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

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The “Basis of Design” tested roof assembly listed in this Section is tested 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:

- 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/ FM4450 (underdeck fire propagation)]**, **[ASTM E108 (rooftop exterior surface spread of flame or fire penetration)]**, **[ASTM E119 (structural fire resistance)]**, wind uplift, and water penetration 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 cellular glass insulation of inorganic soda lime glass.

C. PERFORMANCE/ DESIGN CRITERIA

1. Thermal Resistance (measured per ASTM C518 at mean temperature of 75°F): R-3.8 per inch of thickness.
2. Compressive Strength (ASTM C165): Minimum 0 percent deflection at 72 pounds per square inch.
3. Flexural Strength (ASTM C203): Minimum 58 pounds per square inch.
4. Modulus of Elasticity (ASTM C623): Perpendicular 169 ksi, Parallel 197 ksi.
5. Shear Strength (PC Test Method (S Method)): Minimum 37 psi.
6. Density (ASTM C303): Minimum 5 pcf.
7. Closed Cell Content (Helium Pycnometer): Minimum 98%.
8. Water Absorption (ASTM C240): Maximum 0.1 percent by volume.
9. Hygroscopicity: Minimum no increase in weight at 90% relative humidity.
10. Surface Burning Characteristics (ASTM E84): Flame spread maximum 5; smoke developed maximum 0, certified by independent third-party testing agency.
11. Combustibility (ASTM E136): Non-Combustible.
12. Vapor Permeability (ASTM E96): Maximum 0.005 perms per inch thickness.
13. Dimensional Stability (ASTM D2126): Maximum 1% at 158F at 97% relative humidity, at -40F ambient relative humidity, at 200F at ambient humidity.
14. Coefficient of Linear Thermal Expansion (ASTM E228): Maximum 5×10^{-6} per inch per inch per degree Fahrenheit.
15. Service Temperature: -445°F to 806°F.
16. Mold/Mildew Resistance (ASTM C1338): Pass

D. MATERIALS

1. Recycle Content: Minimum 60%, certified by independent third party.
2. Environmental Product Declaration (EPD) by independent third party.
3. Provide R-3.8 per inch of thickness; **[2.0, 2.4, 2.8, 3.5, 3.9, 4.3, 4.7, 5.1, 5.5, 5.9, 6.3, 6.7, 7.1, 7.5, 7.9]** thick; **[17.7 inches x 23.6 inches]** flat square edge.
4. **[Provide R-3.8 per average thickness per inch; tapered square edge [1/8”, ¼”] slope available in 2.0 inch to 7.9 inch thicknesses [tapered insulation available only in 17.7 x 23.6 inch block and 1/8” and ¼” slope]**

2.2 ADHESIVE FOR CELLULAR GLASS INSULATION

- A. MANUFACTURERS** **[built-up asphalt, hot-applied asphalt, modified bituminous membrane]** roof assembly is used as adhesive in this assembly. See **[Section 07 10 00 [Project Specific] or Section [Project Specific] 07 50 00]**.

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

The “Basis of Design” tested roof assembly listed in this Section is tested 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:

- 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/ FM4450 (underdeck fire propagation)]**, **[ASTM E108 (rooftop exterior surface spread of flame or fire penetration)]**, **[ASTM E119 (structural fire resistance)]**, wind uplift, and water penetration requirements.

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- 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
The system is comprised of a flat roof substrate, bitumen, FOAMGLAS cellular glass insulation, and a water proofing membrane, providing a durable, waterproof and constant insulating efficiency. ALL layers are fully bonded to each other using bitumen. The water proofing membrane is fully adhered to the insulation resulting in a solid build-up impervious to water and water vapor **[built-up asphalt, hot-applied asphalt, modified bituminous membrane]** roof membrane assembly as described in **[Section 07 50 00]**.
- C. PERFORMANCE/ DESIGN CRITERIA
 - 1. Sticks
 - 2. Remains highly elastomeric after curing
 - 3. Compatible with surrounding materials
- D. MATERIALS
 - 1. TBD

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Verify that substrate joints & cracks, flashings, counterflashing strips, penetrations, inside and outside corners, terminations, transitions, and drainage assemblies have been installed per requirements of the Project.
- B. Verify locations drain assemblies and drain heights in accordance with drawings and notify owner's agent and **[Architect, Engineer, Consultant]** of discrepancy in writing before proceeding. Do not proceed with work until unsatisfactory conditions have been corrected.
- C. Verify adjacent materials and deck surface are smooth, dry, and free from any foreign material prior to installation of the membrane and insulation.
- D. 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.
- E. 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. Grout and feather all concrete joints ¼ inch or greater to provide a smooth surface for installation.
- C. If required by **[Section 07 10 00 [Project Specific] or Section [Project Specific] 07 50 00]**, prime concrete deck with primer at rate recommended by the manufacturer.
- D. If primer is applied, allow primer to dry as specified by the manufacturer.
- E. Prepare surfaces using methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

- A. DECKS NOT REQUIRING FM MECHANICAL FASTENING OF INSULATION
 - 1. Lay no more insulation in a day than can be covered the same day with a completed roofing membrane assembly.
 - 2. Firmly adhere the insulation to the concrete deck in a continuous layer of 23-25 lbs/square **[built-up asphalt, hot-applied asphalt, modified bituminous]** membrane as described in **[Section 07 10 00 [Project Specific] or Section [Project Specific] 07 50 00]**.
 - 3. Install the insulation in continuous parallel courses with all joints tightly butted and staggered between courses.
 - 4. Install insulation in maximum sizes to minimize joints.
 - 5. Insulation edges shall be butted together tightly and cut and fit tightly around obstructions, openings, and penetrations. Fill voids with insulation.
 - 6. Extend insulation in thickness indicated to envelop entire area to be insulated.
 - 7. Apply single layer of insulation boards to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.
 - 8. When more than one layer of insulation is used, embed the cellular glass in continuous mopping of 23-25 lbs/square **[built-up asphalt, hot-applied asphalt, modified bituminous]** on top of the first layer of cellular glass and hot asphalt with joints tightly butted and offset between layers

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9. Apply subsequent layers of cellular glass and **[built-up asphalt, hot-applied asphalt, modified bituminous]** as described in 3.3.A.7 this Section.
10. Ensure all layers are firmly adhered in continuous layer of **[built-up asphalt, hot-applied asphalt, modified bituminous]**.

B. MEMBRANE

1. Continue installation of hot asphalt roof membrane assembly according to **[Section 07 10 00 [Project Specific] or Section [Project Specific] 07 50 00]**.
2. If reinforcement layer is required, starting at low point of the roof, embed reinforcement in a continuous layer of minimum thickness hot asphalt per **[Section 07 10 00 [Project Specific] or Section [Project Specific] 07 50 00]**.
3. If reinforcement layer is required, lap seams minimum width required per the hot asphalt roof membrane assembly.
4. Seal all laps with hot asphalt.
5. Broom each sheet to assure complete embedment.
6. If base layer is required, starting at low point of the roof, embed base layer in a continuous layer of minimum thickness hot asphalt per **[Section 07 10 00 [Project Specific] or Section [Project Specific] 07 50 00]**.
7. If base layer is required, lap seams minimum width required per the hot asphalt roof membrane assembly.
8. Seal all laps with hot asphalt.
9. Broom each sheet to assure complete embedment.
10. Starting at low point of the roof, embed cap sheet in a continuous layer of minimum thickness hot asphalt per **[Section 07 10 00 [Project Specific] or Section [Project Specific] 07 50 00]**.
11. Lap seams minimum width required per the hot asphalt roof membrane assembly.
12. Seal all laps with hot asphalt.
13. Broom each sheet to ensure complete embedment.

3.4 REPAIR

A. FILL ERRANT PUNCTURES, PENETRATIONS, AND HOLES

1. If membrane assembly is damaged or where holes are drilled into the system, the affected area must be detailed with sealant see **Section 07 10 00 [Project Specific] or Section [Project Specific] 07 50 00]**
2. If hole is greater than **2** inches diameter, replace insulation with additional cellular glass insulation adhered with hot asphalt or compatible sealant.
3. If hole is less than **2** inches diameter, completely fill the hole with sealant. Fill the hole in the insulation to full depth making sealant contact with the membrane below the insulation and fully flush with the outer face of the insulation.

3.5 CLEANING

- A.** Prior to project closeout, remove all related rubbish, excess material, 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.** Touch-up, repair, or replace damaged products before Substantial Completion.

END OF SECTION 07 22 16

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