**PROJECT ENGINEER 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 building specification that is to be fully reviewed and edited by the engineer. Sections of this guide should be included, 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 Owens Corning or otherwise.

SECTION 07 22 16

ROOF BOARD INSULATION

Note to Specifier: Protected Roof Membrane Assemblies (PRMA) and horizontal waterproofing applications incorporating FOAMULAR® insulation products include the use of single ply, built-up asphalt, hot fluid applied, or modified bituminous membranes. These horizontal applications may be ballasted/protected with precast pavers, stones or gravel, cast in place concrete, or engineered growth media fill for vegetative green roofs. Precast pavers or cast in place concrete may be placed directly over FOAMULAR® or they can be elevated to promote venting/drainage with pedestal support systems or a drainage course.

Note to Specifier: Consult the local building code for applicable requirements regarding underdeck fire propagation, (UL 1256/FM 4450), rooftop exterior surface spread of flame or fire penetration, (ASTM E 108), structural fire resistance (ASTM E 119), wind uplift resistance, or other requirements if applicable.

1. GENERAL
	* + 1. SUMMARY
				1. Section Includes: Provide [FOAMULAR® 404, 404RB, 604, 604RB] extruded polystyrene roof board insulation in horizontal waterproofing applications.
			2. Submittals
				1. Product Data: Submit data on product characteristics, performance criteria, and limitations, including installation instructions.
				2. Sustainable Design: Submit manufacturer’s sustainable design certifications as specified.
				3. Final Inspection Report and Warranty.
				4. [Ballast or Paver Samples for Verification: Submit ballast or paver, samples showing all normal variation to be expected in the delivered product.]
				5. The contractor shall submit written verification from the membrane manufacturer that he/she is an authorized applicator.
				6. The contractor shall submit written verification that the specifications for the waterproofing system are in accordance with the recommendations of the manufacturer.
			3. Quality Assurance
				1. Installer Qualifications: The installation work of this Section shall be performed by an experienced waterproofing contractor approved and certified by the waterproofing system manufacturer.
				2. 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.
				3. Preconstruction Review: Before beginning construction, waterproofing, insulation, and ballast/protection system, the installer shall meet with installers of work adjacent to or which penetrates the waterproofing, insulation, and ballast to discuss the system. The meeting shall include an owner’s representative and the waterproofing system manufacturer’s representative to review procedures for preparation of the substrate and application of the waterproofing/insulation/ballast.
				4. The insulation selected shall be compatible with the waterproofing membrane and acceptable to the membrane manufacturer.
				5. Before start of waterproofing system application, review installed substrate surfaces for compliance with preparation requirements. Document necessary actions for correcting unacceptable surface conditions.
				6. Upon completion of the installation, an inspection shall be made by a representative of the waterproofing membrane manufacturer.
				7. The waterproofing membrane, or component containers, must be labeled with manufacturer’s name and product brand name.
				8. There shall be no deviations from manufacturer’s/supplier’s specifications or the approved shop drawings without the prior written approval of the architect and manufacturer.
			4. Delivery, Storage, and Handling
				1. Deliver materials in manufacturer’s original packaging.
				2. 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. Do not install insulation that has been damaged or wet.

In the event the board insulation becomes wet, wipe dry prior to installation.

Note to Specifier: For proper fire protection of plastic foam in storage, consult the National Fire Protection Association (NFPA) standards or the authority having jurisdiction.

* + - 1. PROJECT Conditions
				1. Do not allow waste products (petroleum, grease, oil, solvents, vegetable or mineral oil, animal fat, etc.) or direct steam venting to come in contact with the waterproofing/insulation/ballast system. Any atypical exposures must be presented to Owens Corning or the membrane manufacturer for assessment of impact on products.
				2. The surface to be waterproofed shall be free of ponded water, ice or snow. This precaution is to discourage potential future condensation on the underside of the membrane.
				3. Complete substrate construction, including work which will penetrate waterproofing, before start of waterproofing application.
				4. Comply with manufacturer's recommendations regarding: condition of the substrate to receive waterproofing, insulation, and ballast system; weather conditions before and during installation; and protection of the installed waterproofing/insulation/ballast system.
				5. Do not expose FOAMULAR® insulation to surfaces such as vent stacks, pipes or other rooftop appurtenances whose constant temperature is in excess of 165°F. If temperature cycling conditions are anticipated near the maximum recommended use temperature consult your Owens Corning FOAMULAR® representative for recommendations regarding system components.
				6. When insulation is to be exposed to the sun for prolonged periods due to job site delays, or in areas adjacent to vertical reflective surfaces, protect the insulation with a light colored opaque covering. Provisions should be made to prevent wind loss of insulation materials at the job site when partially open units of FOAMULAR® are on hand.
				7. Install no more FOAMULAR® insulation than can be covered with [paving, stones, pavers, protection] the same day.
				8. [Any deteriorated decking shall be repaired or replaced. Existing roof drains must be verified to be open and adequate to promote proper roof drainage.]
				9. Each day’s roofing work shall be completed in accordance with the manufacturer’s specifications and recommendations.
				10. When staging material on the roof and during application, the contractor shall ensure that overloading of the deck and structure does not occur.
				11. For projects requiring removal of the existing waterproofing system, remove only as much existing membrane and insulation as can be replaced and made watertight the same day.
			2. Warranty
				1. A thermal performance warranty shall be issued to the Owner upon completion of the work. Insulation shall be warranted to retain all physical properties and a minimum of 90% of its published R-value for the lifetime of the product.

[A single source full roof covering system warranty shall be issued to the Owner upon completion of the work.]

Note to Specifier: Consult an Owens Corning representative for information on obtaining warranties. Single source full system warranties are available for certain waterproofing systems.

* + - * 1. System warranty shall cover, at a minimum, the following components of insulation, waterproofing, ballast system:

Waterproofing membrane.

Flashings, edge and penetration detailing materials.

Protection sheet.

Board insulation.

Pavers and paver pedestals.

1. PRODUCTS
	* + 1. MANUFACTURER
				1. Owens Corning Insulating Systems, LLC, Toledo, OH 43659; [www.owenscorning.com](http://www.owenscorning.com).
			2. Materials
				1. Extruded Polystyrene (XPS) Insulation:

Physical Properties: FOAMULAR® [404, 404RB, 604, 604RB], rigid closed-cell foam panels, conforming to the minimum physical requirements of ASTM C578, Type [VI, VII].

Note to Specifier: See the Product Data Sheets for FOAMULAR® product physical properties and association with ASTM C578 type designations. No further specification of physical properties is required if a standard ASTM C578 type designation is given. However, if the specifier chooses to elaborate, it should be verified that the specified properties align with the chosen ASTM type category.

Note to Specifier: See the Owens Corning technical bulletin “FOAMULAR® Foundation Properties for Load Bearing Slab Applications” for recommended in service compressive stress load limits for FOAMULAR® waterproofing insulation.

Product Criteria:

ASTM C 578 type [VI, VII], certified by independent third party such as RADCO.

Blowing Agent Formulation: Zero ozone depleting.

Compressive Strength (ASTM D 1621): [40,60] psi, minimum.

Edge and Surface Conditions: [channeled on all four bottom edges, ribbed top surface]

Thermal Resistance (180 day real-time aging as mandated by ASTM C 578, measured per ASTM C 518 at mean temperature of 75F): 5.0 per inch of thickness, with 90% lifetime limited warranty on thermal resistance.

Water Absorption (ASTM C272): Maximum. percent by volume.

Surface Burning Characteristics (ASTM E 84): Flame spread less than 25, smoke developed less than 450, certified by independent third party such as Underwriters Laboratories.

Indoor Air Quality: Compliance certified by independent third party such as GreenGuard Indoor Air Quality Certified® and/or GreenGuard Children and Schools Certified℠.

Recycle Content: Minimum 20%, certified by independent third party such as Scientific Certification Systems.

Warranty: Limited lifetime warranty covering all ASTM C578 physical properties.

Manufacturers: Subject to compliance with product criteria, the manufacturers whose products may be incorporated into the work include but are not limited to:

DiversiFoam Products.

Dow Chemical Company.

Owens Corning.

Pactiv Corporation.

Panel Size: Provide [1”, 1-1/2”, 2”] thick by 4 ft. wide by 8 ft. long.

* + - 1. MEMBRANE SYSTEM

Note to Specifier: The following components are not provided by Owens Corning, the membrane manufacturer’s recommendations shall inform the following selections:

* + - * 1. Membrane: As recommended by the manufacturer.
				2. [Separator Sheet: Flexible glass fiber, nonwoven, non-flammable, corrosion and mildew resistant or other suitable separator (underlayment) sheets shall be used over PVC membranes and other such membranes which contain plasticizing agents. Separator sheet shall have been evaluated and approved by the membrane manufacturer for adequacy as a separator].
				3. Protective Mats (for Installation over the Insulation Layer): Filter fabric, non-woven geotextile, made of polypropylene fibers, or other suitable fabric, recommended by its manufacturer for this application in PRMA roofing.
			1. Ballast
				1. Ballast: Provide the following:

Note to Specifier: Building height, parapet height, and project wind zone are major factors when specifying a minimum ballast requirement. Design ballasted systems in accordance with ANSI/RMA/SPRI RP-4, Wind Design Guide for Ballasted Single-Ply Roofing Systems.

[Rounded Water Worn Gravel or Crushed Stone Ballast: ASTM D448, size [#3, #24, #2, #1].]

[Concrete Pavers: Provide a compressive strength equal to [\_\_\_psi] or greater, maximum water absorption rate of [\_\_% by volume], and dimensions, not exceeding 2" x 2' x 2']. Paver weight must be manageable for removal and replacement purposes. Concrete quality must be suitable for weathering conditions to which it will be subjected.

Paver Weight: Conform to requirements of ANSI/RMA/SPRI RP-4, Wind Design Guide for Ballasted Single-Ply Roofing Systems.

* + - 1. Paver Pedestals
				1. [FOAMULAR® 404RB, 604 RB] if needed for installation of concrete paver system
				2. [Plastic pedestals must be UV stable, resistant to freeze-thaw cycling and designed to align and level concrete pavers.]
				3. [Provide FOAMULAR® [404RB, 604RB] as a top layer over base layers of FOAMULAR® described in Section A.]

Note to Specifier: Paver pedestals may be preferred over other methods of setting pavers such as into a sand or gravel bed. Pedestals promote drainage and thereby discourage wash out of the setting medium and freeze-thaw degradation of the paver as may occur if the paver is placed directly onto a setting bed. If paver leveling is not required, FOAMULAR® 404RB and 604RB are designed to enhance drainage beneath pavers and eliminate the need for a drainage medium.

* + - * 1. [Adjustable paver pedestal system], designed to support anticipated live and dead loads, to control alignment and joint spacing of pavers and to accommodate slope of subsurfaces to create a smooth, uniform, non-slip surface for paver installation. Provide products supplied by and recommended by joint manufacturer’s group.
			1. Drainage Course
				1. [Pea Gravel or Sand] A three inch layer of sand or pea gravel placed between the structural cast-in-place concrete topping slab and the insulation will promote drainage away from the bottom of the concrete.
1. EXECUTION
	* + 1. EXAMINATION
				1. Examine the areas and conditions under which work of this section will be installed. Verify that adjacent materials are dry and ready to receive insulation. Verify mechanical and electrical services within walls have been tested and inspected.

[Minimum slope shall be sufficient to permit positive drainage. The manufacturer/supplier shall be consulted for specific slope limitations.]

* + - * 1. Provide written report listing conditions detrimental to performance of work in this section. Do not proceed with installation until unsatisfactory conditions have been corrected.
			1. Roof Deck Criteria
				1. The deck shall be constructed to drain completely free of water within 48 hours following rainfall.
				2. [Parapets, gravelstops] must be constructed to extend above the top surface of the [ballast, pavers].
				3. The dead load carrying capability of the deck must be sufficient to support code mandated live loads and dead loads incident on the roof including the entire roof covering, insulation and ballast system.
			2. Substrate/Roof Deck Preparation
				1. Inspect substrates and conditions under which the work of this section will be performed, and verify that installation may properly commence. Do not proceed with the work until unsatisfactory conditions have been resolved per waterproofing membrane manufacturer’s recommendations.
				2. Surfaces on which the waterproofing membrane system is to be applied shall be compatible, clean, and smooth. Surfaces should be free of fins, sharp edges, loose and foreign materials, oil and grease, blisters, or other surface irregularities.
				3. Where required, the substrate shall be primed and allowed to dry.
				4. [Any deteriorated decking shall be repaired or replaced] A thorough inspection should be required in the case of total tear off.
				5. [Concrete Decking:]

Patch as required honeycomb, or aggregate pockets. Remove fins, ridges, and projecting rough areas.

Verify that form release agents and methods and materials used to cure concrete surfaces are compatible with waterproofing products and waterproofing membrane manufacturer's recommendations.

Verify that surfaces are smooth, sound, clean, and dry, and that components which will penetrate waterproofing are complete and rigidly installed.

* + - * 1. [Install wood nailers as shown on construction drawings for edge, curb and other roof accessories.] See Factory Mutual System Loss Prevention Data 1 49, which provides recommendations for edge detail design and securement.
			1. Waterproofing Membrane
				1. Complete substrate construction, including work which will penetrate waterproofing, before start of waterproofing application.
				2. Comply with manufacturer's recommendations regarding condition of the substrate to receive waterproofing/paving system, weather conditions before and during installation, and protection of the installed waterproofing/insulation, ballast system.
				3. Begin waterproofing membrane installation at the low point of the roofing project area such that the direction of water flow is not against any laps.
				4. The membrane shall be installed to fit neatly around penetrations and roof projections without the formation of “backwater laps.”
				5. The waterproofing membrane surface to be insulated shall be inspected [by the Architect, the waterproofing manufacturer's representative, or other designee] for satisfactory completion before applying FOAMULAR®. This inspection is necessary to insure that all splices, field seams and any lap/seam treatment have been completed, that all flashing has been installed, and that all membrane terminations have been completed before being covered and becoming relatively inaccessible.
				6. The membrane surface over which the PRMA insulation is to be applied shall be free of debris and relatively even.
				7. Install layer of protection sheet over membrane as soon as practicable after membrane installation to avoid damage to membrane from sunlight and subsequent operations.
				8. [Flood test complete membrane before placement of protection sheet, insulation, or paving. Plug or dam drains and fill area with water to a depth of 2 inches or to within 1/2 inch of top of flashings; let stand for 24 hours. If leaks are discovered, repair and retest until no leaks are observed.] Before specifying, verify that structural system is capable of withstanding the load of a flood test.
			2. Vapor Retarder
				1. Install a vapor retarder in accordance with construction drawings. Place the vapor retarder to insure adequate end and side joint laps. The roofing/water¬proofing membrane, present on the warm side of the insulation in a PRMA system functions as a vapor retarder. The thermal resistance above the membrane and the thermal resistance below the membrane must be balanced to discourage condensation on the underside of the membrane. When environmental conditions create a condensation point within the insulation board under the membrane, it may be necessary to install a vapor retarder between the layer of below membrane insulation and the roof deck. FOAMULAR® insulation is compatible with most commonly used asphaltic and sheet film vapor retarding materials. See the American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Handbook of Fundamentals for specific design guidelines.
			3. Insulation
				1. Total waterproofing insulation aged thermal resistance shall be [R\_\_\_], achieved in the thicknesses and number of layers as shown in the construction documents. R value chosen is to be specified based on the intended use of each project and design criteria of each project, and applicable energy conservation codes.
				2. Apply only as much FOAMULAR® waterproofing insulation as can be covered by the protective mat and ballast on the same day.
				3. Place insulation directly on the membrane with the [channel side down, rib side up]. Apply roof insulation in parallel rows with end joints staggered. Install side and end joints closely but do not force together. Install to within 3/4 inch of all projections and cant strips.
				4. [In a multiple layer application, apply panels parallel to the preceding layer but with side and end joints staggered in relation to the preceding layer.] In multiple layer applications FOAMULAR® 404 or 604 can be placed as a bottom, membrane level, drainage layer with upper layers completed using 400 or 600.
				5. [Insulation placed over hot fluid, BUR or other systems to which the PRMA insulation may adhere shall be separated from the membrane by a non-degradable sheet as recommended by the membrane manufacturer that will prevent the insulation from bonding to the membrane.] [PRMA insulation placed over chemically incompatible membrane systems such as coal tar or PVC shall be separated from the membrane by a separator sheet as recommended by the membrane manufacturer.]
			4. Protective Mat
				1. Install protective mat fabric over the FOAMULAR® layers, perpendicular to the long dimension of the insulation boards. The fabric shall be unadhered and unattached. The protective mat acts as a sieve layer preventing the penetration of debris or fine grade stone ballast into insulation board joints which may work their way down to the membrane level presenting a puncture hazard. It also limits the flotation of an individual board during periods when the membrane surface is flooded. Fabric is required between the insulation and ballast if stone ballast is used. Fabric is recommended for use under pavers.
				2. Overlap all fabric edges a minimum of 12". Extend the fabric 2 to 3 inches above the ballast at the roof perimeter and penetrations. The fabric shall be extended to the base of drain bonnets, but shall not cover the drain or restrict flow to the drain.
				3. Additional fabric shall be installed around penetrations to prevent fine grade stone ballast from entering the space between the penetration and the insulation. Wetting the protective mat fabric helps hold it in place over the insulation as the ballast is installed. It is also helpful to install the fabric so that the wind direction is with the laps rather than against the laps. Immediately following the application of the fabric it is necessary to install the stone or gravel ballast. Particularly on windy days, the stone should be installed soon after the fabric in order to help prevent blow-off of unballasted fabric and insulation.
			5. Ballast

Note to Specifier: Before specifying a PRMA system, it must be determined that the ballast dead load required will not exceed the dead load limits of the structure.

* + - * 1. Ballasting Requirements: Weight of ballast installed must be sufficient to provide protection against wind uplift pressure. The necessary weight per square foot, gradation and application surface areas shall be determined in accordance with ANSI/RMA/SPRI RP-4, Wind Design Guide for Ballasted Single-Ply Roofing Systems.
				2. Protect membrane and place ballast in accordance with building parameters and the ANSI/RMA/SPRI/RP-4 document.
				3. [Stone ballast gradation and quantity installed (i.e., depth) must be adequate to completely cover the protective mat.] Insulation thickness does not affect the amount of ballast required.
				4. [Concrete paver ballast must be installed so that the pavers are elevated above the surface of the foam by integrally cast feet on the paver (not conducive to paver leveling), pedestals at the paver corners, or by a permeable setting bed beneath the pavers.] See Section & 2.07. When pavers cover only minor portions of the roof such as at windscrub locations or walkways to and around equipment, it is not necessary to elevate the pavers above the surface of the insulation due to the limited areas involved.
				5. Top of pavers shall be dead level, except as otherwise indicated. Waterproofing membrane shall, in general, be applied to concrete substrates that slope to building drains, either by pitching the structural slab or by the addition of a topping slab, as indicated. Transition between top surface of waterproofing and pavers shall be accomplished by use of “reverse tapered” insulation, by use of pedestal shims or by combination of both.
			1. Roof Walkways
				1. Specify if regular maintenance is required to service rooftop units or if a passageway over the surface is otherwise required. Well defined walkways shall be provided, constructed of materials such as rubber matting, concrete pavers or other materials approved by the roofing membrane manufacturer.
				2. Should access to the waterproofing membrane be required for repairs or warranty service, the ballast, protective mat and insulation layers must be removed. Rooftop equipment, landscaping, window washing systems, or intricately placed or multicolored ballast configurations may complicate access and service to the membrane.
			2. FIELD QUALITY CONTROL
				1. Schedule and complete a final inspection by the system manufacturer as required to obtain the final system warranty.

END OF SECTION

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