SECTION 073233
POLYMERIC SHINGLES

****

POLYMERIC SHINGLES: This specification covers plastic roofing systems of “shake” or “slate” profile designed for installation on sloped, nailable roof deck surfaces. These products provide authentic shake/slate appearance with superior performance characteristics and reduced structural requirements compared to traditional clay or concrete shake/slate. Accessories include metal flashings, underlayment, ridge vents, eave protection, etc.

Specifier shall verify if the Project requires Special compliance programs that have specific inspection and verification procedures beyond standard manufacturer requirements. Select applicable programs based on project location, code requirements, or Owner specifications.

SHAKE vs. SLATE Selection: SHAKE: Rustic/informal aesthetic. Best for: Craftsman, mountain, ranch styles. Multiple widths (5", 7", 12") create varied texture. Traditional in Pacific Northwest/mountain regions. SLATE: Formal/elegant aesthetic. Best for: Colonial, Victorian, traditional styles. Uniform rectangular shape creates orderly appearance. Traditional in Northeast/Mid-Atlantic regions. PERFORMANCE: Identical between profiles (same fire, impact, wind ratings, warranty, cost). Selection is aesthetic/architectural, not performance-driven.

FORTIFIED Compliance: Include where enhanced storm resistance is desired or required. Requires engagement of certified FORTIFIED Evaluator for third-party verification during installation. Adds approximately $300-600 to project cost but may qualify for insurance discounts of 10-30% and improved resale value. Most beneficial in hurricane-prone regions (Gulf Coast, Atlantic Coast).

Miami-Dade County Compliance: Required for all projects within Miami-Dade County boundaries. Products must have current Notice of Acceptance (NOA) and installation must comply with High Velocity Hurricane Zone (HVHZ) requirements. County inspection fees and enhanced installation requirements will affect project schedule and cost. Non-compliance voids building permits.

WUI Compliance: Required in designated Wildland-Urban Interface zones or where local fire authorities mandate ignition-resistant construction. Most common in California (Chapter 7A), but increasingly required in fire-prone areas nationwide. Requires Class A fire rating assembly and may affect material selection and installation methods.

Multiple Programs: Projects may require compliance with multiple programs simultaneously (e.g., Miami-Dade + FORTIFIED). Ensure all program requirements are compatible and properly coordinated.

SECTION 073233 -- POLYMERIC SHINGLES, Copyright 2025, Brava Roof Tile.
****

PART 1 – GENERAL

1.01 SECTION INCLUDES

****

The paragraphs following this article title should be brief descriptions of types of work included in the section. These paragraphs are informational only and are intended to help the contractor identify the

scope of each section.
****

A. Polymeric roofing tiles of [shake][slate] profile.
B. Sheet membranes for eave protection, underlayment, and valley protection.
C. Metal flashing.
D. Accessories.
E. Nailer systems for proper installation geometry.

1.02 RELATED SECTIONS

****
Verify section numbers match project manual organization. Add or delete sections as applicable.
****

A. Section 061000 - Rough Carpentry: Roof deck preparation, structural support, and nailer installation.
B. Section 076200 - Flashing and Sheet Metal: Roof flashings, valley metals, and trim accessories.
C. Section 077123 - Manufactured Gutters and Downspouts.
D. Section 077200 - Roof Accessories: Snow guards.
E. Section 079113 - Compression Seals: Joint sealants and weatherization materials.
F. Section 079200 - Joint Sealants.
G. Section _____: Attic space vent within shingled roof area.
H. Section _____: Chimney flue within shingled roof area.
I. Section _____: Mechanical work projecting through roof.

1.03 PRICE AND PAYMENT PROCEDURES

****
Price & Payment Procedures are typically omitted from specific Sections unless the products/materials require unique measurement, payment, or allowance considerations that differ from standard project procedures.
****

A. Allowances:
   1. Include cash, testing, and quantity allowance for [_____].
B. Unit Prices:
   1. Basis of Measurement for [_____]: By linear foot.
   2. Basis of Measurement for [_____]: Per unit.
   3. Basis of Payment for [_____]: Include purchase, delivery, and installation.
C. Alternates:
   1. This section includes base bid items.

1.04 REFERENCES STANDARDS

****
Reference standards are current as of specification date. Verify latest editions during project development. Include as author the full name of the sponsoring organization, unless the acronym is an adequate identifier (ASTM, ANSI, NEMA, etc.). Include the date of publication if consistent with global decision on publication dates.
****

A. ASTM International (ASTM):
   1. ASTM D226 - Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing; 2017 (Reapproved 2023).
   2. ASTM D1970 - Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection; 2021.
   3. ASTM D2178 - Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing; 2021.
   4. ASTM D3909 - Standard Specification for Asphalt Roll Roofing (Glass Felt) Surfaced with Mineral Granules; 2021.
   5. ASTM D8257 - Standard Specification for Mechanically Attached Polymeric Roof Underlayment Used in Steep Slope Roofing; 2022.
   6. ASTM E108 - Standard Test Methods for Fire Tests of Roof Coverings; 2025.
   7. ASTM G155 - Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials; 2021.

B. Florida Building Code Testing Application Standard (TAS):
   1. TAS 100 - Standard Test Method for Wind and Wind Driven Rain Resistance of Discontinuous Roof Systems; 2020.
   2. TAS 125 - Test for Uplift Resistance on Roof Assemblies; 2020.

C. International Code Council (ICC):
   1. ICC-ES Acceptance Criteria AC07 - Acceptance Criteria for Polymeric Roofing Tiles.; 2014, with Editorial Revision (2021)

D. International Building Code (IBC).
   1. ICC (IWUIC) International Wildland-Urban Interface Code.

E. Insurance Institute for Business & Home Safety (IBHS): FORTIFIED Roof Standards.

F. Underwriters Laboratories (UL):
   1. UL 790 - Standard Test Methods for Fire Tests of Roof Coverings.
   2. UL 2218 - Impact Resistance of Prepared Roof Covering Materials.

1.05 SUBMITTALS

****

Submittals require contractor verification of compliance with specifications through formal review by the design team. Specifier to identify which types of submittals are appropriate for the anticipated Construction Administration. Do not request submittals if drawings sufficiently describe the products of this section or if proprietary specifying techniques are used. The review of submittals increases the possibility of unintended variations from contract documents, thereby increasing the design professional's liability.

****

A. Submit under provisions of Section 013000 - Administrative Requirements.

B. Product Data:
   1. Manufacturer's data sheets for each product specified.
   2. Installation instructions and application guidelines.
   3. Performance test reports and third-party certifications.
   4. Code evaluation reports and approval listings.

C. Sustainable Design Documentation:

****

Include where Project has sustainability requirements of LEED or other certification goals.

****

   1. Recycled content verification per requiirements cited in Part 2.
   2. End-of-life recyclability documentation.

3. Cool roof compliance documentation for Title 24 requirements.

D. Shop Drawings:
1. Installation details showing relationship to adjacent construction.
2. Flashing and trim configurations.
3. Color and pattern layout plans for complex roof geometries.

E. Samples:

****

Adjust sample requirements based on project size and complexity.

****

1. Selection Samples: Provide [two][three][_____] samples showing full range of products, colors, and finishes available.
2. Verification Samples: Provide [two][three][_____] samples representing actual products, colors, and finishes selected for project.
3. Texture Samples: Samples demonstrating compression-molded surface detail and dimensional characteristics.

F. Manufacturer's Certificates: Certify that shingles supplied for project meet or exceed specified requirements.

G. Manufacturer's qualification statement.

H. Installer's qualification statement.

I. Wildland-Urban Interface (WUI) compliance documentation.
1. Evidence of compliance with the WUI Code, where applicable.

J. FORTIFIED compliance documentation:
1. Evidence of FORTIFIED Roof designation compliance where applicable.

K. Miami-Dade County compliance documentation:
1. Evidence products are approved for use in Miami-Dade County, where applicable.

L. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Manufacturer Qualifications:
1. Company specializing in manufacturing plastic roofing products using compression-molding technology.
   a. Minimum [five][ten][_____] years documented experience in synthetic shingle production.
2. Member of PEPA (Polymeric Exterior Products Association).
3. ISO 9001 certified manufacturing processes or equivalent quality management system.

****

Brava Roof Tile's Preferred Contractor program provides specialized training and technical support for polymeric tile installation. Specifying "and/or" allows qualification by either documented experience OR program participation, offering flexibility while maintaining quality. Other manufacturers may have similar programs - verify if substitutions are permitted.

****

B. Installer Qualifications:
1. Company specializing in performing work of the type specified and with at least [three][five][_____] years of [documented][_____] experience.
2. Company is part of manufacturer's Preferred Contractor program [or equivalent manufacturer-certified installer program].

C. Source Limitations:
1. Obtain polymeric shingles from single manufacturer.

2. Provide accessories, nailers, and flashing trim components from polymeric shingle manufacturer or sources approved by polymeric shingle manufacturer.

D. Wildland-Urban Interface Compliance (IWUIC):

****

Include where WUI compliance is required by local codes or fire authorities in wildfire-prone areas. Website for info: 2021 International Wildland-Urban Interface Code (IWUIC).

****

1. Products and installation to achieve Class A fire rating when installed with approved fire-resistant underlayment for IWUIC compliance.
2. Installation shall comply with Chapter 7A of California Building Code or local IWUIC requirements, where applicable.
3. Contractor shall demonstrate familiarity with IWUIC construction requirements and ignition-resistant construction practices.
4. Submit fire classification test reports and code evaluation reports demonstrating IWUIC compliance.

E. FORTIFIED Roof Compliance:

****

FORTIFIED is voluntary enhanced storm resistance (not code-required). Common use: Hurricane/coastal regions, high-wind zones, owners seeking insurance discounts (10-30%), projects prioritizing resilience over first cost.
Program info: https://ibhs.org/guidance/fortified-construction-standards/

****

1. Products and installation shall comply with the FORTIFIED Roof requirements per Insurance Institute for Business & Home Safety (IBHS) standards.
2. Engage FORTIFIED Evaluator for third-party verification of installation compliance.
3. Contractor shall be FORTIFIED-trained or work with FORTIFIED-certified installer.

F. Miami-Dade County Compliance:

****

Include where Miami-Dade County approval is required for projects in Miami-Dade County or where High Velocity Hurricane Zone (HVHZ) compliance is specified. Website for info: Product Control Search - Miami-Dade County

****

1. Products and installation shall comply with the current Miami-Dade County Product Control Division requirements for use in High Velocity Hurricane Zone (HVHZ).
2. Contractor shall demonstrate experience with Miami-Dade County inspection requirements and HVHZ construction practices.

1.07 MOCK-UPS:

****

Mock-ups are particularly valuable for [shake][slate] installations due to complexity of nailer systems and dimensional requirements. Determine mock-up strategy by reviewing Section 01 4000 (01400) - Quality Requirements, decide on objectives and extent of mock-up requirements and edit this Article in coordination. Use this Article for assessing full sized erected assemblies for review of construction, coordination of work of several sections, testing, or observation of operation. A mock-up may also be used for assessing field applied finishes such as paint or for assessing the aesthetics of field installed products

****

A. Mock-Up: Provide a mock-up for evaluation of shingle installation workmanship, including typical eave, rake, valley, and ridge details.

B. Construct mock-up [as indicated on Drawings][minimum 100 square feet (9.3 sq m)] demonstrating installation quality, nailer placement, and appearance.
   1. Locate mock-up where directed by [Architect][Owner].
   2. Obtain [Architect's][Owner's] acceptance before proceeding with installation.

C. Mock-up [may][may not] remain as part of the work.

1.08 PRE-INSTALLATION CONFERENCE

A. Convene conference minimum [five][ten][_____] days before commencement of installation.

B. Attendees:
   1. [Architect][Owner's representative][_____].
   2. General Contractor.
   3. Roofing Contractor.
   4. Manufacturer's representative or certified technical support.
   5. Nailer installation subcontractor.

C. Agenda:
   1. Project schedule and sequencing including nailer installation.
   2. Material delivery and storage requirements.
   3. Nailer layout and installation procedures.
   4. [Shake][Slate] shingle installation procedures and quality requirements.
   5. Weather protection and temporary roofing.
   6. Inspection procedures and responsibilities.

1.09 DELIVERY, STORAGE, AND HANDLING

A. See Section 017419 - Construction Waste Management and Disposal for packaging waste requirements.

B. Delivery:
   1. Deliver materials in manufacturer's original packaging with labels intact.
   2. Coordinate delivery to minimize on-site storage time and prevent damage.

C. Storage: Store materials in strict accordance with manufacturer's requirements.
   1. Protect from damage due to weather, temperature extremes, and construction operations.
   2. Store polymeric shingles on level surfaces with adequate ventilation.
   3. Store and dispose of solvent-based materials, and materials used with solvent based materials, in accordance with requirements of local authorities having jurisdiction.
   4. Do not store materials directly on ground or concrete surfaces.

1.10 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results.

B. Do not install polymeric shingles, [eave protection][membrane][or][underlayment] when surface, ambient air, or wind chill temperatures are outside manufacturer's recommended limits.

C. Roof Deck Conditions:
   1. Verify roof deck consists of minimum 15/32-inch CDX plywood or 7/16-inch OSB.
      a. [Permissible use of OSB: Verify with local authorities and required tested assemblies.][_____.][n/a]
   2. Verify deck surface is clean, smooth, and free of protruding fasteners.
   3. Confirm deck is properly constructed, dry, and ready to receive roofing materials.

1.11 WARRANTY

A. Manufacturer's Standard Limited Warranty:

1. Minimum 50-year limited warranty against material defects causing leaks under normal weather and use conditions.
   a. Warranty terms based on compliance with manufacturer's installation requirements and specified wind speed design.
2. Warranty coverage includes material replacement and installation costs.
3. Warranty transferable in accordance with manufacturer's standard transfer procedures.
4. Color durability warranty: Maximum 4 Hunter units (ΔE) for first 10 years.
5. Impact Warranty: Warranty coverage against hail damage from hailstones 1-1/2 inches diameter or smaller.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

****

This Article establishes acceptable manufacturers for the Section. This is a Brava Roof Tile manufacturer guide specification (MGS) featuring Brava polymeric shinlges of [shake][slate] profile as the Basis of Design. Verifying other manufacturer products is beyond the scope of an MGS. Architect/Specifiers are cautioned to conduct due diligence in identifying alternate manufacturers/product lines.

This MGS includes language to assist Architect/Specifiers in meeting industry best practices and public bid requirements where listing comparable manufacturers is required. Architect/Specifiers are encouraged to identify manufacturers that are legitimate peers to Brava in terms of quality and performance. This strategic approach helps prevent substitution requests from lower-tier manufacturers while maintaining project quality standards and fulfilling competitive bidding requirements.

****

Basis of Design manufacturer and model/series:

1. Brava Roof Tile;[Cedar Shake Series][Slate Roof Tile Series]: www.bravarooftile.com.
2. Substitutions: [Not permitted.]

****

Brava's unique compression-molding process using sand-casted molds and patented ColorCast mineral-infusion technology makes direct substitution extremely difficult.
#Author of this MGS (manufacturer guide specification) did not research existence of "equally conforming products."
Consider "not permitted" for critical applications.

****

B. Other acceptable manufacturers - Bidders to verify equally conforming products to Basis of Design manufacturer/model/series/selection:
   1. Ecostar Roofing: www.ecostarllc.com.
   2. DaVinci Roofscapes: www.davinciroofscapes.com.
   3. [_____: www._____.]
   4. Substitutions: See Section 016000 - Product Requirements.

2.02 PERFORMANCE REQUIREMENTS

****

Performance requirements are based on extensive third-party testing and code approvals. Brava polymetric shingles qualify as FORTIFIED designated roofing product and meets Wildland-Urban Interface (WUI) compliance when properly configured.]

****

A. Structural Performance:

1. Design roof system to resist wind uplift, live loads, and dead loads in accordance with applicable building codes.
2. Lightweight design eliminates need for additional structural support typically required for traditional materials.

B. Weather Resistance:
1. Roof system to provide weather-tight envelope with no measurable water penetration.
2. Materials to withstand exposure to UV radiation, temperature cycling, and moisture without degradation.
3. Tested for compliance with high-wind resistance requirements and test standards.

C. Fire Resistance:

****

Fire class depends on material specification and underlayment type. Class A rating requires "Brava Class A" material and fire-resistant underlayment
Specify Class A fire rating for Wildland-Urban Interface (WUI) compliance.

****

1. Class A fire rating when installed with Class A material over approved fire-resistant underlayment in accordance with ASTM E108 and UL 790.
2. Class C fire rating when installed over standard organic felt or synthetic underlayment meeting ASTM D226 Type II or ASTM D8257.

D. Physical Durability:

****

ASTM G155 xenon arc exposure simulates long-term weathering to test physical durability. Test duration selection:
- 2,500 hours: Simulates 10-15 years field exposure, suitable for standard applications.
- 4,500 hours: Simulates 20-25 years field exposure, recommended for premium projects or extended warranty requirements.
Brava's CER (Code Evaluation Report) documents <10% tensile strength loss at 4,500 hours. Select test duration based on project warranty requirements and expected service life..

****

1. Tensile Strength: Maximum 10 percent loss of tensile strength after [2,500][4,500] hours exposure per ASTM G155.
2. Impact Resistance:
   a. UL 2218 Class 4 impact resistance in accordance with UL 2218 test procedures.
      1) Impact resistance capable of withstanding impact from 2-inch (51 mm) diameter steel ball weighing 1.2 pounds (0.54 kg) dropped twice on each of two different spots of the sample from 20 feet (6.1 m) without cracking, splitting, or other failure.
3. Accelerated Weathering Performance: No visible cracking, crazing, chalking, checking, or delamination after accelerated weathering exposure.

E. Wind Resistance:

****

TAS 100 evaluates water infiltration resistance under progressively higher wind-driven rain conditions (35-110 mph). Products are tested at each speed tier sequentially. Select wind speed based on project location design wind speed requirements. Higher wind speed tiers provide additional safety margin for severe weather zones.

****

1. Wind-driven rain resistance: System tested in accordance with TAS 100.
   a. Pass wind-driven rain test at [35][70][90][110] mph wind speeds with no water penetration through roof deck.

****

Wind uplift resistance testing per TAS 125 requires minimum 15/32-inch (12 mm) thick plywood sheathing. Wind-driven rain resistance testing per TAS 100 can be performed on various deck configurations. Verify that project deck construction matches tested assembly conditions or obtain test data for actual deck configuration.
****

2. Wind uplift resistance: System tested in accordance with TAS 125.
   a. Pass wind uplift test at [90][110][130] mph wind speeds with specified fastening methods and no structural failure.

F. Thermal Performance:
1. Freeze-thaw resistance: No crazing, cracking, or delamination after temperature cycling from -40°F to +180°F (-40°C to +82°C) in accordance with ICC-ES AC07.
2. UV resistance: Color stability demonstrated through accelerated weathering testing per ASTM G155.

****
Verify specific cool roof requirements and solar reflectance values with manufacturer for projects requiring energy code compliance.
****

3. [Cool roof compliance where required by local energy codes.]

G. Color Durability:
****
Hunter units (ΔE) quantify color change: ≤4 is imperceptible to normal viewing; ≤6 is barely perceptible. ASTM G155 accelerated weathering correlates to field exposure:
- 2,500 hours: Simulates 10-15 years, Brava warrants ≤4 Hunter units for first 10 years.
- 5,000 hours: Simulates 20-25 years field exposure.
Brava's mineral-infusion ColorCast technology provides superior fade resistance. Specify 4 Hunter units at 2,500 hours for highest color retention standards; 6 Hunter units at 5,000 hours for extended service life verification.
****

1. Color stability achieved through mineral-infusion manufacturing process.
2. UV resistance: Color stability demonstrated through accelerated weathering testing per ASTM G155.
   a. Color change not to exceed [4][6] Hunter units (ΔE) after [2,500][5,000] hours accelerated weathering exposure.

2.03 POLYMERIC SHINGLES

A. Description:
1. Lightweight polymeric roofing shingles replicating appearance, texture, and dimensional characteristics of traditional materials.
2. Compression-molded construction using sand-casted molds for authentic surface detail and dimensional accuracy.

B. Materials:
1. Engineered plastic formulated from up to 85% recycled plastic and are 100% recyclable.
2. Mineral (inorganic) pigments for superior color durability and fade resistance.
3. UV stabilizers integrated throughout material for long-term performance.
4. Impact modifiers for enhanced durability and crack resistance.

C. Physical Properties:
1. Installed weight: Maximum [304/310] pounds per 100 square feet (15 kg/sq m) at maximum exposure.
2. Profile thickness: [0.5 to 1.0] inches (12.7 to 25.4 mm).

D. Profile and Appearance:

1. [Shake][Slate] profile with exposed upper surface and edges replicating traditional wood/slate tile appearance.
2. Compression-molded surface detail providing authentic dimensional characteristics and shadow lines.
3. Molded-in nail guidelines and exposure markers for installation accuracy.

E. System Components:
1. Eave Starter Components:
   a. Designed for proper eave closure and first course alignment.
   b. Sized to provide adequate weather protection at eave conditions.
2. Hip components: [Low profile caps][Standard profile caps][or][Steep profile caps].
3. Ridge components: [Low profile caps][Standard profile caps][or][Steep profile caps].
4. Rake and Valley components: Solid shake edge profile.

F. Colors:

****

Verify available colors with manufacturer.
Brava Roof Tile offers "ColorCast" process creates natural variegation within each color selection.

****

1. [As selected by [Architect][Owner]]
2. [As indicated on Drawings]
3. [Custom colors if available].
4. Shake tile Basis of Design color: Brava sandard color: [Aged Cedar][Aspen][Canyon Gray][Lake Forest][Natural Cedar][Weathered].
5. Shake tile Basis of Design color: Brava premium color: [Arendale][Light Arendale][New Cedar][Onyx][Sierra].
6. Shake tile Basis of Design color: Brava "cool color": [Cool Lake Forest][Cool Weathered][Cool Western Cedar][Cool White].
7. Slate tile Basis of Design color: Brava sandard color: [Arendale][Atlantic][Cottage][Graphite][Light Arendale][Onyx][Washington].
8. Slate tile Basis of Design color: Brava premium color: [European][Pine Green][Tuscan Clay][Victorian].
9. Slate tile Basis of Design color: Brava "cool color": [Cool Arendale][Cool Atlantic][Cool Light Arendale][Cool Weathered][Cool White].

G. Sustainability Features:
1. Recycled Content: Up to 85% recycled polymer content that is 100% recyclable.
2. End-of-Life: Fully recyclable material suitable for reprocessing into new products.
3. Transportation Impact: Lightweight design reduces shipping weight and associated emissions.
4. Durability: Extended service life reduces replacement frequency and waste generation.
5. "Cool colors" to reduce heat island effect.
6. Documentation: Submit recycled content verification and end-of-life recyclability documentation for green building certification requirements.

****

PLACEHOLDER: AS OF 2025: Brava Roof Tile is working to achieve ZERO manufacturing waste certification. Architect/Specifier should verify if this criteria is applicable.

****

7. Documentation: Manufacturing process certified as having zero manufacturing waste.

2.04 SHEET MATERIALS

A. Underlayment:

****

Specfier to select 1 or 2 underlayment and delete/hide others.
Select underlayment type based on climate, roof slope, and fire rating requirements Underlayment covers the entire roof area under the shingles.
ASTM D226/D226M Type I is 11.5 lb/100sq ft minimum
ASTM D226/D226M Type II is 30 lb/100 sq ft minimum.
Fire-resistant underlayments are required to achieve Class A fire rating. Standard underlayments yield Class C rating. Select based on project fire rating requirements and local wildfire risk. Fire-resistant underlayments typically cost 2-3 times more than standard underlayments but may be required for wildfire-prone areas, insurance benefits, or code compliance. Verify compatibility with specific tile manufacturer's tested assemblies.
****

1. Asphalt-saturated organic roofing felt, unperforated, complying with ASTM D226/D226M, Type II, No. 30 per ASTM D2178.
2. Synthetic underlayment of woven or spun polyethylene or polypropylene complying with ASTM D3909/D3909M or D8257/D8257M.
   a. Performance Requirements:
      1) Minimum Thickness 20 mils (0.51 mm) per ASTM D1777.
      2) Water vapor permeance: Variable permeance ranging from 0.05 perms (vapor barrier) to >1.0 perms (breathable) per ASTM E96.
      3) Water Transmission: Passes ASTM D4869.
   b. Approved products:
      1) PolyGlass; [Poly Anchor]
      2) Owens Corning; [Titanium UDL 50]
      3) FT Synthetics; [Hydra]
      4) Eco-Chief; [SOLARHIDE-SRW]
      5) [_____].
      6) Substitutions: See Section 016000 - Product Requirements.

B. Ice Dam Protection and Eave Protection Membrane
1. Cold applied, self-adhering waterproof membrane composed of polyethylene film coated one side with rubberized asphalt adhesive
2. Self-adhering polymer-modified bituminous membrane complying with ASTM D1970.
3. Minimum 40 mils (1.0 mm) thickness per ASTM D1777.
4. Performance Requirements:
   a. Minimum tensile strength: 250 psi (1,724 kPa) per ASTM D1970.
   b. Low temperature flexibility: Unaffected at minus 32°F (minus 36°C) minimum.
   c. Vapor permeance: 0.05 perms maximum per ASTM E96.
5. Approved products:
   a. Mapei Polyglass; [TU Polystick]
   b. Owens Corning; [Titanium PSU-30]
   c. GCP Applied Technologies; [Grace Ice & Water Shield]
   d. FT Synthetics; [Platinum HT-B]
   e. GAF StormGuard; [Film-Surfaced Leak Barrier]
   f. [_____].
   g. Substitutions: See Section 016000 - Product Requirements.

2.05 FLASHINGS

A. Flashing Materials:
****
Coordinate with Section 076000 - Flashing and Sheet Metal. Select materials compatible with plastic tile material and local environmental conditions. Avoid dissimilar metals to prevent galvanic corrosion. Flashing design and installation critical for long-term performance. Consider manufacturer's tested

assemblies and warranty requirements when selecting flashing materials. Verify compatibility between flashing materials and tile manufacturer's tested systems.
****

1. Fabricate from sheet to profiles and dimensions indicated on drawings and approved shop drawings.
   a. [16-ounce copper][26-gauge (0.455 mm) galvanized steel][24-gauge aluminum][Stainless steel][____].
   b. Install in accordance with Section 07 60 00 - Flashing and Sheet Metal.
2. [Refer to Section 076200 - Flashing and Sheet Metal.]

B. Performance Requirements:
1. Resistance to UV degradation and thermal cycling.
2. Compatibility with plastic roofing shingle expansion characteristics.
3. Corrosion resistance appropriate for project environment.

C. Base Flashings:
1. Install over or under roof coverings and turn up on vertical surfaces.
2. Extend under uppermost row of shingles full depth of tile or minimum 4 inches (102 mm) over tile immediately below.
3. Vertical leg turned up minimum 4 inches (102 mm) and extend 4 inches (102 mm) on polymeric shingles as laid.

D. Valley Flashing:
1. Open Valley: Double W-style configuration with minimum 2-1/2-inch (64 mm) enter crimps.
2. Closed Valley: W-style configuration with minimum 2-1/2-inch (64 mm) enter crimp.
3. Minimum 24-inch (610 mm) width extending 11 inches (279 mm) each direction from centerline.
4. Self-supporting design compatible with polymeric shingle installation methods.

E. Flexible Flashing Systems:
1. Lead-free moldable flashing for complex penetrations and transitions.
2. Self-sealing properties with weather-resistant construction.
3. Compatible with shingle thermal movement characteristics.
4. [Wakaflex][or][approved equal meeting performance requirements].

F. Weather Blocking Materials:
1. Hip and ridge weather barriers preventing wind-driven rain infiltration.
2. Polyisobutylene (PIB) construction with aluminum composite facing.
3. Butyl adhesive strips for secure attachment and sealing.
4. [Compatible products include Zephyr Block systems][or][approved equal].

G. Ridge Vent Integrated Flashing:
1. Combined ventilation and weather protection systems.
2. Prevents wind-driven rain while maintaining airflow.
3. Flexible design conforming to roof contours.
4. [Systems such as Zephyr Roll][or][approved equal].

2.06 ACCESSORIES

****
[SPECIFIER GUIDE: All accessories should be from tile manufacturer or approved by tile manufacturer to ensure compatibility and warranty coverage. Verify current product availability and specifications with manufacturer before finalizing selections.
****

A. Nailer Systems:
****

Nailers are critical for proper polymeric shingle installation geometry. Heights must be calculated based on roof slope and tile profile.
****

1. Hip and Ridge Nailers: Required for all hip and ridge installations.
   a. Code-approved wood or metal nailers and as recommended by the shingle manufacturer.
   b. Maximum 24-inch (610 mm) on-center spacing.
   c. Hold hip nailers back 4 inches (102 mm) from outside corners.
2. Rake Nailers: [as recommended by the polymeric shingle manufacturer][not required].

B. Fasteners:
****

Fastener selection depends on environmental conditions, wind requirements, and deck material. Stainless steel recommended for coastal applications. All fasteners must penetrate minimum 3/4 inch into deck or completely through deck.
****

1. Standard Installation Nails: [not permitted][(2) 0.120-inch (3.0 mm) x ≥ 1-3/4-inch (44 mm) ring shank roofing nails].
2. Screw Installation: No. 10 x 2-inch (51 mm) or 2-1/2-inch (64 mm) wood screws with corrosion-resistant coating.
3. High-Wind Installation Screws:
   a. Field Tile: (2) No. 8 x 2-inch (51 mm) wood screws with corrosion-resistant coating.
   b. Hip/Ridge: (2) No. 8 x 3-inch (76 mm) wood screws with corrosion-resistant coating.
   c. Materials: [Polymer-coated steel][305 stainless steel][316 stainless steel for coastal applications].
   d. Drive type: T25 Torx drive head.

C. Solar Mounting Systems:
****

Include where photovoltaic installations are planned. Coordinate with solar installer for load requirements.
****

1. Base-and-post style mounting systems designed for shingle roofing applications.
   a. Installation per manufacturer's instructions with appropriate waterproofing.
   b. Multi-purpose design accommodating various tile profiles and exposures.
2. Engineered for structural loads and waterproof installation.
3. Compatible products include [QBase systems][or][approved equal].

D. Snow Retention Systems:
****

Include where required by code or climate conditions. Consult structural engineer for loading calculations.
****

1. Pad-style snow guards with optional rod systems.
2. Metal snow guards with custom-length mounting plates.
3. Bracket-style retention systems designed for specific tile profiles.
4. Approved manufacturers include [Alpine][Snow Gem][TRA][or][approved equal].

E. Ventilation Components:
****

Ventilation requirements vary by code and climate. Ensure balanced intake and exhaust ventilation.
****

1. [Shake][Slate]-profile exhaust vents with corrosion-resistant mesh screening.
2. Ridge ventilation systems compatible with shingle installation.
3. Powered ventilation with appropriate mounting systems.

4. Compatible products available from [AtticBreeze][O'Hagin][GAF][AIR VENT][or][approved equal].

F. Installation Hardware:
1. Cap Nails: 1-3/4-inch (44 mm) 12-gauge (2.7 mm) electro-galvanized plastic cap nails for underlayment attachment.
2. Seam Tape: Pure aluminum foil tape with reinforced scrim mesh and Class 1 fire rating.
3. Weather Sealing: Appropriate sealants and gaskets per manufacturer's specifications.

PART 3 – EXECUTION

****

Proper installation is critical for warranty coverage and long-term performance. Brava provides extensive technical support including installation guides, videos, and online/bilingual training resources. Consider manufacturer's field inspection services for critical or large projects.

Reference to manufacturer's installation instructions ensures access to current technical requirements while maintaining contractual enforceability. Specific tolerances and critical requirements protect design intent and long-term performance.
****

3.01 EXAMINATION

A. Site Verification:
1. Verify roof structure is complete, properly braced, and meets design loads.
   a. If substrate preparation is the responsibility of another installer, notify Architect in writing of unsatisfactory preparation before proceeding.
2. Confirm roof deck consists of minimum 15/32-inch CDX plywood or 7/16-inch OSB.
3. Plywood is preferable for high wind environments.
4. [For Miami-Dade County [new construction][reroof] projects:
   a. Verify requirements for minimum 19/32-inch plywood sheathing for polymeric shingle applications.]
5. Verify deck surface is clean, dry, level, and free of protruding fasteners.

B. Environmental Conditions:
1. Only install when products have a measured temperature is of 32°F (0°C) or higher.
2. Do not install during precipitation or when deck surfaces are wet.
   a. Tiles may become slippery when wet.

3.02 PREPARATION

A. Layout and Verification:
1. Confirm roof dimensions are square within acceptable tolerances.
2. Establish reference lines for proper tile alignment and exposure.
3. Avoid using red or blue chalk as it can stain the tiles.
4. Verify compliance with applicable building codes for exposure requirements.

B. Material Inspection:
1. Inspect tiles for conformity with approved samples and specifications.
2. Blend materials from multiple pallets to achieve uniform color distribution.
3. Set aside non-conforming or damaged materials.

3.03 INSTALLATION - GENERAL REQUIREMENTS

****

Special compliance programs require specific inspection and verification procedures beyond standard manufacturer requirements. Select applicable (FORTIFIED Roof, Miami-Dade, Wildland-Urban Interface) programs based on project location, code requirements, or Owner specifications.
****

A. Compliance:
   1. Install in strict accordance with manufacturer's current published installation instructions.
   2. Install using only qualified installers per Part 1 of this Section.
   3. FORTIFIED Roof Compliance:
      a. Engage FORTIFIED Roof Evaluator for third-party verification and documentation of installation compliance with IBHS FORTIFIED Roof standards.
   4. Miami-Dade County Compliance:
      a. Installation subject to Miami-Dade County building department inspection procedures and Notice of Acceptance (NOA) requirements.
   5. Wildland-Urban Interface (IWUIC) Compliance:
      a. Verify installation meets Chapter 7A of California Building Code or local IWUIC requirements with appropriate inspection and documentation.
   6. Submit compliance documentation and inspection reports for applicable programs before final acceptance.

B. Roof Slope Requirements:
   1. Minimum slope: 4:12 for warranty coverage and optimal performance.
   2. Slopes 3:12 to 4:12: Install ice dam protection membrane (commonly referred to as Ice & Water Shield) over entire roof area.

C. Fastening Requirements:
   1. Install two corrosion-resistant fasteners per shingle at designated locations.
   2. Achieve minimum 3/4-inch (19 mm) penetration into deck or complete penetration.
   3. Drive fasteners flush with shingle surface without overdriving.
   4. No exposed fasteners permitted in completed installation.
   5. No smooth nails. Ring-shank roofing nails only.
   6. Install at eaves using the starter tile.

3.04 INSTALLATION TOLERANCES

A. Exposure Limits:
   1. [Shake][Slate]: Maximum 10 inches (254 mm), minimum 4 inches (102 mm).

B. Spacing Requirements:
   1. Maintain minimum 3/16-inch (4.8 mm) gap between shingle for thermal movement.
   2. Recommended spacing: 3/8-inch (9.5 mm) for optimal performance.

C. Alignment Standards:
   1. Courses shall be straight and parallel to eave line within 1/4 inch per 10 feet.
   2. Vertical alignment maintained within manufacturer's published tolerances.
   3. Sidelap for all shingles: Provide ≥1 1/2" field tiles and accessories.

3.05 INSTALLATION REQUIREMENTS

A. Nailer Installation:
   1. Install hip and ridge nailers before field tile installation.
   2. Maximum 24-inch (610 mm) on-center fastener spacing.
   3. Calculate nailer heights per manufacturer's specifications for roof slope.

B. Valley Installation:
   1. Do not fasten polymeric shingles within 5 inches (127 mm) of valley centerline.
   2. Maintain minimum 3/16-inch (4.8 mm) expansion gap at valley flashing.
   3. Solid shakes at rakes and valleys recommended.

C. Penetration Protection:
   1. Install ice dam protection membrane around all roof penetrations.
   2. Professional flashing installation per industry standards and applicable codes.

3.06 FIELD QUALITY CONTROL

A. Inspection Requirements: Owner may provide separate contract for installation oversight.
   1. Coordinate with Owner’s inspectors per agreed schedule or after first 200 square feet (18.6 sq m) installation.
   2. Coordinate with Owner’s inspectors for periodic inspections during installation progress.
   3. Coordinate with Owner’s inspectors for final inspection upon completion.

B. Acceptance Criteria:
   1. Installation meets manufacturer's published standards.
   2. Weather-tight performance at all roof details.
   3. Uniform appearance and color distribution.
   4. Compliance with specified exposure and spacing tolerances.

C. Defective Work:
   1. Remove and replace work not meeting specified requirements.
   2. Replace tiles showing damage or excessive color variation.

3.07 COMPLETION

A. Final Cleaning:
   1. Remove installation debris and temporary materials.
   2. Clean tile surfaces per manufacturer's recommendations.

B. Project Documentation:
   1. Provide manufacturer's warranty documentation.
   2. Submit installer certification records.
   3. Provide maintenance instructions to Owner.

END OF SECTION