SECTION 073116 - METAL SHINGLES

TIPS:

To view non-printing Editor's Notes that provide guidance for editing, click on MasterWorks/Single-File Formatting/Toggle/Editor's Notes.

To read detailed research, technical information about products and materials, and coordination checklists, click on MasterWorks/Supporting Information.

Content Requests:

[<Double click here to submit questions, comments, or suggested edits to this Section.>](http://user.avitru.com/ContentContact.aspx?sect=073116&ver=03-01-19&format=FL&sid=14648&utm_source=MasterSpec&utm_medium=Word)

Revise this Section by deleting and inserting text to meet Project-specific requirements.

This Section uses the term "Architect." Change this term to match that used to identify the design professional as defined in the General and Supplementary Conditions.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

1. GENERAL
	* + 1. RELATED DOCUMENTS

Retain or delete this article in all Sections of Project Manual.

* + - * 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
			1. SUMMARY
				1. Section Includes:

Metal shingles.

Underlayment materials

Sheet metal flashing and trim.

Ridge vents.

* + - * 1. Related Requirements:

Retain subparagraphs below to cross-reference requirements Contractor might expect to find in this Section but are specified in other Sections.

Section 074113.13 "Formed Metal Roof Panels" for sheet metal roofing panels that are installed as single panels extending from eave to ridge.

Retain subparagraph below if snow guards are not inserted in this Section.

Refer to sections listed below for cross-reference requirements Contractor might expect to find in this Section but are specified in other Sections. Sections listed below are for spec editor’s and design team coordination and are to remain as Editor’s Notes. Remove referenced specification sections within the body of the specification if not applicable to the project.

Section 077253 "Snow Guards" for prefabricated devices designed to hold snow on the roof surface, allowing it to melt and drain off slowly.

* + - 1. ALLOWANCES

Retain this article if products and Work included in this Section, such as replacement of deteriorated roof decks, are covered by lump-sum, unit-cost, or quantity allowances.

* + - * 1. See Section 012100 "Allowances" for description of allowances affecting items specified under this Section.
			1. UNIT PRICES

Retain this article if products and Work specified in this Section, such as replacement of deteriorated roof decks, are measured and paid for under the provisions of unit prices.

* + - * 1. See Section 012200 "Unit Prices" for description of unit prices affecting items specified under this Section.
			1. ALTERNATES

Retain this article if products and Work specified in this Section are to be added to or deducted from the base bid amount under the provisions of alternates.

* + - * 1. See Section 012300 "Alternates" for description of alternates affecting items specified under this Section.
			1. DEFINITIONS
				1. Roofing Terminology: See ASTM D1079 for definitions of terms related to roofing Work in this Section.
			2. PREINSTALLATION MEETINGS

Retain "Preinstallation Conference" Paragraphparagraph below if Work of this Section is extensive or complex enough to justify a conference.

* + - * 1. Preinstallation Conference: Conduct conference at [**Project site] <Insert location**>.

If needed, insert list of conference participants not mentioned in Section 013100 "Project Management and Coordination."

<**Insert participant requirements**>.

* + - 1. ACTION SUBMITTALS
				1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
				2. Manufacturer’s installation instructions shall be provided along with product data.
				3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
				4. Provide submittals in the order in which they are specified and tabbed (for combined submittals).
				5. Product Data:

Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each of the following:

Metal shingles.

Underlayment materials.

Ridge vents.

Bituminous coating.

Asphalt roofing cement.

Sealant.

Include manufacturer’s installation instructions for complete shingle system.

* + - * 1. Sustainable Design Submittals:
				2. Shop Drawings: For metal shingles. Include roof plans; sections at hips, gables, ridges, valleys, and eaves; details of metal shingles and joint patterns, flashing, trim, accessories, and attachments to other Work.

Retain "Samples" Paragraphparagraph below for single-stage Samples, with a subordinate list if applicable. Retain "Samples for Initial Selection" and "Samples for Verification" paragraphs for two-stage Samples.

* + - * 1. Samples: For each exposed product and for each color and texture specified, in manufacturer's standard size.
				2. Samples for Initial Selection:

For each type of metal shingle.

For each type of accessory involving color selection.

* + - * 1. Samples for Verification: Full-size Samples of each type and finish of metal shingle indicated.
				2. Quality Control Submittals:
			1. INFORMATIONAL SUBMITTALS

Product Test Reports: For metal shingles, for tests performed by a qualified testing agency.

Evaluation Reports: From [**an agency acceptable to authorities having jurisdiction] [ICCUNIFORM CODE-ES] <Insert evaluation agency**>, indicating that product is suitable for intended use under applicable building codes for the following:

Design Consultant to review code references and verify that the referenced sections/tables are current. Note that code references shall be based on the current version of the Uniform Code.

Retain applicable subparagraphs below to suit Project. The IBC BCNYS and the IRC RCNYS do not address polymer-modified bitumen sheet and synthetic underlayments.

Polymer-modified bitumen sheet underlayment.

Synthetic underlayment.

Sample Warranty: For manufacturer's materials warranty.

* + - * 1. Contract CLOSEOUT SUBMITTALS Closeout Submittals:

Maintenance Data: For metal shingles to include in maintenance manuals.

Materials warranties.

Roofing Installer's warranty.

* + - * 1. Maintenance Material Submittals:

Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

Revise "Metal Shingles" Subparagraphsubparagraph below if different quantities of different types of shingles are required; for example, special shapes or colors.

Metal Shingles: [**100 sq. ft. (9.3 sq. m)] <Insert area**> of exposed area, in each type and color, in unbroken bundles.

* + - 1. QUALITY ASSURANCE
				1. Mockups Benchmarks: Build mockups Benchmarks to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

Build mockups Benchmarks of metal shingles, including related roofing materials.

Size: [**48 inches (1219 mm) long by 96 inches (2438 mm) wide] <Insert dimensions**>.

Retain first subparagraph below if required; insert other mockup requirements to suit Project.

Include gutter and downspout complying with requirements in [**Section 076200 "Sheet Metal Flashing and Trim."] [Section 077100 "Roof Specialties."]**

Approval of mockups Benchmarks does not constitute approval of deviations from the Contract Documents contained in mockups Benchmarks unless Architect Director’s Representative specifically approves such deviations in writing.

Retain subparagraph below if the intention is to make an exception to the default requirement in Section 014000 "Quality Requirements" for demolishing and removing mockupsBenchmarks.

Subject to compliance with requirements, approved mockups Benchmarks may become part of the completed Work if undisturbed at time of Substantial Completion.

* + - 1. DELIVERY, STORAGE, AND HANDLING
				1. Store metal shingle materials in a dry, well-ventilated location protected from weather and moisture in accordance with manufacturer's written instructions. Do not allow metal shingles to contact with other materials that might cause staining, denting, or other surface damage. Store metal shingle materials away from uncured and wet concrete and masonry.

Retain strippable protective covering on metal shingles during installation.

* + - * 1. Store underlayment rolls in a dry, well-ventilated location protected from weather, sunlight, and moisture in accordance with manufacturer's written instructions.

Store on end, on pallets or other raised surfaces.

Do not double-stack rolls.

* + - * 1. Protect unused underlayment from weather, sunlight, and moisture when left overnight or when roofing Work is not in progress.
				2. Handle, store, and place roofing materials in a manner to prevent damage to roof deck or structural supporting members.
			1. FIELD CONDITIONS
				1. Environmental Limitations: Proceed with installation only when existing and forecasted weather conditions permit product installation and related Work to be performed in accordance with manufacturer's written instructions and warranty requirements.

Retain subparagraph below for self-adhering, polymer-modified bitumen sheet used as water protection, an ice barrier, or underlayment.

Install self-adhering, polymer-modified bitumen sheet underlayment within the range of ambient and substrate temperatures recommended in writing by manufacturer.

* + - 1. WARRANTY

When warranties are required, verify with Owner'sDirector’s Representative Representativecounsel that warranties stated in this article are not less than remedies available to Owner Director’s Representativethe Facility under prevailing local laws.

* + - * 1. Materials Warranty: Manufacturer agrees to repair or replace metal shingles and accessories that fail within specified warranty period.

Failures include, but are not limited to, the following:

Structural failures including wind uplift.

Water penetration[ **and hail perforation**].

Deterioration of metals, metal finishes, and other materials beyond normal weathering.

High-Performance Organic Coating: Deterioration of fluoropolymer finish including, but not limited to, the following:

Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.

Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.

Cracking, checking, peeling, or failure of paint to adhere to bare metal.

<**Insert failure modes**>.

Verify available warranties and warranty periods.

Metal Shingle Warranty Period: [**15] [25] [50] <Insert number**> years from date of Substantial Completion.

High-Performance Organic Coating Warranty Period: [**10] [20] <Insert number**> years from date of Substantial Completion.

Retain "Roofing Installer's Warranty" Paragraphparagraph below, with "Roofing Installer's Warranty" Article, if required.

* + - * 1. Roofing Installer's Warranty: On warranty form at end of this Section, signed by Installer, in which Installer agrees to repair or replace components of metal shingle roofing that fail in materials or workmanship within specified warranty period.

Warranty Period: [**Two] [Five] <Insert number**> years from date of Substantial Completion.

* + - * 1. Special Warranty: The one year required by Paragraph 9.8 of the General Conditions is extended to 2 years for the Work in this Section. Refer to Supplementary Conditions.
1. PRODUCTS

Manufacturers and products listed in SpecAgent and MasterWorks Paragraph Builder are neither recommended nor endorsed by the AIA or Deltek. Before inserting names, verify that manufacturers and products listed there comply with requirements retained or revised in descriptions and are both available and suitable for the intended applications. For definitions of terms and requirements for Contractor's product selection., see Section 016000 "Product Requirements."

* + - 1. SOURCE LIMITATIONS
				1. Obtain each type of product from single source from single manufacturer.
			2. PERFORMANCE REQUIREMENTS

Retain "Exterior Fire-Test Exposure" Paragraphparagraph below for classified roof assemblies on combustible decks, and revise to suit Project. Metal shingles are only exempt from testing if installed on noncombustible roof decks. Verify requirements of authorities having jurisdiction for roof assembly.

* + - * 1. Exterior Fire-Test Exposure: Provide metal shingles and related roofing materials identical to those of assemblies tested for Class A fire resistance in accordance with ASTM E108 or UL 790 by Underwriters Laboratories or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.
				2. Wind-Uplift Resistance: Provide metal shingle assemblies that comply with the following wind-uplift requirements:

Retain "Class" or "Uplift Resistance" Subparagraphsubparagraph below, or both; manufacturers often include both class and uplift-resistance values in their product literature. Subparagraphsubparagraphs are examples only; revise to suit Project. Verify compliance with codes and insert other requirements if necessary, such as testing in accordance with ASTM D3161/D3161M. Class 90 is the highest of four obtainable classes.

Class: [**15] [30] [60] [90**] when tested in accordance with UL 580.

Uplift Resistance: [**75 lbf/sq. ft. (3.6 kPa)] [120 lbf/sq. ft. (5.75 kPa)] [165 lbf/sq. ft. (7.9 kPa)] <Insert value**> when tested in accordance with UL 1897.

UL 2218 impact-resistance test method simulates hailstones falling at peak velocity; Class 4 designation is the most impact resistant. Verify available impact resistance with manufacturers.

* + - * 1. Impact Resistance: [**Class 3] [Class 4] <Insert class designation**> when tested in accordance with UL 2218.

Retain "Energy Performance, ENERGY STAR" Paragraphparagraph below if required. To bear the ENERGY STAR label, metal shingles must have initial solar reflectance of 0.25 or greater and maintain a solar reflectance of 0.15 or greater three years after installation under normal conditions.

* + - * 1. Energy Performance, ENERGY STAR: Provide metal shingles that are listed on the DOE's "ENERGY STAR Roof Product List" for steep-slope roof products.
			1. METAL SHINGLES

Retain applicable types of shingles in this article. Material thicknesses and exposure dimensions of units vary among manufacturers and according to unit design.

* + - * 1. Aluminum Shingle Panels: Factory-formed, interlocking stamped panels resembling multiple [shakes] [shingles] [Spanish tiles] [flat tiles] [scalloped tiles] <Insert description>.

[<Double click here to find, evaluate, and insert list of manufacturers and products.>](http://www.specagent.com/LookUp/?ulid=13646&mf=&src=wd)

First option in "Material" Subparagraphsubparagraph below is minimum thickness permitted by the IBC BCNYS for aluminum shingles. Consult metal shingle manufacturers for recommended minimum sheet metal thickness to suit the shingle form and anticipated loading.

Material: Formed aluminum, [0.**019 inch (0.48 mm)] [0.024 inch (0.61 mm)] [0.032 inch (0.81 mm)] [0.040 inch (1.02 mm)] <Insert dimension**> thick.

Panel Size: [**24 by 12 inches (610 by 305 mm)] [39-3/4 by 18-1/2 inches (1010 by 470 mm)] [48 by 12 inches (1219 by 305 mm)] <Insert dimensions**>.

Finish: [**High-performance organic coating] <Insert requirements**>.

If retaining first option in "Color" Subparagraphsubparagraph below, indicate colors in a separate schedule.

Color: [**As indicated by manufacturer's designations] [Match Architect's Director’s Representative’s sample] [As selected by Architect Director’s Representative from manufacturer's full range] <Insert color**>.

* + - * 1. Aluminum, Individual Shingles: Factory-formed, interlocking [**rectangular] [diamond**] shingle units.

First option in "Material" Subparagraphsubparagraph below is minimum thickness permitted by the IBC for aluminum shingles. Consult metal shingle manufacturers for recommended minimum sheet metal thickness to suit the shingle form and anticipated loading.

Material: Formed aluminum, [0**.020 inch (0.51 mm)] [0.032 inch (0.81 mm)] <Insert dimension**> thick.

Exposure: [**12 by 8 inches (305 by 203 mm)] [13-1/2 by 13-1/2 inches (343 by 343 mm)] [14-1/2 by 8-1/8 inches (368 by 206 mm)] <Insert dimensions**>.

Verify availability of polystyrene backing and other features with manufacturers. Polystyrene backing helps shingles resist dents from foot traffic.

Features: [**Polystyrene backing] <Insert requirements**>.

Finish: [**High-performance organic coating] <Insert requirements**>.

If retaining first option in "Color" Subparagraphsubparagraph below, indicate colors in a separate schedule.

Color: [**As indicated by manufacturer's designations] [Match Architect's Director’s Representative’s sample] [As selected by Architect Director’s Representative from manufacturer's full range] <Insert color**>.

* + - * 1. Steel Shingle Panels: Factory-formed, interlocking stamped panels resembling multiple [**shakes] [shingles] [Spanish tiles] [flat tiles] [scalloped tiles] <Insert description>**.

Retain one of first two options in "Material" Subparagraphsubparagraph below. Retain first option for granular-coated finish; retain second option for high-performance organic coating; retain either option if left uncoated or field finished. Verify availability with manufacturers. Consult metal shingle manufacturers for recommended minimum sheet metal thickness to suit the shingle form and anticipated loading.

Material: [**Aluminum-zinc alloy coated] [Zinc-coated (galvanized)]** steel sheet, minimum nominal [0.**0162 inch (0.41 mm)] [0.017 inch (0.43 mm)] <Insert dimension**> thickness.

Exposure: [36 **by 12 inches (914 by 305 mm)] [39-3/8 by 11-7/8 inches (1000 by 302 mm)] <Insert dimension**s>.

Finish: [**Mill, acrylic-coated] [Granular coating] [High-performance organic coating] <Insert requirements**>.

Retain "Color" Subparagraphsubparagraph below for granular or high-performance organic coating. If retaining first option, indicate colors in a separate schedule.

Color: [**As indicated by manufacturer's designations] [Match Architect's Director’s Representative’s sample] [As selected by Architect Director’s Representative’s from manufacturer's full range] <Insert color**>.

* + - * 1. Steel Individual Shingles: Factory-formed, interlocking rectangular, [**fish-scale] [Victorian] [classic stamped] <Insert description**> units.

Retain option in "Material" Subparagraphsubparagraph below or revise to suit Project. Consult metal shingle manufacturers for recommended minimum sheet metal thickness to suit the shingle form and anticipated loading.

Material: Aluminum-zinc alloy coated steel sheet, nominal [0**.028 inch (0.71 mm) thick] <Insert thickness**>.

Exposure: [**8-1/2 by 11-1/2 inches (216 by 392 mm)] [9 by 12 inches (229 by 305 mm)] <Insert dimensions**>.

Finish: [**Mill, acrylic coated] [High-performance organic coating] <Insert requirements**>.

Retain "Color" Subparagraphsubparagraph below for high-performance organic coating. If retaining first option, indicate colors in a separate schedule.

Color: [**As indicated by manufacturer's designations] [Match Architect's Director’s Representative’s sample] [As selected by Architect Director’s Representative from manufacturer's full range] <Insert color**>.

* + - * 1. Copper, Individual Shingles: Factory-formed, interlocking [rectangular] [diamond] units.

First option in "Material" Subparagraphsubparagraph below is the minimum weight (thickness) permitted by the IBCBCNYS for copper shingles. Consult metal shingle manufacturers for recommended minimum sheet metal weight (thickness) to suit the shingle form and anticipated loading.

Material: Copper sheet, minimum [**12 oz./sq. ft. (0.41 mm thick)] [16 oz./sq. ft. (0.55 mm thick)] <Insert requirements**>.

Exposure: [**12 by 8 inches (305 by 203 mm)] [13-1/2 by 13-1/2 inches (343 by 343 mm)] [14-1/2 by 8-1/8 inches (368 by 206 mm)] <Insert dimensions**>.

Verify availability with polystyrene backing and other features with manufacturers. Polystyrene backing helps shingles resist dents from foot traffic.

Features: [**Polystyrene backing] <Insert requirements**>.

Pre-patinated copper is not usually discussed in manufacturers' catalogs but may be available at extra cost; verify availability with manufacturers.

Finish: [**Mill] [Pre-patinated dark brown] [Pre-patinated verdigris] <Insert requirements**>.

* + - * 1. Zinc, Individual Shingles: Factory-formed, interlocking [**rectangular] [diamond] <Insert requirements**> shingle units.

Consult metal shingle manufacturers for recommended minimum sheet metal thickness to suit the shingle form and anticipated loading.

Material: Zinc-alloy sheet, minimum [**0.026 inch (0.65 mm)] [0.028 inch (0.70 mm)] [0.031 inch (0.80 mm)] <Insert dimension**> thick.

Exposure: [**13-1/2 by 13-1/2 inches (343 by 343 mm)] [16-1/16 by 22-1/16 inches (408 by 560 mm)] <Insert dimensions**>.

Verify availability with polystyrene backing and other features with manufacturers. Polystyrene backing helps shingles resist dents from foot traffic.

Features: [**Polystyrene backing] <Insert requirements**>.

Finish: [**Bright rolled] [Preweathered gray] [Preweathered black] <Insert requirements**>.

Retain "Finish Protection" Paragraphparagraph below for all types of mechanical and painted finishes.

* + - * 1. Finish Protection: Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.
			1. SHEET METAL MATERIALS
				1. Aluminum Sheet: ASTM B209 (ASTM B209M), alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.

Retain "Mill Finish" or "High-Performance Organic Coating (Coil-Coated Finishes)" Subparagraphsubparagraph below.

Mill Finish: Uncoated aluminum sheet.

High-Performance Organic Coating (Coil-Coated Finishes): Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

Retain "Two-Coat Fluoropolymer" or "Three-Coat Fluoropolymer" Subparagraphsubparagraph below. First subparagraph is standard fluoropolymer for most manufacturers; other finishes may be available for custom orders. For exact finish, insert names of coating manufacturers and products.

Two-Coat Fluoropolymer: AAMA 2605. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight.

Three-Coat Fluoropolymer: AAMA 2605. System consisting of primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight.

Insert other specialty finishes, such as anodized finishes or metallic or mica fluoropolymers, if required.

<**Insert finish requirements**>.

Finish in "Concealed Surface" Subparagraphsubparagraph below is frequently retained for interior surfaces of coil-coated sheet.

Concealed Surface: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish consisting of prime coat and wash coat and with a minimum total dry film thickness of 0.5 mil (0.013 mm).

Retain "Aluminum-Zinc Alloy Coated Steel Sheet" or "Zinc-Coated (Galvanized) Steel Sheet" Paragraphparagraph below for metallic-coated steel sheet.

* + - * 1. Aluminum-Zinc Alloy Coated Steel Sheet: ASTM A792/A792M, Class AZ50 coating designation, Grade 37 (Class AZM150 coating designation, Grade 255); structural quality.

Retain "Mill Finish" or "Granular-Coating Finish" Subparagraphsubparagraph below.

Mill Finish: Satin-finish, aluminum-zinc alloy coated steel sheet without additional coating.

Granular-Coating Finish: Entire upper surface of shingle, including flange edges, coated with ceramic-colored quartz granules or crushed stone chips bonded to shingle with a resin adhesive and sealed with a clear overglaze.

* + - * 1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A653/A653M, G90 (Z275) coating designation; structural quality.

Retain "Mill Finish" or "High-Performance Organic Coating (Coil-Coated Finishes)" Subparagraphsubparagraph below. If retaining "Mill Finish" Subparagraphsubparagraph, retain second option if field painting is required; verify availability with manufacturers.

Mill Finish: Zinc-coated (galvanized) steel sheet [**without additional coating] [with manufacturer's standard mill-phosphatized finish**].

High-Performance Organic Coating (Coil-Coated Finishes): Prepainted by the coil-coating process to comply with ASTM A755/A755M. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

Retain "Two-Coat Fluoropolymer" or "Three-Coat Fluoropolymer" Subparagraphsubparagraph below. First subparagraph is standard fluoropolymer for most manufacturers; other finishes may be available for custom orders. For exact finish, insert names of coating manufacturers and products.

Two-Coat Fluoropolymer: AAMA 621. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight.

Three-Coat Fluoropolymer: AAMA 621. System consisting of primer, fluoropolymer color coat, and clear fluoropolymer topcoat, with both color coat and clear topcoat containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight.

Insert other specialty finishes, such as metallic or mica fluoropolymers, if required.

<**Insert finish requirements**>.

* + - * 1. Copper Sheet: ASTM B370; Temper H00, cold rolled unless Temper 060 is required for forming.

Retain "Mill Finish" or "Pre-Patinated Finish" Subparagraphsubparagraph below. Mill finish weathers and changes color naturally over time.

Mill Finish: Nonpatinated and exposed.

Retain "Pre-Patinated Finish" Subparagraphsubparagraph below for finishes that reduce nonuniform weathering of exposed copper sheet. Verdigris is the ultimate, light-green color of aged copper. Manufacturers' literature usually does not address pre-patinated copper, but it may be available at extra cost; verify availability with manufacturers.

Pre-Patinated Finish: Pre-patinated in accordance with ASTM B882.

First option in "Zinc-Alloy Sheet" Paragraphparagraph below is based on the IBC BCNYS and cannot be complied with by ASTM B69 alloys or by European standard EN 988. Second option is based on manufacturers' products and EN 988 with which most manufacturers comply and is similar to ASTM B69, Alloy Z41121. Before retaining either option, verify acceptability and requirements with authorities having jurisdiction.

* + - * 1. Zinc-Alloy Sheet: [**Alloy of 99.995 percent pure electrolytic high-grade zinc with alloy additives of copper (0.08 to 0.20 percent), titanium (0.07 to 0.12 percent), and aluminum (0.015 percent)] [Zinc alloy consisting of 99 percent pure zinc with 0.08 to 1.00 percent copper, 0.06 to 0.20 percent titanium, and up to 0.015 percent aluminum**].

Retain "Back Coating" Subparagraphsubparagraph below if protective back coating is required. Zinc sheet is available without protective back coating; however, installation assembly and materials might be more demanding. Verify manufacturers' recommendations for roofing systems designed for Project.

Back Coating: Manufacturer's standard factory-applied, flexible, protective back coating.

Bright-Rolled Finish: Uncoated, bright-rolled zinc-alloy sheet.

Preweathered Finish: Factory-applied preweathering to uniform color.

* + - 1. UNDERLAYMENT MATERIALS

See "Underlayment," "Model-Code Underlayment Requirements," "NRCA Underlayment Recommendations," "Asphalt-Saturated Organic Felt Underlayment," "Synthetic Underlayment," "Polymer-Modified Bitumen Sheet Underlayment," and "Self-Adhering, Polymer-Modified Bitumen Sheet Underlayment" articles in the Evaluations for a discussion of various underlayment options.

Retain "Asphalt-Saturated Felt" Paragraphparagraph below if required. NRCA no longer recommends felt underlayment for use with metal shingles.

* + - * 1. Asphalt-Saturated Felt: Organic felt, nonperforated and complying with the following.

Retain "ASTM D226/D226M" or "ASTM D4869/D4869M" Subparagraphsubparagraph below. The IBC requires one layer of ASTM D226/D226M Type II or ASTM D4869/D4869M Type IV where basic design wind speeds (three-second gusts per ASCE/SEI 7) are equal to or greater than 140 mph (63 m/s) for slopes equal to or greater than 4:12; two layers for slopes between 3:12 and 4:12. The IRC requires one layer of ASTM D226/D226M Type II or ASTM D4869/D4869M Type III or IV where ultimate design wind speeds (as defined in the IRC) are equal to or greater than 140 mph (63 m/s) for slopes equal to or greater than 4:12; two layers for slopes between 3:12 and 4:12.

ASTM D226/D226M Type I felt weighs 11.5 lb/sq. ft. (560 g/sq. m), and Type II felt weighs 26 lb/100 sq. ft. (1270 g/sq. m). Metal shingle manufacturers generally recommend using the heavier weight.

ASTM D226/D226M: [**Type I] [Type II**].

ASTM D4869/D4869M Type I felt weighs 8 lb/100 sq. ft. (390 g/sq. m), Type II felt weighs 13 lb/100 sq. ft. (635 g/sq. m), Type III weighs 20 lb/100 sq. ft. (976 g/sq. m), and Type IV weighs 26 lb/100 sq. ft. (1270 g/sq. m). Metal shingle manufacturers generally recommend using Type IV.

ASTM D4869/D4869M: [**Type I] [Type II] [Type III] [Type IV**].

If retaining "Synthetic Underlayment" Paragraphparagraph below, verify that products comply with requirements of authorities having jurisdiction and are recommended for use under metal shingles. NRCA only recommends using synthetic underlayment as a top layer installed over an anchor layer of mechanically fastened or self-adhering, polymer-modified bitumen sheet in a two-layer installation. See "NRCA Underlayment Recommendations" Article in the Evaluations.

* + - * 1. Synthetic Underlayment: UV-resistant polypropylene, polyolefin, or polyethylene polymer fabric with surface coatings or treatments to improve traction underfoot and abrasion resistance; recommended in writing by manufacturer for use under metal shingles; and evaluated and documented to be suitable for use as a roof underlayment under applicable codes by a testing and inspecting agency acceptable to authorities having jurisdiction.

NRCA recommends using polymer-modified bitumen sheet, including products used as base sheets in low-slope membrane roof systems and products marketed as underlayment, for metal shingle underlayment. Sheets are mechanically fastened See "NRCA Underlayment Recommendations" and "Polymer-Modified Bitumen Sheet Underlayment" articles in the Evaluations.

"Polymer-Modified Bitumen Sheet, Mechanically Fastened" Paragraphparagraph below describes products with non-granular surfacings marketed as underlayment and valley flashing. Revise to suit Project. Granular surfacings are not recommended because they will scratch the underside of metal shingles if they are in direct contact. Metal roofing can reach higher temperatures than other types of roofing; verify that products are appropriate for Project's climatic conditions and sun exposures.

* + - * 1. Polymer-Modified Bitumen Sheet, Mechanically Fastened: Styrene-butadiene-styrene- (SBS) modified asphalt, glass-fiber-mat-reinforced sheet; minimum [55-mil (1.4-mm)] [40-mil (1.0-mm)] <Insert dimension> nominal thickness; recommended in writing by manufacturer and acceptable to authorities having jurisdiction for use as underlayment in metal steep-slope roofing systems; designed for mechanical fastening; and with manufacturer's standard non-abrasive, slip-resistant surface that will not scratch the underside of metal shingles. Granular or sand surfacings are unacceptable.

If required, insert specific testing requirements for polymer-modified bitumen sheet products here. Product testing varies among manufacturers.

<**Insert testing requirements**>.

Retain "Self-Adhering, Polymer-Modified Bitumen Sheet" or "Self-Adhering, Polymer-Modified Bitumen Sheet, High Temperature" Paragraphparagraph below to suit Project. Self-adhering, polymer-modified bitumen sheet commonly covers the entire roof deck under metal shingles and is also used for water and ice-dam protection in roof areas vulnerable to leakage. NRCA and manufacturers' written installation instructions recommend using both standard and high-temperature formulations under metal shingles. Consider Project's climatic conditions and sun exposures when selecting which type of self-adhering, polymer-modified bitumen sheet to specify.

* + - * 1. Self-Adhering, Polymer-Modified Bitumen Sheet: ASTM D1970/D1970M, minimum [**50-mil- (1.3-mm-)] [40-mil- (1.0-mm-)] <Insert dimension**> thick sheet; glass-fiber-mat-reinforced, polymer-modified asphalt; with slip-resistant, polymer-film or polyester-fabric top surface and release backing; cold applied; and recommended in writing by manufacturer for use under metal roof shingles.[ **Provide primer for adjoining concrete , masonry, and metal surfaces to receive underlayment.**]
				2. Self-Adhering, Polymer-Modified Bitumen Sheet, High Temperature: ASTM D1970/D1970M, minimum of [**55-mil- (1.4-mm-)] [50-mil- (1.3-mm-)] [40-mil- (1.0-mm-)] <Insert thickness**> thick sheet; glass-fiber-mat-reinforced, polymer-modified asphalt; with slip-resistant polymer-film or polyester-fabric top surface and release backing; cold applied; and recommended in writing by manufacturer for use under metal roof shingles.[ **Provide primer for adjoining concrete, masonry, and metal surfaces to receive underlayment**.]

Thermal Stability: Stable after testing at 240 deg F (116 deg C) in accordance with ASTM D1970/D1970M.

* + - 1. SHEET METAL FLASHING AND TRIM

Metal shingle manufacturers generally provide standard flashing and trim either prefabricated or field fabricated from coil stock to match metal shingles. Revise "Sheet Metal Flashing and Trim" Paragraphparagraph below to suit Project.

* + - * 1. Sheet Metal Flashing and Trim: Metal shingle manufacturer's flashing and trim components matching shingle material, color, and finish unless otherwise specified in this Section, indicated on Drawings, or recommended in writing by metal shingle manufacturer. Fabricate to sizes and configurations required for a weathertight installation. Unless otherwise specified in this Section or indicated on Drawings, fabricate sheet metal flashing and trim to comply with recommendations that apply to design, dimensions, metal, and other characteristics of the item in SMACNA's "Architectural Sheet Metal Manual."

Options in "Valley Flashing" Subparagraphsubparagraph below reflect IBC BCNYS minimum requirements. The IBC BCNYS and the IRC RCNYS include prescriptive requirements for valley flashings; verify requirements of authorities having jurisdiction. SMACNA recommends minimum 10-inch- (254-mm-) wide flanges. SMACNA also recommends minimum 1-inch- (25-mm-) high, inverted-V profile; 2-inch- (51-mm-) high, inverted-V profile for slopes greater than 6:12 and for where dissimilar slopes join. Revise subparagraph to suit Project.

Valley Flashing: Fabricate to extend not less than [**8 inches (203 mm)] <Insert dimension**> from the centerline of the valley with a splash-diverter rib not less than [**3/4 inch (19 mm)] <Insert dimension**> high at the flowline formed as part of the flashing.

* + - 1. RIDGE VENTS

Design and venting areas of rigid ridge vents vary. Many ridge vents incorporate nonwoven-geotextile filter strips to prevent insect infestation and to block entry of rain and snow. Some ridge vents add an external deflector baffle to further limit entry of wind-blown rain and snow.

* + - * 1. Ridge Vents: Metal shingle manufacturer's continuous vented ridge caps matching material and finish of metal shingles[ **with insect screen or insect-resisting geotextile filter strips] [and] [with external deflector baffles**]; for use with specified metal shingles.

Retain "Minimum Net Free Area" Subparagraphsubparagraph below if required free area is known; verify availability with manufacturers.

Minimum Net Free Area: <**Insert free area**>.

Accessories: Splices, end caps, and other accessories matching metal and finish.

* + - 1. ACCESSORIES

Retain "Wood Battens" or "Metal Battens" Paragraphparagraph below to suit Project. Insert additional material requirements and dimensions if preferred. NRCA does not recommend preservative-treated wood for this application because of potential for metal shingle corrosion.

* + - * 1. Wood Battens: Nominal [2**-by-2-inch (51-by-51-mm)] <Insert dimensions**> untreated wood complying with requirements in [**Section 061000 "Rough Carpentry."] [Section 061053 "Miscellaneous Rough Carpentry."]**

Revise "Metal Battens" Paragraphparagraph below for metal battens formed from other metals or with other profiles.

* + - * 1. Metal Battens: Hat channels formed from zinc-coated (galvanized) steel sheet; ASTM A653/A653M, G90 (Z275) coating designation, not less than [**0.025-inch (0.64-mm)] <Insert dimension>** nominal thickness.

Size: [**Minimum 2-inch- (51-mm-) wide surface for fastening metal shingles and 1-1/2 inches (38 mm) deep] <Insert requirements**>.

* + - * 1. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187/D1187M.
				2. Asphalt Roofing Cement: ASTM D4586/D4586M Type II, asbestos free.

Revise "Sealant" Paragraphparagraph below if a specific polymer, class, and use are required.

* + - * 1. Sealant: ASTM C920, Type S, Grade NS, one-part, non-sag elastomeric polymer joint sealant as recommended in writing by metal shingle manufacturer for installation indicated; of class and use classifications required to seal joints and remain watertight. Where sealant is exposed, provide in color matching shingle.
				2. Sheet Metal Fasteners: Noncorrosive screws, nails, and anchors designed to withstand design loads and recommended in writing by metal shingle manufacturer.

Retain applicable subparagraphs below.

Exposed Fasteners: Heads matching color of metal shingles using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC washers under heads of exposed fasteners bearing on weather side of shingles.

Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

Blind Fasteners: High-strength aluminum or stainless steel rivets suitable for metal being fastened.

Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.

Fasteners for [**Aluminum-Zinc Alloy Coated] [Zinc-Coated**] Steel Sheet: Hot-dip galvanized steel in accordance with ASTM A153/A153M, ASTM F2329, or Series 300 stainless steel.

Fasteners for Copper Sheet: Copper, hardware bronze, or Series 300 stainless steel.

Fasteners for Zinc Sheet: Hot-dip galvanized steel in accordance with ASTM A153/A153M, ASTM F2329, or Series 300 stainless steel.

* + - * 1. Underlayment Nails: Aluminum, stainless steel, or hot-dip galvanized-steel wire nails with low-profile metal or plastic caps, 1-inch- (25-mm-) minimum diameter.

Retain first subparagraph below to comply with IBC BCNYS requirements for locations where the basic design wind speed is equal to or greater than 140 mph (63 m/s) or with IRC requirements for locations where the ultimate design wind speed is equal to or greater than 140 mph (63 m/s).

Provide with minimum 0.0134-inch- (0.34-mm-) thick metal cap, 0.010-inch- (0.25-mm-) thick power-driven metal cap, or 0.035-inch- (0.89-mm-) thick plastic cap; and with minimum 0.083-inch- (2.11-mm-) thick ring shank or 0.091-inch- (2.31-mm-) thick smooth shank of length to penetrate at least 3/4 inch (19 mm) into roof sheathing or to penetrate through roof sheathing less than 3/4 inch (19 mm) thick.

Retain subparagraph below if applicable; revise to suit Project.

Where nails are in contact with metal shingles or flashing, use nails made from same metal as metal shingles.

* + - * 1. Wood Batten Nails: ASTM F1667; common or box, steel wire, flat head, and smooth shank; hot-dip galvanized.

Insert requirements for snow guards using Section 077253 "Snow Guards" as a basis if not specifying them in that Section.

* + - * 1. <**Insert snow-guard requirements**>.
1. EXECUTION
	* + 1. EXAMINATION
				1. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

Examine roof sheathing to verify that sheathing joints are supported by framing and blocking, that tops of fasteners are flush with surface, and that installation is within flatness tolerances.

Verify that substrate is sound, dry to the maximum moisture content recommended in writing by metal shingle manufacturer, smooth, clean, sloped for drainage, and completely anchored and that provisions have been made for flashings and penetrations through metal shingles.

Verify that vent stacks and other penetrations through roofing are installed and securely fastened.

* + - * 1. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
				2. Proceed with installation only after unsatisfactory conditions have been corrected.
			1. INSTALLATION OF UNDERLAYMENT MATERIALS

Underlayments installed parallel to eaves are installed perpendicular to sloped roof deck. Underlayments installed parallel to the rake are installed parallel to sloped roof deck.

* + - * 1. Comply with metal shingle and underlayment manufacturers' written installation instructions and with recommendations in NRCA's "The NRCA Roofing Manual: Steep-Slope Roof Systems" applicable to products and applications indicated unless more stringent requirements are specified in this Section or indicated on Drawings.

Retain "Asphalt-Saturated Felt" Paragraphparagraph below if required. Because of metal shingles' long service lives, NRCA recommends using polymer-modified bitumen sheet instead of felt underlayment. Verify recommendations of local installers and metal shingle manufacturers.

* + - * 1. Asphalt-Saturated Felt: Install on roof deck parallel with and starting at eaves and fasten with underlayment nails.

Retain "Single-Layer Installation" or "Double-Layer Installation" Subparagraphsubparagraph below to suit Project. The IBC BCNYS and the IRC RCNYS require double layers for slopes less than 4:12 where the limiting design wind speed is equal to or greater than 140 mph (63 m/s).

Single-Layer Installation:

Usually, retain first option in first subparagraph below for 2-inch- (51-mm-) minimum side laps, except for where the limiting design wind speed is equal to or greater than 140 mph (63 m/s). In that case, the IBC BCNYS and the IRC RCNYS require at least 4-inch (102-mm) side laps. Verify requirements of authorities having jurisdiction.

Lap sides a minimum of [**2 inches (51 mm)] [4 inches (102 mm**)] over underlying course.

Lap ends a minimum of 4 inches (102 mm).

Stagger end laps between succeeding courses at least 72 inches (1829 mm).

Side lap and starter course dimensions in "Double-Layer Installation" Subparagraphsubparagraph below are based on 36-inch-- (914-mm-) wide rolls of felt underlayment and are needed to maintain double-layer felt underlayment coverage with 2 inches (51 mm) to spare. Verify requirements of authorities having jurisdiction.

Double-Layer Installation:

Install a 19-inch- (483-mm-) wide starter course at eaves and completely cover with a 36-inch- (914-mm-) wide second course.

Install succeeding 36-inch- (914-mm-) wide courses lapping previous courses 19 inches (483 mm) in shingle fashion.

Lap ends a minimum of 4 inches (102 mm).

Stagger end laps between succeeding courses at least 72 inches (1829 mm)..

Retain first subparagraph below if cemented double layers of felt serve as water and ice-dam membranes or if required for additional protection. Self-adhering, polymer-modified bitumen sheet has largely replaced cemented double layers of felt as water and ice-dam protection.

Apply a continuous layer of asphalt roofing cement over starter course and on felt surface to be concealed by succeeding courses as each felt course is installed. Apply [**over entire roof] [at locations indicated on Drawings**].

Retain first subparagraph below if combining self-adhering, polymer-modified bitumen sheet and felt underlayment.

Install felt underlayment on roof deck not covered by self-adhering, polymer-modified bitumen sheet unless otherwise specified in this Section or indicated on Drawings.

Lap sides of felt over self-adhering sheet not less than 4 inches (102 mm) in direction that sheds water.

Lap ends of felt not less than 6 inches (152 mm) over self-adhering sheet underlayment.

Retain first subparagraph below for areas subject to high wind speeds. The IBC BCNYS requires fastening of underlayment in grid pattern described below where the basic design wind speed is equal to or greater than 140 mph (63 m/s). The IRC RCNYS requires the same fastening pattern where the ultimate design wind speed is equal to or greater than 140 mph (63 m/s).

Install fasteners in a grid pattern of 12 inches (305 mm) between side laps with 6-inch (152-mm) spacing at side and end laps.

Retain first option in subparagraph below if desired for areas where roof deck is covered by self-adhering, polymer-modified bitumen sheet against walls and other roof projections.

Terminate felt [**flush] [extended up not less than 4 inches (102 mm)] <Insert requirements**> against sidewalls, curbs, chimneys, and other roof projections.

* + - * 1. Synthetic Underlayment:

Install on roof deck parallel with and starting at the eaves.

Usually, retain first option in first subparagraph below for 2-inch- (51-mm-) minimum side laps, except for where the limiting design wind speed is equal to or greater than 140 mphh (63 m/s). In that case, the BCNYSIBC and the IRC RCNYS require at least 4-inch (102-mm) side laps. Verify requirements of manufacturers and authorities having jurisdiction.

Lap sides and ends and treat laps as recommended in writing by manufacturer, but not less than [2 inches (51 mm)] [4 inches (102 mm)] for side laps and 6 inches (152 mm) for end laps.

Stagger end laps between succeeding courses at interval recommended in writing by manufacturer, but not less than 72 inches (1829 mm).

Fasten with underlayment nails in accordance with manufacturer's written instructions.

Cover underlayment within period recommended in writing by manufacturer.

The IBC BCNYS and the IRC RCNYS require double layers of underlayment for slopes less than 4:12 where the limiting design wind speed is equal to or greater than 140 mph (63 m/s).

Install in double layer on roofs sloped at less than 4:12.

Retain first subparagraph below if combining self-adhering, polymer-modified bitumen sheet and synthetic underlayment.

Install synthetic underlayment on roof deck not covered by self-adhering, polymer-modified bitumen sheet unless otherwise specified in this Section or indicated on Drawings.

Lap sides of underlayment over self-adhering sheet not less than 4 inches (102 mm) in direction to shed water.

Lap ends of underlayment not less than 6 inches (152 mm) over self-adhering sheet.

Retain first subparagraph below for areas subject to high wind speeds. The IBC BCNYS requires fastening of underlayment in grid pattern described below where the basic design wind speed is equal to or greater than 140 mph (63 m/s). The IRC RCNYS requires the same fastening pattern where the ultimate design wind speed is equal to or greater than 140 mph (63 m/s).

Install fasteners in a grid pattern of 12 inches (305 mm) between side laps with 6-inch (152-mm) spacing at side and end laps.

Retain first option in subparagraph below if desired for areas where roof deck is covered with self-adhering, polymer-modified bitumen sheet against walls and other roof projections.

Terminate synthetic underlayment [**flush] [extended up not less than 4 inches (102 mm)] <Insert requirements>** against sidewalls, curbs, chimneys, and other roof projections.

Retain "Polymer-Modified Bitumen Sheet, Mechanically Fastened" Paragraphparagraph if required. NRCA's "The NRCA Roofing Manual: Steep-Slope Roof Systems" recommends using polymer-modified bitumen sheet.

* + - * 1. Polymer-Modified Bitumen Sheet, Mechanically Fastened: Install on roof deck parallel with and starting at eaves. Fasten with underlayment nails.

Retain "Single-Layer Installation" or "Double-Layer Installation" Subparagraphsubparagraph below to suit Project. The IBC BCNYS and the IRC RCNYS require double layers of underlayment for slopes less than 4:12 where the limiting design wind speed is equal to or greater than 140 mph (63 m/s).

Single-Layer Installation:

Usually, retain first option for 2-inch- (51-mm-) minimum side laps in first subparagraph below except for where the limiting design wind speed is equal to or greater than 140 mph (63 m/s). In that case, the IBC BCNYS and the IRC RCNYS require at least 4-inch (102-mm) side laps. Verify requirements of manufacturers and authorities having jurisdiction.

Lap sides a minimum of [**2 inches (51 mm)] [4 inches (102 mm**)] over underlying course.

Lap ends a minimum of 6 inches (152 mm).

Stagger end laps between succeeding courses at least 72 inches (1829 mm).

Double-Layer Installation:

Install in overlapping layers with a half-width plus 1-inch- (25-mm-) wide starter course at eaves completely covered by full-width second course. Install succeeding courses lapping previous courses by a half-width plus 1 inch (25 mm) in shingle fashion.

Lap ends a minimum of 6 inches (152 mm).

Stagger end laps between succeeding courses at least 72 inches (1829 mm).

Retain first subparagraph below if combining mechanically fastened, polymer-modified bitumen sheet with self-adhering, polymer-modified bitumen sheet.

Install mechanically fastened sheet on roof deck not covered by self-adhering, polymer-modified bitumen sheet unless otherwise specified in this Section or indicated on Drawings.

Lap sides of mechanically fastened sheets over self-adhering sheet not less than 4 inches (102 mm) in direction to shed water.

Lap ends of mechanically fastened sheets not less than 6 inches (152 mm) over self-adhering sheets.

Retain first subparagraph below for areas subject to high wind speeds. The IBC BCNYS requires fastening of underlayment in grid pattern described below where the basic design wind speed is equal to or greater than 140 mph (63 m/s). The IRC RCNYS requires the same fastening pattern where the ultimate design wind speed is equal to or greater than 140 mph (63 m/s).

Install fasteners in a grid pattern of 12 inches (305 mm) between side laps with 6-inch (152-mm) spacing at side and end laps.

Retain first option in subparagraph below if desired for area where roof deck is covered by self-adhering, polymer-modified bitumen sheet against walls and other roof projections.

Terminate sheets [flush] [extended up not less than 4 inches (102 mm)] <Insert requirements> against sidewalls, curbs, chimneys, and other roof projections.

Retain "Self-Adhering, Polymer-Modified Bitumen Sheet" Paragraphparagraph below if a single layer of self-adhering sheet is used as underlayment or as water and ice-dam protection.

* + - * 1. Self-Adhering, Polymer-Modified Bitumen Sheet: Install, wrinkle free, on roof deck.

Comply with low-temperature installation restrictions of underlayment manufacturer.

Install lapped in direction that sheds water.

Lap sides not less than 4 inches (102 mm).

Lap ends not less than 6 inches (152 mm), staggered 24 inches (610 mm) between succeeding courses.

Roll laps with roller.

Retain first subparagraph below if primer is required to enhance adhesion to concrete and masonry surfaces, such as chimneys or walls, and metal surfaces, such as valley flashing.

Prime concrete and masonry surfaces to receive self-adhering sheet underlayment.

Retain "Single-Layer Installation" Subparagraphsubparagraph below if self-adhering, polymer-modified bitumen sheet covers the entire roof deck.

Single-Layer Installation: Install over entire roof deck.

Retain "Water and Ice-Dam Protection Installation" Subparagraphsubparagraph below if a layer of self-adhering, polymer-modified bitumen sheet partially covers roof deck in areas vulnerable to moisture penetration; revise to suit Project.

Water and Ice-Dam Protection Installation: Install where indicated [below] [on Drawings].

Retain one or more of first eight subparagraphs below if locations are not indicated on Drawings. Revise to suit Project.

Eaves: Extend from edges of eaves [**24 inches (610 mm)] [36 inches (914 mm**)] <**Insert dimension**> beyond interior face of exterior wall.

Rakes: Extend from edges of rakes [**24 inches (610 mm)] [36 inches (914 mm)] <Insert dimension**> beyond interior face of exterior wall.

Verify requirements of authorities having jurisdiction for valley underlayment.

Valleys: Extend from lowest to highest point [**18 inches (457 mm)**] <**Insert dimension**> on each side of centerline.

Hips: Extend [**18 inches (457 mm)**] <**Insert dimension**> on each side.

Ridges: Extend [**36 inches (914 mm)**] <**Insert dimension**> on each side [**without obstructing continuous ridge vent slot**].

Sidewalls: Extend [**18 inches (457 mm)**] <**Insert dimension**> beyond sidewalls and return vertically against sidewalls not less than [**4 inches (102 mm)**] <**Insert dimension**>.

Dormers, Chimneys, Skylights, and Other Roof-Penetrating Elements: Extend [**18 inches (457 mm)**] <**Insert dimension**> beyond penetrating elements and return vertically against penetrating elements not less than [**4 inches (102 mm)**] <**Insert dimension**>.

Roof-Slope Transitions: Extend [**18 inches (457 mm)**] <**Insert dimension**> on each roof slope.

Cover underlayment within seven days.

Retain "Valley Underlayment" Paragraphparagraph below if required and if installing self-adhering, polymer-modified bitumen sheet is not specified for water and ice-dam protection at valleys. Paragraph is applicable if using felt or mechanically fastened, polymer-modified bitumen sheet underlayment; synthetic-underlayment manufacturers recommend using self-adhering, polymer-modified bitumen sheet for valley underlayment. Paragraph is based on IBC BCNYS requirements in areas where there is a possibility of ice forming along eaves causing a backup of water and on NRCA recommendations and IRC RCNYS requirements in all geographic areas. Verify requirements of authorities having jurisdiction.

* + - * 1. Valley Underlayment: Install one layer of 36-inch- (914-mm-) wide underlayment centered in valley, running full length of valley, and on top of underlayment on field of roof that is woven through valley. Install all layers of underlayment in and through valley tight with no bridging.

Use same underlayment as installed on field of roof.

Lap ends at least 12 inches (305 mm) in direction that sheds water, and seal with asphalt roofing cement.

Fasten to roof deck with underlayment nails located as far from valley center as possible and only to extent necessary to hold underlayment in place until installation of valley flashing.

SubparagraphSubparagraph below is based on IBC BCNYS and IRC RCNYS requirements for roof slopes less than 7:12 in areas where there is a possibility of ice forming along eaves causing a backup of water. Verify requirements of authorities having jurisdiction.

Solidly cement valley underlayment to roof-field underlayment that is woven through valley using asphalt roofing cement.

* + - 1. INSTALLATION OF SHEET METAL FLASHINGS AND TRIM
				1. Install metal flashings and trim in accordance with manufacturer's written instructions and recommendations in NRCA's "The NRCA Roofing Manual: Steep-Slope Roof Systems" unless more stringent requirements are specified in this Section or indicated on Drawings.

Install with minimum 4-inch (102-mm) end laps.

* + - 1. INSTALLATION OF RIDGE VENTS
				1. Install ridge vents with end closures at locations indicated on Drawings in accordance with manufacturers' written instructions unless more stringent requirements are specified in this Section or indicated on Drawings.
			2. INSTALLATION OF ACCESSORIES
				1. Install accessories in accordance with manufacturers' written instructions unless more stringent requirements are specified in this Section or indicated on Drawings.

Retain "Battens" Paragraphparagraph below if required. Revise paragraph if installation of wood battens is specified in Section 061000 "Rough Carpentry" or Section 061053 "Miscellaneous Rough Carpentry" or if installation of metal battens is specified in Section 054000 "Cold-Formed Metal Framing."

Requirements for battens vary with roof assembly construction, shingle size, and metal shingle manufacturer's recommendations. Insert subparagraphs for counter battens if required. Battens are normally installed horizontally, perpendicular to roof-deck slope and parallel to eaves. Counter battens are normally installed vertically, parallel to roof-deck slope and parallel to rakes.

* + - * 1. Battens: Install battens in accordance with metal shingle manufacturer's written instructions.

Wood Battens: Install wood battens horizontally over installed underlayment with ends separated by 1/2 inch (13 mm), at spacing required by metal shingle manufacturer, and securely fasten to roof deck with wood batten nails.

Metal Battens: Install metal battens horizontally over installed underlayment with ends separated by 1/2 inch (13 mm), at spacing required by metal shingle manufacturer, and securely fasten to roof deck with sheet metal fasteners.

* + - * 1. Metal Protection: Where dissimilar metals contact each other, protect against galvanic action by painting contact surfaces with bituminous coating, by applying self-adhering, polymer-modified bitumen sheet to each contact surface, or by other means of permanent separation recommended in writing by manufacturer of metal shingles or of the metals in contact.
			1. INSTALLATION OF METAL SHINGLES
				1. Install metal shingles in accordance with manufacturer's written instructions true in line.
				2. Maintain uniform exposure and coursing of metal shingles throughout roof.
				3. Apply sealant between shingles, flashing, trim, and exposed fasteners to achieve a weathertight system.

Generally, retain first option in first paragraph below. Retain second option only if aligning vertical joints of tile-form shingle panels.

* + - * 1. Interlock and overlap shingles, and [**stagger end joints from**] [**align joints of tile-form**] shingle courses above and below.
				2. Metal Protection: Where dissimilar metals contact each other, protect against galvanic action by painting contact surfaces with bituminous coating, by applying self-adhering, polymer-modified bitumen sheet to each contact surface, or by other means of permanent separation recommended in writing by manufacturer of metal shingles or of the metals in contact.

Retain subparagraph below if required to prevent galvanic corrosion between graphite and aluminum or aluminum-zinc alloy coated steel. See "Metal Considerations" Article in the Evaluations.

Do not use graphite pencils to mark metal surfaces.

* + - 1. ADJUSTING
				1. Remove and replace damaged or deformed metal shingles. Replace shingles with damaged or deteriorated finishes and other components of the Work that cannot be successfully repaired by finish touchup or similar minor repair procedures.
				2. Remove temporary protective coverings and strippable films as metal shingles are installed unless otherwise indicated in manufacturer's written installation instructions.
				3. On completion of installation, touch up minor nicks and abrasions in finish, in accordance with manufacturer's written instructions.
				4. Remove excess sealants.
			2. ROOFING INSTALLER'S WARRANTY

Retain this article if required. Revise to include another Roofing Installer's Warranty form or as advised by Owner'sDirector’s Representative. counsel. Coordinate with "Warranty" Article.

* + - * 1. WHEREAS <**Insert name**> of <**Insert address**>, herein called the "Roofing Installer," has performed roofing and associated work ("the work") on the following project:

Owner Director’s Representative: <**Insert name of Owner Director’s Representative**>.

Owner Director’s Representative Address: <**Insert address**>.

Building Name/Type: <**Insert information**>.

Building Address: <**Insert address**>.

Area of the Work: <**Insert information**>.

Acceptance Date: <**Insert date**>.

Warranty Period: <**Insert time**>.

Expiration Date: <**Insert date**>.

* + - * 1. AND WHEREAS Roofing Installer has contracted (either directly with Owner Director’s Representative or indirectly as a subcontractor) to warrant the work against leaks and faulty or defective materials and workmanship for designated Warranty Period,
				2. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that, during Warranty Period, Roofing Installer will, at Roofing Installer's own cost and expense, make or cause to be made such repairs to or replacements of the work as are necessary to correct faulty and defective work and as are necessary to maintain the work in a watertight condition.
				3. This Warranty is made subject to the following terms and conditions:

Specifically excluded from this Warranty are damages to the work and other parts of the building, and to building contents, caused by:

Lightning;

Insert required wind speed in first subparagraph below.

Peak gust wind speed exceeding <**Insert wind speed**> mph (m/s);

Fire;

Failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;

Faulty construction of copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;

Vapor condensation on bottom of roofing; and

Activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner Director’s Representative.

When the work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner Director’s Representative or by another responsible party so designated.

Roofing Installer is responsible for damage to the work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of the work.

During Warranty Period, if Owner Director’s Representative allows alteration of the work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of the alterations, but only to the extent the alterations affect the work covered by this Warranty. If Owner Director’s Representative engages Roofing Installer to perform the alterations, Warranty shall not become null and void unless Roofing Installer, before starting the alterations, notified Owner Director’s Representative r in writing, showing reasonable cause for claim, that the alterations would likely damage or deteriorate the work, thereby reasonably justifying a limitation or termination of this Warranty.

During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a use or service more severe than originally specified, this Warranty shall become null and void on date of the change, but only to the extent the change affects the work covered by this Warranty.

Owner Director’s Representative shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect the work and to examine evidence of such leaks, defects, or deterioration.

This Warranty is recognized to be the only warranty of Roofing Installer on the work and shall not operate to restrict or cut off Owner Director’s Representative from other remedies and resources lawfully available to Owner Director’s Representative in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of the work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner Director’s Representative or a subcontract with Owner's Director’s Representative General Contractor.

* + - * 1. IN WITNESS THEREOF, this instrument has been duly executed this <**Insert day**> day of <**Insert month>, <Insert year**>.

Authorized Signature: <**Insert signature**>.

Name: <**Insert nam**e>.

Title: <**Insert title**>.

END OF SECTION 073116