SECTION 07 41 13 METAL ROOF PANELS

OR

SECTION 07 61 13 STANDING SEAM SHEET METAL ROOFING

To view hidden notes to specified, select “hidden text” via File—Options—Display.

Prepared by Gulf Coast Supply and Manufacturing, LLC

October 2017

Note to Specifier: Edit this specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information. Un-bold text after the appropriate selections have been made.

Remove information and requirements not required in respective project. Remove all red-text note areas such as this one.

Coordinate this section with other system components specifications such as framing, decking, insulation and sheet metal flashing.

# PART 1 GENERAL

1. SECTION INCLUDES
   1. Roll-formed metal roof panels and related flashing/trim, sealant, and other accessories to provide complete roofing system.
2. RELATED REQUIREMENTS

Note to Specifier: If retaining this optional section, select/add the appropriate CSI references below to correspond to the project.

* 1. Division 5 Section “Cold-Formed Metal Framing” for cold-formed metal framing structure supporting the metal roof.
  2. Division 5 Section “Structural Steel Framing” for steel frame structure supporting the metal roof.
  3. Division 7 Section “Sheet Metal Flashing and Trim” for flashing items not covered in this section.

1. REFERENCES

Note to Specifier: If retaining this optional section, edit the list below to correspond to the project.

* 1. American Society of Civil Engineers (ASCE)
     1. ASCE 7 Minimum Design Loads for Buildings and Other Structures
  2. ASTM International (ASTM)
     1. ASTM A792/A792M Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
     2. ASTM A924/A924M Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
     3. ASTM B117 Standard Practice for Operating Salt Spray (Fog) Apparatus
     4. ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
     5. ASTM C920 Standard Specification for Elastomeric Joint Sealants
     6. ASTM D1308 Effect of Household Chemicals on Clear and Pigmented Organic Finishes
     7. ASTM D1970/D1970M Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection
     8. ASTM D2244 Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates
     9. ASTM D2247 Testing Water Resistance of Coatings in 100% Relative Humidity
     10. ASTM D2794 Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
     11. ASTM D3359 Standard Test Methods for Rating Adhesion by Tape Test
     12. ASTM D3363 Film Hardness by Pencil Test
     13. ASTM D4214 Standard Test Method for Evaluating the Degree of Chalking of Exterior Paint Films
     14. ASTM D4587 Standard Practice for Fluorescent UV-Condensation Exposures of Paint and Related Coatings
     15. ASTM D522/D522M Mandrel Bend Test of Attached Organic Coatings
     16. ASTM D523 Standard Test Method for Specular Gloss
     17. ASTM D610 Evaluating Degree of Rusting on Painted Steel Surfaces
     18. ASTM D822 Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings
     19. ASTM D968 Abrasion Resistance of Organic Coatings by Falling Abrasive
     20. ASTM E1592 Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference
     21. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials
     22. ASTM G152 Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials
     23. ASTM G153 Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials
  3. Metal Building Manufacturers Association (MBMA):
     1. MBMA RSDM Metal Roofing Systems Design Manual
  4. National Roofing Contractrors Association (NRCA)
     1. NRCA 0420 Architectural Metal Flashing, Condensation Control and Reroofing
     2. NRCA RoofMan The NRCA Roofing Manual
  5. Sheet Metal and Air Conditioning Contractor’s National Association (SMACNA)
     1. SMACNA Architectural Sheet Metal Manual
  6. Underwriter’s Laboratory (UL)
     1. UL 580 Tests for Uplift Resistance of Roof Assemblies

1. PREINSTALLATION MEETINGS

Note to Specifier: Include this section only if a pre-installation/pre-construction meeting will be required.

* 1. After approval of submittals and before performing roofing system installation work, hold a pre-roofing conference to review the following:
     1. Drawings, specifications, and submittals related to the roof work.
     2. Submit, as a minimum; sample profiles of roofing panels, with factory-applied color finish samples, flashing and accessories, typical fasteners and pressure sensitive tape, sample gaskets and sealant/insulating compounds. Also include manufacturer's installation manual.
     3. Roof system installation;
     4. Procedure for the roof manufacturer's technical representative's onsite inspection and acceptance of the roofing substrate, the name of the manufacturer's technical representatives, the frequency of the onsite visits, distribution of copies of the inspection reports from the manufacturer's technical representative;
     5. Contractor's plan for coordination of the work of the various trades involved in providing the roofing system and other components secured to the roofing; and
     6. Quality control plan for the roof system installation;
     7. Safety requirements.

1. SUBMITTALS

Note to Specifier: Edit this list to meet the needs of the project.

* 1. Shop Drawings
     1. Roofing Panels
     2. Flashing and Accessories
     3. Gutter/Downspout Assembly
  2. Product Data: Submit manufacturer's catalog data for the following items:
     1. Roof Panels
     2. Factory-Applied Color Finish
     3. Accessories
     4. Fasteners
     5. Underlayment
     6. Gaskets and Sealing/Insulating Compounds
  3. Samples
     1. Roof Panels
     2. Factory-applied Color Finish, Samples
  4. Manufacturer's Instructions
     1. Installation Manual
  5. Closeout Submittals
     1. Warranties

1. QUALITY ASSURANCE
   1. Qualification of Manufacturer: Submit documentation verifying metal roof panel manufacturer has been in the business of manufacturing metal roof panels for a period of not less than 10 years.

Note to Specifier: Manufacturer’s Technical Representative is typically only required for weathertight warranty jobs.

* 1. Manufacturer's Technical Representative: The manufacturer's technical representative must be thoroughly familiar with the products to be installed, installation requirements and practices, and with any special considerations in the geographical area of the project. The representative must perform field inspections and attend meetings as specified herein.
  2. Single Source: Roofing panels, fasteners, clips, closures, and other accessories must be standard products supplied by the manufacturer, and the most recent design of the manufacturer to operate as a complete system for the intended use.
  3. Qualification of Installer: Metal roof system installer must be licensed in the state or municipality where the project will take place, and shall be factory trained by the manufacturer. Installer shall have a minimum of three years’ experience installing the specified roof system. Supply the names, locations and client contact information of 5 projects of similar size and scope constructed by applicator using the manufacturer's roofing products submitted for this project within the previous three years.

1. DELIVERY, STORAGE, AND HANDLING
   1. Deliver, store, and handle panel materials, bulk roofing products, accessories, and other manufactured items in a manner to prevent damage and deformation, as recommended by the manufacturer, and as specified.
   2. Delivery: Package and deliver materials to the site in undamaged condition. Provide adequate packaging to protect materials during shipment. Do not uncrate materials until ready for use, except for inspection. Immediately upon arrival of materials at jobsite, inspect materials for damage, deformation, dampness, and staining. Remove affected materials from the site and immediately replace. Remove moisture from wet materials not otherwise affected, restack and protect from further moisture exposure.
   3. Handling: Handle materials in a manner to avoid damage. Select and operate material handling equipment so as not to damage materials or applied roofing.
   4. Storage: Stack materials stored on site on platforms or pallets, and cover with tarpaulins or other weathertight covering which prevents trapping of water or condensation under the covering. Store roof panels so that water which may have accumulated during transit or storage will drain off. Do not store panels in contact with materials that might cause staining. Secure coverings and stored items to protect from wind displacement.
2. WARRANTY
   1. Furnish the metal roof panel manufacturer's warranty as described below and subject to the applicable terms, conditions, and exclusions:

Note to Specifier: Select the appropriate warranty(ies) below and remove the non-applicable items

* + 1. **[Steel Substrate: Warrant that steel substrate will not as a result of corrosion rupture, fail structurally, or perforate for a period of 25 years. ]**
    2. **[Kynar/polyvinylidene fluoride (PVDF) Paint System: Warrant that the paint system shall not fade more than 5 Hunter BE units as measured by ASTM D D2244 or chalk more than a number 8 rating as measured by ASTM D 4214 for a period of 30 years. Warrant that the paint system will not chip, crack, peel, flake, or otherwise lose adhesion for a period of 35 years.]**
    3. **[Silicone modified polyester (SMP) Paint System: Warrant that the paint system shall not fade more than 7 Hunter BE units as measured by ASTM D D2244 or chalk more than a number 6 rating as measured by ASTM D 4214 for a period of 30 years. Warrant that the paint system will not chip, crack, peel, flake, or otherwise lose adhesion for a period of 40 years.]**
    4. **[OceanGuard Aluminum: Warrant that the paint system shall not fade more than 5 Hunter BE units as measured by ASTM D D2244 or chalk more than a number 8 rating as measured by ASTM D 4214 for a period of 25 years. Warrant that the paint system will not chip, crack, peel, flake, or otherwise lose adhesion for a period of 25 years. Warrant that the aluminum substrate will not as a result of corrosion rupture, fail structurally, or perforate for a period of 20 years.]**
  1. Provide roof system installer warranty for a period of not less than **[two][five]** years that the roof system, as installed, is free from defects in installation workmanship, to include the roof panel installation, flashing, accessories, attachments, and sheet metal installation integral to a complete watertight roof system assembly. Correction of defective workmanship and replacement of damaged or affected materials is the responsibility of the metal roof system installer. All costs associated with the repair or replacement work are the responsibility of the installer.

Note to Specifier: Include only if weathertight warranty is required.

* 1. **[**Weathertight Warranty: Provide a manufacturer's **[no-dollar-limit] [20 year]** warranty for the roofing system guaranteeing that the roof system shall remain weathertight for the duration of the warranty term, subject to the terms, conditions, and exclusions of the warranty program**.]**
  2. Continuance of Warranty: Repair or replacement work that becomes necessary within the warranty period must be approved, as required, and accomplished in a manner so as to restore the integrity of the roof system assembly and validity of the metal roof system manufacturer warranty for the remainder of the warranty period.

1. CONFORMANCE AND COMPATABILITY
   1. The entire metal roofing and flashing system must be in accordance with specified and indicated requirements, including wind requirements. Work not specifically addressed and any deviation from specified requirements must be in general accordance with recommendations of the MBMA RSDM, NRCA RoofMan, the metal panel manufacturer's published recommendations and details, and compatible with surrounding components and construction. Submit any deviation from specified or indicated requirements to the project manager for approval prior to installation.

# PART 2 PRODUCTS

1. MANUFACTURER
   1. Basis of Design Manufacturer: Gulf Coast Supply and Manufacturing, LLC; Newberry, FL. Tel: 888-393-0335 | Email: [info@gulfcoastsupply.com](mailto:info@gulfcoastsupply.com) | Web: [www.gulfcoastsupply.com](http://www.gulfcoastsupply.com)

Note to Specifier: Select the appropriate panel and thickness below; remove the non-applicable items.

* + 1. **[29ga steel][26ga steel] GulfRib, through fastened panel with ¾” tall rib on 9” centers and (2) miniribs between each primary rib. 36” coverage. [Seal side laps with approved sealant.]**
    2. **[26ga steel][032 aluminum] 5VCrimp, through fastened panel with 7/16” tall rib on 12” centers and striated flat between primary ribs. 24” coverage. [Seal side laps with approved sealant.]**
    3. **[26ga steel][24ga steel] GulfPBR, through fastened panel with 1-¼” tall rib on 12” centers and (2) miniribs between each primary rib. 36” coverage. [Seal side laps with approved sealant.]**
    4. **[26ga steel] GulfWave, through fastened panel with ¾” deep corrugation. 29” coverage. [Seal side laps with approved sealant.]**
    5. **[26ga steel][24ga steel][032 aluminum][040 aluminum] GulfLok, nailstrip, snaplock, clipless panel with 1-½” tall rib and striated flat. [12][16]” coverage. [Seal side laps with approved sealant.]**
    6. **[24ga steel][032 aluminum][040 aluminum] GulfSeam, snaplock, clip system with 1-¾” tall rib and striated flat. [14][16][18]” coverage.**
    7. **[24ga steel][032 aluminum][040 aluminum] VersaLoc, mechanical seam clip system with 1-½” tall rib and striated flat. [14][16][18]” coverage.**
    8. **[24ga steel][032 aluminum][040 aluminum] MegaLoc, mechanical seam clip system with 2” tall rib and striated flat. [14][16][18]” coverage.**

1. PERFORMANCE REQUIREMENTS
   1. Material:
      1. Steel panels and accessory components must conform to the following standard(s): ASTM A792 and ASTM A924
      2. Aluminum panels and accessory components must conform to the following standard(s): ASTM B209
   2. Wind Uplift
      1. Provide metal roof panel system tested according to ASTM E1592 and/or UL 580. Uplift force due to wind action governs the design for panels. Roof system and attachments must resist the wind loads as determined by ASCE 7, in pounds per square foot.
2. METAL ROOF PANEL ACCESSORIES

Accessories must be compatible with the metal roof panels. Sheet metal flashing, trim, metal closure strips, caps, and similar metal accessories must be not less than the minimum thicknesses specified for roof panels. Provide exposed metal accessories to match the panels furnished**[**, except as otherwise indicated**]**. Molded foam rib, ridge and other closure strips must be closed-cell or solid-cell synthetic rubber or neoprene premolded to match configuration of the panels and not absorb or retain water. Pre-manufactured accessories must be manufacturer's standard for intended purpose, compatible with the metal roof system and approved for use by the metal roof panel manufacturer. Support all rooftop equipment/peentrations with curbs designed to structurally support the intended use. Construct curbs to match roof slope.

* 1. Fasteners:

Note to Specifier: Remove the items below which do not apply. Select the appropriate material for each item retained.

* + 1. Exposed Fasteners: Fasteners for roof panels must be corrosion resistant **[coated steel][aluminum][stainless steel]**, compatible with the sheet panel or flashing material and of the type and size recommended by the manufacturer to meet the performance requirements and design loads. Fasteners for accessories must be the manufacturer's standard. Provide an integral metal washer, matching the color of attached material with compressible sealing EPDM gasket.
    2. Screws: Provide corrosion resistant screws, **[coated steel][aluminum][stainless steel]** of the type and size recommended by the manufacturer to meet the performance requirements.
    3. Rivets: Provide blind rivets, corrosion resistant **[coated steel][aluminum][stainless steel]**, and color matched. Seat rivets in silicone caulk where watertight connections are required.
    4. Clips: Provide **[hot-dip galvanized, conforming to ASTM A653/A653M, ][stainless steel]** clips. Size, shape, thickness and capacity must meet the thickness and design load criteria specified.
  1. Sealants: Sealants are to be an approved gun type for use in hand or air pressure caulking guns with a minimum solid content of 85 percent of the total volume. Sealant must dry with a tough, durable surface skin which permits it to remain soft and pliable underneath, providing a weather tight joint. Shall be tested in accordance with ASTM C920.
     1. Field Applied Sealants: Sealants for field-applied caulking must be an approved gun grade, non-sag on-component polysulfide or two component polyurethane with an initial maximum Shore A durometer hardness of 25, conforming to ASTM C920, Type II. Color to match panel color.
     2. Tape Sealants: Provide pressure sensitive, 100 percent solid tape sealant with a release paper backing; permanently elastic, non-sagging, non-toxic and non-staining as approved by the roof panel manufacturer.
  2. Sheet Metal Flashing and Trim: Custom fabricate sheet metal flashing and trim to comply with recommendations within the SMACNA that apply to design, dimensions, metal type, and other characteristics of design indicated. Shop fabricate items to the greatest extent possible. Obtain and verify field measurements for accurate fit prior to shop fabrication. Fabricate flashing and trim without excessive oil canning, buckling, and tool marks, true to line and levels indicated, with exposed edges folded back to form hems.

Note to Specifier: This spec is written with self-adhering underlayment as the standard. Other underlayment types may be suitable based on project specifics—replace this item with the alternative material as appropriate.

* 1. Underlayment: Provide self-adhering modified underlayment material in compliance with ASTM D1970/D1970M, suitable for use as underlayment for metal roofing. Use membrane resistant to cyclical elevated temperatures for extended period of time in high heat service conditions. Provide membrane with integral non-tacking top surface of polyethylene film or other surface material to serve as separator between bituminous material and metal products to be applied above.
  2. Gaskets: Gaskets and sealing/insulating compounds must be nonabsorptive and suitable for insulating contact points of incompatible materials. Sealing/insulating compounds must be non-running after drying.
  3. Finish Repair Materials: Repair paint for color finish enameled roofing must be compatible paint of the same formula and color as the specified finish furnished by the manufacturer. Only use repair and touch-up paint supplied by the roof panel manufacturer and is compatible with the specified system.

1. FABRICATION
   1. Fabricate and finish metal roof panels and accessories on a factory stationary roll former to the greatest extent possible, per manufacturer's standard procedures and processes, and as necessary to fulfill indicated performance requirements. Comply with indicated profiles, dimensional and structural requirements.
2. FINISHES
   1. Finish quality and application processes must conform to the related standards specified within this section. Noticeable variations within the same piece are not acceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved samples and are assembled or installed to minimize any contrasting variations.
   2. All panels are to receive a factory applied **[polyvinylidene fluoride/Kynar (PVDF)] [silicone modified polyester (SMP)]** finish consisting of a baked topcoat with a manufacturer's recommended prime coat conforming to the following:
      1. Color: The exterior finish chosen from the manufacturer's standard color chart.
      2. Physical Properties: Coating must conform to the industry and manufacturer's standard performance criteria as listed by the following certified test reports:
         1. Abrasion: ASTM D968
         2. Adhesion: ASTM D3359
         3. Chemical Pollution: ASTM D1308
         4. Flame Spread: ASTM E84
         5. Flexibility: ASTM D522
         6. Formability: ASTM D522
         7. Specular Gloss: ASTM D523
         8. Humidity: ASTM D2247
         9. Pencil Hardness: ASTM D3363
         10. Reverse Impact: ASTM D2794
         11. Salt Spray: ASTM B117
         12. Weatherometer: ASTM G152, ASTM G153 and ASTM D822 or ASTM D3361, ASTM D4587, and ASTM G23

# PART 3 EXECUTION

1. EXAMINATION
   1. Examine substrates, areas, and conditions for compliance with requirements for installation tolerances, metal roof panel supports, and other conditions affecting performance of the work. Ensure surfaces are suitable, dry and free of defects and projections which might affect the installation.
   2. Examine primary and secondary roof framing to verify that rafters, purlins, angels, channels, and other structural support members for panels and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer, UL, ASTM, and ASCE 7.
   3. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking; and that installation is within flatness tolerances required by metal roof panel manufacturer, or total variation less than ±1/2” from line of true slope in 10’.
   4. Examine rough-in for components and systems penetrating metal roof panels to verify actual locations of penetrations relative to seam locations of panels prior to installation.
   5. Submit a written report to the project manager listing conditions detrimental to the performance of the work. Proceed with installation only after defects have been corrected or the impacts identified have been accepted in writing.
2. METAL PANEL INSTALLATION
   1. Installation must meet specified requirements and be in accordance with the manufacturer's installation instructions and approved shop drawings. Do not install damaged materials. Dissimilar materials which are not compatible when contacting each other must be insulated by means of gaskets or sealing/insulating compounds. Keep all exposed surfaces and edges clean and free from sealant, metal cuttings, hazardous burrs, and other foreign material. Remove stained, discolored, or damaged materials from the site.
   2. Preparation:
      1. Clean all substrate substances which may be harmful to roof panels including removing projections capable of interfering with roof panel attachment.
      2. Install sub-purlins, eave angles, furring, decking, and other miscellaneous roof panel support members and anchorage according to manufacturer's written instructions, the project design, and applicable codes.
   3. Underlayment:
      1. Install underlayment according to the underlayment manufacturer’s written recommendations, the roof panel manufacturer's written recommendations and recommendation in NRCA "The NRCA Roofing and Waterproofing Manual".
      2. Show the extent and location of the appropriate underlayment on the drawings. The underlayment must ensure that any water penetrating below the roof panels will drain outside of the building envelope.
      3. Install self-adhering sheet underlayment; wrinkle free on roof deck. Comply with temperature installation restrictions of manufacturer where applicable. Install at locations indicated on project drawings, lapped in a direction to shed water. Lap sides not less than 4 inches. Lap ends not less than 6 inches staggered 24 inches between courses. Cover underlayment within 30 days
   4. Metal Panel Installation
      1. Provide metal roof panels of full length from eave to ridge or eave to wall as indicated, unless otherwise indicated or restricted by shipping limitations. Anchor metal roof panels or other components of the Work securely in place, with provisions for thermal and structural movement in accordance with NRCA 0420. Use approved fasteners and clips as required by section 2.3.
      2. Metal Protection: Where dissimilar metals contact each other or possibly corrosive substrates, protect against galvanic action by **[coating contact surfaces with a bituminous coating][applying rubberized asphalt underlayment to each contact surface][permanent separation].**
      3. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and required for weatherproof performance of metal roof panel system. Provide types of gaskets, fillers, and sealants indicated or, if not indicated, types recommended by metal roof panel manufacturer.
      4. Handling and Erection
         1. Erect roofing system in accordance with the approved erection drawings, printed instructions and safety precautions of the manufacturer.
         2. Do not subject panels to overloading, abuse, or undue impact. Do not apply bent, chipped, or defective panels. Damaged panels must be replaced and removed from the site at the contractors expense. Erect panels true, plumb, and in exact alignment with the horizontal and vertical edges of the building, securely anchored, and with indicated rake, eave, and curb overhang. Allow for thermal movement of the roofing, movement of the building structure, and provide permanent freedom from noise due to wind pressure.
         3. Do not permit storage, walking, wheeling or trucking directly on applied roofing materials. Provide temporary walkways, runways, and platforms of smooth clean boards or planks as necessary to avoid damage to the installed roofing materials, and to distribute weight to conform to the indicated live load limits of the roof construction.
         4. Roof panels must be laid with corrugations in the direction of the roof slope. End laps of exterior roofing must not be less than 12 inches; side laps of standard exterior corrugated panels must not be less than 2-1/2 corrugations (or one rib for rib or PBR type panels)
         5. Field cutting of metal roof panels by torch or abrasive blades is not permitted. Field cut only as recommended by manufacturer's written instructions.
      5. Closure Strips
         1. Install closure strips at open ends of metal ridge rolls; open ends of corrugated or ribbed pattern roofs, and at intersection of wall and roof, unless open ends are concealed with formed eave flashing; rake of metal roof unless open end has a formed flashing member; and in other required areas.
         2. Install closure strips at intersection of the wall with metal roofing; top and bottom of metal siding; heads of wall openings; and in other required locations.
      6. Workmanship
         1. Make lines, arises, and angles sharp and true. Free exposed surfaces from any visible wave, warp, buckle and tool marks. Make sheet metal exposed to the weather watertight with provisions for expansion and contraction.
         2. Make surfaces to receive sheet metal plumb and true, clean, even, smooth, dry, and free of defects and projections which might affect the application. For installation of items not shown in detail or not covered by specifications conform to the applicable requirements of SMACNA. Provide sheet metal flashing in the angles formed where roof decks abut walls, curbs, ventilators, pipes, or other vertical surfaces and wherever indicated and as necessary to make the work watertight.
3. ACCESSORY INSTALLATION
   1. Fastener Installation: Anchor metal roof panels and other components of the Work securely in place, using approved fasteners according to manufacturer's written instructions.
   2. Flashing, Trim, and Closure Installation
      1. Comply with performance requirements, manufacturer's written installation instructions, and SMACNA. Provide concealed fasteners where possible. Set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently water tight and weather resistant. Work is to be accomplished to form weather tight construction without waves, warps, buckles, fastening stresses or distortion, and to allow for expansion and contraction. Cutting, fitting, drilling, and other operations in connection with sheet metal required to accomplish the work must conform to the manufacturers written instructions.
      2. Install exposed metal flashing at building corners, rakes, eaves, junctions between metal siding and roofing, valleys and changes off slope or direction in metal roofing, building expansion joints and gutters.
      3. Exposed metal flashing must be the same material, color, and finish as the specified metal roofing panels. Lap ends of flashing minimum of 4” and seal with approved joint sealant. Box out ends of flashing where required and provide rivets at corners and as required to create a stable and weathertight system.
      4. Fasten flashing at not more than 12 inches on center for roofs, except where flashing is held in place by the same screws used to secure panels. Exposed flashing and flashing subject to rain penetration must be bedded in specified joint sealant. Flashing which is contact with dissimilar metals must be isolated by means of the specified asphalt mastic material to prevent electrolytic deterioration.
4. FIELD QUALITY CONTROL
   1. ACCEPTANCE PROVISIONS
      1. Erection Tolerances: Erect metal roofing straight and true with plumb vertical lines correctly lapped and secured in accordance with the manufacturer's written instructions. Variation in coverage (“stretching” or “compressing” the panel width) not to exceed ±1/16” per panel and accumulated variation not to exceed ±1:500 (2.4” in 100’). Total combined deviation from true due to fanning/dogleg shall not exceed panel length divided by 500 (±L/500).
   2. Leakage Tests
      1. Finished application of metal roofing is to be subject to inspection and test for leakage by the Project Manager or designated representative, and Architect/Engineer.
      2. Inspection and testing is to be made promptly after erection to permit correction of defects and removal/replacement of defective materials.
   3. Repairs to Finish
      1. Scratches, abrasions, and minor surface defects of finish may be repaired with the specified repair materials and as recommended by the metal roof panel manufacturer. Repaired metal surfaces that are not acceptable to the project requirements are to be immediately removed and replaced with new material.
5. CLEANING AND PROTECTION
   1. Clean exposed sheet metal work at completion of installation. Remove metal shavings, filings, nails, bolts, and wires from roofs. Remove grease and oil films, excess sealants, handling marks, contamination from steel wool, fittings and drilling debris and scrub the work clean. Exposed metal surfaces must be free of dents, creases, waves, scratch marks, solder or weld marks, and damage to the finish coating. Touch up scratches in panel finish with manufacturer supplied touch-up paint system to match panel finish. **[Treat exposed cut edges with manufacturer supplied [clear][\_\_\_\_\_] coat.]**
   2. Collect all scrap/waste materials and place in containers. Promptly dispose of demolished and scrap materials.
   3. Do not permit storing, walking, wheeling, and trucking directly on applied roofing/insulation materials. Provide temporary walkways, runways, and platforms of smooth clean boards or planks as necessary to avoid damage to applied roofing/insulation materials, and to distribute weight to conform to indicated live load limits of roof construction.