

SECTION 07 6100

SHEET METAL ROOFING

This section includes editing notes to assist the user in editing the section to suit project requirements. These notes are included as hidden text, and can be revealed or hidden by one of the following methods:

Microsoft Word 2007: Click the OFFICE button, select WORD OPTIONS, select DISPLAY, then select or deselect the HIDDEN TEXT option.

Microsoft Word (earlier versions): From the pull-down menus select TOOLS, then OPTIONS. Under the tab labeled VIEW, select or deselect the HIDDEN TEXT option.

Corel WordPerfect: From the pull-down menus select VIEW, then select or deselect the HIDDEN TEXT option.

This guide specification section has been prepared by Ultra Seam and Tophat Framing Systems for use in the preparation of a project specification section covering the US200 and US175LS structural standing seam sheet metal roofing systems with related flashing and trim, fabricated from aluminum-zinc alloy coated steel, (Galvalume), aluminum, galvanized steel, or stainless steel.

Two types of metal roofing are available:

US200 System: Standing seam profile, mechanically seamed, formed using portable roll-forming equipment.

US175LS System: Standing seam profile, snap-lock with interlocking seams.

This specification section is intended for use in conjunction with Tophat's light gage steel retrofit framing system for use over existing metal roof assemblies. This approach includes both framing and metal roof panels for a single source, engineered, warranted roofing package. For this combined system utilize both this section and Section 05 4600 - Retrofit Steel Roof Framing System, available from Tophat Framing Systems.

The following should be noted in using this specification:

Hypertext links to specific websites are included after manufacturer names and names of organizations whose standards are referenced within the text, to assist in product selection and further research. Hypertext links are underlined and contained in parenthesis, e.g.:

(www.astm.org)

Optional text requiring a selection by the user is enclosed within brackets, e.g.: "Section [09 0000.] [____.]"

Items requiring user input are enclosed within brackets, e.g.: "Section [____ - ____]."

Optional paragraphs are separated by an "OR" statement, e.g.:

**** OR ****

"Green" requirements are included for projects requiring LEED certification, and are included as green text. For additional information on LEEDS, visit the U.S. Green Building Council website at www.usgbc.org.

For assistance on the use of the products in this section, contact Tophat Framing Systems by calling toll-free at 866-361-4141, by email at info@tophatframing.com, or visit their website at www.tophatframing.com.

Contact CSM Products & Solutions (or another licensed Ultra Seam manufacturer) by calling toll-free at 800-229-4276, by email at info@csmproductsonline.com, or visit their website at www.csmproductsonline.com.

PART 1 - GENERAL

1.1 SUMMARY

Edit the following paragraphs to include only those items specified in this section.

- A. Section Includes:
1. [Aluminum-zinc alloy coated steel (Galvalume)] [Aluminum] [Galvanized steel] [Stainless steel] roofing.
 2. Attachments, flashings, trim, closures, and accessories.

Coordinate the following paragraphs with other sections in the project manual.

- B. Related Sections:
1. Division 01: Administrative, procedural, and temporary work requirements.
 2. Section 05 4600 - Retrofit Steel Roof Framing System: Metal support framing [and insulation.]
 3. Section [07 2200 - Roof Insulation:] [__ ____ - _____.:] Insulation.
 4. Section [07 9200 - Joint Sealers.] [__ ____ - _____.]

1.2 REFERENCES

In the following paragraphs, retain only those reference standards that are used elsewhere in this section.

- A. American Society of Civil Engineers (ASCE) (www.asce.org):
1. 7 - Minimum Design Loads for Buildings and Other Structures.
 2. 8 - Specifications for the Design of Cold-Formed Stainless Steel Structural Members.
- B. ASTM International (ASTM) (www.astm.org):
1. A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 2. A666 - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
 3. A755/A755M - Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.
 4. A792/A792M - Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 5. B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.
 6. B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 7. C1371 - Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emissometers.
 8. D523 - Standard Test Method for Specular Gloss.
 9. D968 - Standard Test Methods for Abrasion Resistance of Organic Coatings by Falling Abrasive.
 10. D1308 - Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes.
 11. D2247 - Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.
 12. D2794 - Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
 13. D3359 - Standard Test Methods for Measuring Adhesion by Tape Test.
 14. D3363 - Standard Test Method for Film Hardness by Pencil Test.
 15. E84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
 16. E408 - Standard Test Methods for Total Normal Emittance of Surfaces Using Inspection-Meter Techniques.
 17. E1592 - Standard Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference.
 18. E1646 - Standard Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Differential.
 19. E1680 - Standard Test Method for Rate of Air Leakage Through Exterior Metal Panel Roof

- Systems.
 - 20. E1980 - Standard Practice for Calculating Solar Reflectance Index of Horizontal and Low-Sloped Opaque Surfaces.
 - 21. G53 - Practice for Operating Light- and Water-Exposure Apparatus (Fluorescent UV-Condensation Type) for Exposure of Nonmetallic Materials.
 - 22. D522 - Standard Test Methods for Mandrel Bend Test of Attached Organic Coatings.
- C. American Iron and Steel Institute (AISI) - Specifications for the Design of Cold-Formed Steel Structural Members.
- D. Underwriters Laboratories, Inc. (UL):
1. 580 - Tests for Uplift Resistance of Roof Assemblies.
 2. Roofing Materials Directory.

1.3 SYSTEM DESCRIPTION

- A. System Requirements:
1. Attached to supporting structure using concealed anchor clips designed to accommodate thermal movement and meeting UL90 requirements.
 2. Exposed fasteners permitted only at flashings, trim, panel fixing locations, and other points indicated on Shop Drawings.

Include the following for curved panels.

3. Form curved panels to required roof radius without stretching or crimping.
 4. Design roofing system in accordance with ASCE Specifications.
- B. Design Requirements; design roof system to withstand:
1. Live and dead loads in accordance with Building Code without damage, deformation, or failure.
 2. Minimum wind pressures in accordance with [ASCE 7,] [Building Code,] tested in accordance with ASTM E1592, with maximum deflection of L/180.
 3. Movement caused by an ambient temperature range of [120] [] degrees F and a surface temperature range of [160] [] degrees F.
- C. Performance Requirements:
1. Air leakage: Maximum 0.0038 CFM/SF, tested to ASTM E1680 at 6.24 PSF.
 2. Water leakage: None, tested to ASTM E1646 at 12.0 PSF.

1.4 SUBMITTALS

Limiting submittals to only those actually required helps to minimize liability arising from the review of submittals. Minimize submittals on smaller, less complex projects.

Include the following for submission of shop drawings, product data, and samples for the Architect's review.

- A. Submittals for Review:
1. Shop Drawings:
 - a. Include dimensioned layout showing locations of seams, accessories, gage of metal, fastening methods, provisions for expansion and contraction, and details of joints.
 - b. Designate factory and field-assembled work.
 - c. Identify attachment requirements for different roof zones.
 2. Product Data: Show system components including panels, trim, and accessories.
 3. Samples:
 - a. [3 x 3] [] x [] inch finish samples showing available colors, on representative substrate.
 - b. After color selection submit 12 inch long panels in selected color and profile.
 - c. Panel clips.
 4. Warranties: Samples of each warranty.

- B. Quality Control Submittals:
1. Design Calculations:
 - a. Show positive and negative wind loads on each zone of roof.
 - b. Signed by Registered Professional Engineer licensed in State in which Project is located.
 - c. If attachment between existing purlins is required provide test reports based on ASTM E1592 showing system's load response characteristics and ultimate failure under wind load requirements.

Include the following for submission of sustainable design submittals, including LEED and Energy Star.

Standing seam metal roofing manufactured using cool metal roof coatings can contribute to an energy-efficient project in the following ways; for additional information visit www.coolmetalroofing.org:

- Solar Reflectance: The amount of solar radiation that is immediately reflected from a surface.
 - LEED Credit SS 7.2 requires a Solar Reflectance Index (SRI) of at least 0.78 for low-slope roofs (less than or equal to 2:12) and 0.29 for steep-slope roofs (greater than 2:12).
 - Energy Star requires an initial solar reflectance of at least 0.65 for low-slope roofs (less than or equal to 2:12) and 0.25 for steep-slope roofs (greater than 2:12). After three years normal exposure, solar reflectance must be at least 0.50 and 0.15 respectively for low and steep-slope roofs.
 - California Energy Code, Georgia Energy Code, IECC and other entities may have similar requirements.
- Cool metal roof coatings meet various solar reflectance requirements. Refer to manufacturer's technical data for solar reflectance characteristics of the various cool metal roof coatings.
- Emissivity: The amount of energy re-radiated from a surface to its surroundings.
 - The emissivity of a roofing material affects the amount of net heat influx into a structure.
 - Cool metal roof coatings can assist in energy simulation calculations required by LEED Credit EA 1. Refer to manufacturer's technical data for emissivity characteristics of the various cool metal roof coatings.
- Recycled Content:
 - The use of recycled metals during the fabrication of the base metal helps contribute to LEED Credits MR 4.1 and 4.2.
 - Tophat Framing Systems' and Ultra Seam's metals typically contain a minimum of 25 percent recycled content for galvanized steel and Galvalume, and 80 percent recycled content for aluminum. Please contact Tophat Framing Systems and Ultra Seam to determine current recycled content.
- Regional Materials:
 - The use of materials extracted, processed, and manufactured within a 500 mile radius of the Project site helps contribute to LEED Credits MR 5.1 and 5.2.
 - Tophat subframes and Ultra Seam metal panels are manufactured at various locations throughout the United States. Contact each manufacturer for the proximity of manufacturing facilities to your project site.
- Energy Performance: Cool metal roof coatings metal roofing can assist in energy simulation calculations required by LEED Credit EA 1.
- Recyclability: LEED Credits 2.1 and 2.2 require the recycling of construction waste. Scraps from Tophat subframes and Ultra Seam metal panels are 100 percent recyclable.

- C. Sustainable Design Submittals:
1. Solar Reflectance Index: Certify initial [and 3-year] solar reflectance index of metal roofing.
 2. Recycled Content: Certify recycled content of metal roofing; indicate recycled content percent and whether pre-consumer or post-consumer.
 3. Regional Materials: Certify materials extracted, processed, and manufactured within 500 mile radius of Project site.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: Minimum 10 years experience on projects of similar scope and complexity.
- B. Installer Qualifications: Minimum 10 years experience on retrofit roof systems of similar scope and complexity.
- C. Roofing System:
1. Class 90 rated, tested to UL 580.
 2. Listed in UL Roofing Materials Directory.

1.6 DELIVERY, STORAGE AND HANDLING

- A. Store products off ground or floor.
- B. Provide weathertight coverings, ventilated to provide air circulation.

1.7 WARRANTIES

Include the following paragraph for a manufacturer's 25-year, 6 month limited warranty covering defects in aluminum-zinc alloy coated steel sheet.

- A. Substrate Warranty: Furnish manufacturer's 25 year, 6 month limited warranty providing coverage against rupture, structural failure, or perforation of acrylic-coated aluminum-zinc alloy coated steel sheet due to corrosion.

Include the following paragraph for a manufacturer's 35-year limited warranty covering defects in Kynar 500 or Hylar 5000 PVDF-coated aluminum-zinc alloy coated steel or aluminum sheet. Edit to suit project requirements

- B. Finish Warranty: Furnish manufacturer's 35-year limited warranty providing coverage against chipping, cracking, peeling, flaking, or checking of PVDF-coated [galvanized steel] [aluminum-zinc alloy coated steel] [aluminum] sheet.

Include the following paragraph for Sheffield's CoolR Guard 20-year Premium roofing warranty. This warranty covers the specific items listed. In order to qualify for this warranty, the following requirements must be met:

- Installer must be certified by Sheffield. Contact Sheffield for a current list of certified installers.
 - CoolR-approved roll-forming equipment must be used.
 - All materials must be CoolR Guard. Fasteners and panel attachment clips must be CoolR-approved.
 - Project Shop Drawings and project conditions must meet CoolR Guard requirements.
 - A third-party inspector must perform all inspections.
 - Owner must follow CoolR Guard maintenance program including routine inspections and maintenance.
- C. Watertightness Warranty: Furnish manufacturer's 20 year warranty providing coverage against water leakage through roofing system. Include roof panels and side seams, panel end laps, roof-to-wall

flashings, ridge flashings, hip flashings, valley flashings, high-side eave flashings, rake flashings, expansion joint flashings, and manufacturer-approved curb and penetration flashings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

Edit the following paragraph to suit project requirements. US200 is a 2 inch high mechanically-seamed standing seam panel; US 175LS is a 1-3/4 inch high snap-lock standing seam panel.

- A. Contract Documents are based on Ultra-Seam [US200] [US175LS] by Ultra Seam, Inc., manufactured by:

CSM Products & Solutions
8660 Lambright Road
Houston, TX 77075
800-229-4276
Fax 713-991-4747
info@csmproductsonline.com

- B. Equivalent products by other licensed Ultra Seam manufacturers are acceptable.

Edit the following to indicate whether or not substitutions will be permitted for the products in this section.

- C. Substitutions: [Under provisions of Division 01.] [Not permitted.]

2.2 MATERIALS

Select one of the following three paragraphs depending on the type of metal desired; edit to suit project requirements.

- A. Aluminum-Zinc Alloy Coated (Galvalume) Steel Sheet:
1. ASTM A792/A792M, Structural Grade, AZ50 aluminum-zinc alloy coating, [22] [24] [] gage core steel.
 2. Recycled content: Minimum 25 percent recycled steel, classified as post consumer.

**** OR ****

- B. Aluminum Sheet:
1. ASTM B209, alloy 3105, temper H14, H22, or H24, [0.032] [0.040] [0.050] inch thick.
 2. Recycled content: Minimum 80 percent recycled aluminum, classified as post consumer.

**** OR ****

- C. Galvanized Steel Sheet:
1. ASTM A653/A653M, Structural Quality, G90 coating class, [22] [24] [] gage core steel.
 2. Recycled Content: Minimum 25 percent recycled steel, classified as post consumer.

**** OR ****

- D. Stainless Steel Sheet:
1. ASTM A666, Type 304 or 316, minimum 38 ksi yield strength, [22] [24] gage, No. 2B satin finish.
 2. Recycled Content: Minimum 25 percent recycled steel, classified as post consumer.

2.3 ACCESSORIES

Include the following paragraph for US200 panels.

- A. Panel Clips: UL 90 approved, 22 gage [galvanized] [stainless] steel, two-piece clips allowing for thermal movement.

**** OR ****

Include the following for US175LS panels.

- B. Panel Clips: 18 gage [galvanized] [stainless] steel, single piece.
- C. Fasteners:
1. Exposed screws: [Carbon steel] [corrosion-resistant coated steel] [or] [Type 304 stainless steel], self-tapping, minimum No. 14 diameter, self-tapping, hex-head with 5/8 inch bonded neoprene washer; head painted to match exterior panel color.
 2. Concealed screws: [Carbon steel] [or] [corrosion-resistant coated steel.]
 3. Concealed clips screws: Minimum No. 14 diameter RoofGrip by ITW Buildex or equivalent with No. 3 Phillips head.
 4. Trim and flashing rivets: 1/8 inch diameter, stainless steel, with standard dome head painted to match trim or flashing color.
- D. Pipe Flashings: One-piece EPDM molded rubber boot with aluminum flanged base ring; DEKTITE by ITW Buildex or equivalent.
- E. Snow Guards: ColorGard by S!5 or approved substitute.
1. Fabricated from 6061 T6 aluminum and attached to panel ribs with aluminum clamps and stainless steel set screws tested for load-to-failure results.
 2. Attachment shall not penetrate roof system.
- F. Retrofit Roof Framing System: Specified in Section 05 4600.
- G. Insulation: Specified in Section [05 4600.] [07 2200.] [__ ____.]

Edit the following paragraph to suit project requirements.

- H. Joint Sealers: Specified in Section [07 9200.] [____.]
- I. Touch-Up Pens: Provided by manufacturer in color to match panel finish.

2.4 FABRICATION

In the following two paragraphs panels with intermediate striations are standard to reduce oil canning. Smooth texture panels and panels with longitudinal stiffening ribs are optional.

Include the following paragraph for US200 panels; edit to suit project requirements.

- A. Roll form roofing in shop or at Project site to provide 2 inch high standing seams spaced nominally [12] [16] [18] inches on center, [with intermediate striations,] [smooth texture,] [with longitudinal stiffening ribs,] formed to permit machine-closing of seam in field.

**** OR ****

Include the following paragraph for US175LS panels; edit to suit project requirements.

- B. Form roofing in shop or at Project site to provide 1-3/4 inch high standing seams spaced nominally [12] [16] [18] inches on center, [with intermediate striations,] [smooth texture,] [with longitudinal stiffening ribs,] formed to permit snapping together of seam in field.
- C. Form panels in single lengths from eave to ridge.
- D. Form sections true to shape, accurate in size, square, and free from distortion and defects.

- E. Fabricate trim, flashings, and [hip] [and] [ridge] closures using same material, gage, finish, and color as metal roof panels.
- F. Fabricate convex curved panels using curving machine.

2.5 FINISHES

Include the following for a 70 percent Kynar 500 or Hylar 5000 fluoropolymer coating on aluminum.

- A. Panels and Trim: ASTM A755/A755M; Cool metal fluoropolymer coating applied to sheets in coil form, [____] color [to be selected from manufacturer's full color range].

Include the following for a 70 percent Kynar 500 or Hylar 5000 fluoropolymer coating on aluminum-zinc alloy coated steel.

- B. Panels and Trim: ASTM A755/A755M; Cool metal fluoropolymer coating applied to sheets in coil form, [____] color [to be selected from manufacturer's full color range].
- C. Coating Performance Requirements:
 1. Specular gloss: 25 to 35 at 60 degrees; tested to ASTM D523.
 2. Abrasion resistance: Total 67 liters sand plus or minus 10 liters; tested to D968.
 3. Acid resistance: Tested to D1308.
 - a. 10 percent hydrochloric acid at 24 hours: No visible change.
 - b. 20 percent hydrochloric acid at 18 hours: No visible change.
 - c. 20 percent sulfuric acid at 18 hours: No visible change.
 - d. 25 percent sodium hydroxide at 1 hour: No visible change.
 - e. 20 percent muriatic acid at 15 minutes: No visible change.

In the following paragraph select 2000 hours for Galvalume substrate and 3000 hours for aluminum substrate.

- 4. Humidity resistance: [2000] [3000] hours, Rating 10, no blisters; tested to D2247.

In the following paragraph select 1.5 for aluminum substrate and 3.0 for Galvalume substrate.

- 5. Impact resistance: [1.5] [3.0] times metal thickness in inch-pounds without loss of adhesion; tested to D2294.
- 6. Adhesion: No loss of adhesion; tested to ASTM D3359.
- 7. Pencil hardness: Hb minimum; tested to ASTM D3363.
- 8. Surface burning characteristics: Class A; tested to ASTM E84.
- 9. Accelerated weathering: 2000 hours, No. 8 chalk, Color 2 E; tested to ASTM G53.
- 10. Formability: 1/8 inch mandrel, no cracking or loss of adhesion; tested to ASTM D522.
- 11. Salt spray resistance: 1000 hours, Scribe 7, 1/16 inch blisters, Field 10, no blisters; tested to ASTM B117.

Include one or both of the following paragraphs for projects requiring documented solar reflectance and emissivity values. In both paragraphs the first value is for low-slope roofing and the second value is for steep-slope roofing.

- D. Solar Reflectance Index; tested to ASTM C1549 and calculated in accordance with ASTM E1980:
 1. Initial: Minimum [0.25.] [0.65.]
 2. After three years normal exposure: Minimum [0.15.] [0.50.]
- E. Emissivity: Minimum 0.77, tested to ASTM C1371 or ASTM E408.

**** OR ****

Include the following for a clear acrylic coating on aluminum-zinc-alloy coated steel.

- F. Panels and Trim: High-performance clear acrylic coating.

PART 3 - EXECUTION

3.1 INSTALLATION OF ROOFING

- A. Install roofing system in accordance with manufacturer's instructions and approved Shop Drawings.
- B. Apply roofing panels beginning at low edge of roof.
- C. Panel end joints not permitted.

Include the following paragraph for US200 panels; edit to suit project requirements.

- D. Close adjacent seams to [180 degree double-lock] [90 degree single-lock] profile using approved seam forming equipment.

**** OR ****

Include the following paragraph for US175LS panels.

- E. Align adjacent seams and snap into place.
- F. Fit flashings with square corners and surfaces true, aligned, and accurate to required profiles.
- G. Fasten panels to supports using concealed panel clips. Exposed fasteners permitted on trim members only.
- H. Install trim to maintain visual continuity of system.
- I. Install joint sealers and gaskets to prevent water penetration.
- J. Install pipe flashing through flat portion of the panel when possible.
- K. Flash penetrations through roofing with metal trim to match panels:
 - 1. Lap flashings over roof panels 6 inches minimum on all sides and seal with double bead of joint sealer.
 - 2. Install metal draw band and joint sealer at top of pipe penetrations.
 - 3. Install water diverter at uphill side of square and rectangular penetrations.
- L. Installation Tolerances:
 - 1. Variation from location: Plus or minus 1/4 inch.
 - 2. Variation from plane: 1/4 inch in 10 feet.

3.2 ADJUSTING

- A. Touch up field cuts and abrasions to match factory finish using touch-up pens.

3.3 CLEANING

- A. Clean exposed surfaces; remove stains and foreign matter.
- B. Consult manufacturer for specific cleaning materials and procedures.

END OF SECTION