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Section 1

General

1. Scope

- 1) These specifications cover the materials and the fabrication of metal buildings designed, fabricated, and readily erected to be weather tight.
- 2) These specifications are an outline of performance to insure that the architect, engineer, building and/or owner understands the basis for design, manufacture and application of all the manufacturer's metal building systems.
- 3) Because of a continuing program of research and development, specifications in this manual are subject to change without notice.

2. Building Description

- 1) Gable Symmetrical is a continuous frame building with the ridge in the center of the building, consisting of tapered or straight columns and tapered rafters. Sidewall girts may be continuous, by-passing the columns or simple span, flush in the column line. Rafters may or may not have interior columns. A ridged (double slope) building in which the ridge is in the center of the building.
- 2) Gable Unsymmetrical is a continuous frame building with an off-center ridge, consisting of tapered or straight columns and tapered rafters. Eave height and roof slope may differ on

each side of the ridge. Sidewall girts may be continuous, by-passing the columns or simple span, flush in the column line. Building may or may not have interior columns.

- 3) Single Slope is a continuous frame building which does not contain a ridge, but consists of one continuous slope from side to side. Building consists of straight or tapered columns and tapered or straight rafters. Sidewall girts may be continuous, by-passing the columns or simple span, flush in the column line. Building may or may not have interior columns.
- 4) Lean-to (LT) is a building extension which does not contain a ridge, but consists of one continuous slope from side to side. These units usually have the same roof slope and girt design as the building to which they are attached.
- 5) All building types normally have Simple Span end wall girts flush in the column line.

3. Building Nomenclature

- 1) Roof slope is expressed as inches of rise for each 12" of horizontal run.
- 2) Building "Width" is measured from outside to outside of sidewall girts.
- 3) Building "Eave Height" is a nominal dimension measured from the bottom of the base plate on the column to the intersection of the inside of the roof and sidewall sheets.
- 4) Building "Length" is measured from outside to outside of end wall girts.
- 5) Standard "Bay Spacing" shall be 20', 25' or 30' between frame centerlines (except at end bays) unless otherwise specified, for buildings with "A", "AM" or "R" panels.
- 6) Standard "Bay Spacing" shall be 20', 24' or 28' between frame centerlines (except at end bays) for buildings with ShadowRib Panels.
- 7) References to "Architectural" panel shall include "A" and "AM" panels. Roof slope is expressed as inches of rise for each 12" of horizontal run.
- 8) Building "Width" is measured from outside to outside of sidewall girts.
- 9) Building "Eave Height" is a nominal dimension measured from the bottom of the base plate on the column to the intersection of the inside of the roof and sidewall sheets.
- 10) Building "Length" is measured from outside to outside of end wall girts.
- 11) Standard "Bay Spacing" shall be 20', 25' or 30' between frame centerlines (except at end bays) unless otherwise specified, for buildings with "A", "AM" or "R" panels.

12) Standard "Bay Spacing" shall be 20', 24' or 28' between frame centerlines (except at end bays) for buildings with ShadowRib Panels.

13) References to "Architectural" panel shall include "A" and "AM" panels.

4. Drawings & Certifications

- 1) Drawings: Manufacturer shall furnish complete erection drawings for the proper identification and assembly of all building components. These drawings will show anchor bolt settings, transverse cross-sections, sidewall, end wall and roof framing, flashing and sheeting, and accessory installation details.
- 2) Certifications: Standard drawings and design analysis shall bear the seal of a registered professional engineer upon request. Design analysis shall be on file and furnished by manufacturer upon request.

Section 2

Structural Steel Design

1. General

- 1) The building manufacturer shall use standards, specifications, recommendations, findings and/or interpretations of professionally recognized groups such as AISC, AISI, AAMA, AWS, ASTM, MBMA, Federal Specifications, and unpublished research by MBMA as the basis for establishing design, drafting, fabrication, and quality criteria, practices, and tolerances. For convenience, one or more sources may be referenced in a particular portion of these specifications. In all instances, however, the manufacturer's design, drafting, fabrication and quality criteria, practices, and tolerances shall govern, unless specifically countermanded by the contract documents.
- 2) Structural mill sections or welded up plate sections will generally be designed in accordance with the 9th edition of AISC's "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings", ASD method.
- 3) Cold-Formed steel structural members will generally be designed in accordance with the latest edition of AISI's "Specifications for the Design of Cold-Formed Steel Structural Members".

2. Design Loads

- 1) Design loads shall be as specified and set forth in the contract, and shall be in accordance with the manufacturer's standard design practices. Design loads may include dead load,

roof live loads, wind loads, seismic loads, collateral loads, auxiliary equipment loads, and/or other applied or specified loads.

- 2) Dead Load - the actual weight of the building system supported by a given member.
- 3) Roof Live Loads - loads produced by maintenance activities, rain, erection activities, and other movable or moving loads by not including wind, snow seismic, crane, or dead loads.
- 4) Roof Snow Loads - gravity load induced by the weight of snow or ice on the roof, assumed to act on the horizontal projection of the roof.
- 5) Wind Loads - the loads on a structure induced by the forces of wind blowing from any horizontal direction.
- 6) Collateral Loads - the weight of any non-moving equipment or material, such as ceilings, electrical or mechanical equipment, sprinkler systems, plumbing, or ceilings.
- 7) Auxiliary Loads - dynamic loads induced by cranes, conveyors, or other material handling systems.
- 8) Seismic Loads - horizontal loads acting in any direction a structural system due to action of any earthquake.
- 9) Floor Live Loads - loads induced on a floor system by occupants of a building and their furniture, equipment, etc.

Section 3

Basic Material Specifications

1. Primary Framing Steel

- 1) Steel for hot rolled shapes shall conform to the requirements of ASTM Specifications A-36, with minimum yield of 36, 42, or 50 psi.
- 2) Steel for built-up sections shall generally conform to the physical requirements of ASTM D529, ASTM 572 or ASTM A36 as applicable, with minimum yield of 42,000, 50,000, or 55,000 psi as indicated by the design requirements.
- 3) Steel for endwall "C" sections shall generally conform to the physical requirements of ASTM A607 GR55M or equivalent, and have a minimum yield of 55,000 psi.

2. Secondary Framing Steel

- 1) Steel used to form purlins, girts, eave struts and "C" sections shall be Republic Steel P-55 or equivalent, comparable to the requirements of ASTM A607 Grade 55. Minimum yield shall be 55,000 psi.

3. Roof & Wall Panel Material

- 1) Panel material as specified shall be 26 gauge Galvalume as manufactured by Bethlehem Steel Corporation, or equal, conforming to the requirements of ASTM A792 Grade 80 or Grade 50. Minimum yield stress shall be 80,000 ksi for Grade 80 and 50,000 ksi for Grade 50.
- 2) Panel material as specified shall be 24 gauge Galvalume, conforming to the requirements of ASTM A792 Grade 50 or Grade 80. Minimum yield stress shall be 50,000 ksi for Grade 50.
- 3) See 5.1.4 for additional material used.

Section 4

Structural Framing

1. General

- 1) All framing members shall be shop fabricated for field bolted assembly. The surfaces of the bolted connections shall be smooth and free from burrs or distortions.
- 2) All shop connections shall be in accordance with the manufacturer's standard design practices as specified in Paragraph 2.1.1. Certification of welder qualifications will be furnished when required and specified in advance.
- 3) All framing members, where necessary, shall carry an easily identifying mark.

2. Primary Framing

- 1) Rigid Frame: All rigid frames shall be welded built-up "I" sections or hot-rolled sections. The columns and the rafters may be either uniform depth or tapered. Flanges shall be connected to webs by means of a continuous fillet weld on one side.
- 2) Endwall Frames: All endwall roof beams and endwall columns shall be cold-formed "C" sections, mill-rolled sections, or built-up "I" sections depending on design requirements.
- 3) Plates, Stiffeners, etc.: All base plates, splice plates, cap plates, and stiffeners shall be factory welded into place on the structural members.

- 4) Bolt Holes, etc: All base plates, splice and flanges shall be shop fabricated to include bolt connection holes. Webs shall be shop fabricated to include bracing holes.
- 5) Connections for secondary structural (purlins and girts) shall be by means of welded clips.

3. Secondary Framing

- 1) Purlins and Girts: Purlins and girts shall be cold-formed "Z" sections with stiffened flanges. Flange stiffeners shall be sized to comply with the requirements of the latest edition of AISI. Purlin and girt flanges shall be unequal in width to allow for easier nesting during erection. They shall be prepunched at the factory to provide for field bolting to the rigid frames. They shall be simple or continuous span as required by design. Connection bolts will install through the webs, not flanges.
- 2) Eave Struts: Eave Struts shall be unequal flange cold-formed "C" sections.
- 3) Base Angle: A base member will be supplied by which the base of the wall covering may be attached to the perimeter of the slab. This member shall be secured to the concrete slab with ram-sets, expansion bolts, or equivalent anchors as shown on the drawings.

4. Bracing

- 1) Diagonal Bracing: Diagonal bracing in the roof and sidewalls shall be used to remove longitudinal loads (wind, crane, etc.) from the structure. This bracing will be furnished to length and equipped with bevel washers and nuts at each end. It may consist of rods threaded each end or galvanized cable with suitable threaded end anchors. If load requirements so dictate, bracing may be of structural angle and/or pipe, bolted in place.
- 2) Flange Braces: The compression flange of all primary framing shall be braced laterally with angles connecting to the webs of purlins or girts so that the flange compressive stress is within allowable limits for any combination of loading.
- 3) Special Bracing: When diagonal bracing is not permitted in the sidewall, a rigid frame type portal or fixed base columns will be used. Wind bracing in the roof and/or walls need not be furnished where it can be shown that the diaphragm strength of the roof and/or wall covering is adequate to resist the applied wind forces.

Section 5

Roof & Wall Covering

1. General

- 1) Roof panels shall be any of the following: "R", "PBR", or standing seam. "PBR" panels shall have an extended purlin bearing leg. For standing seam see Sections 5.3 and 5.4.
- 2) Wall panels may be any of the following: "R", "U", "A", "AM", "PBR", "ShadowRib", or "NuWall" profile. Panel profiles "A", "AM", "ShadowRib", and "NuWall" are considered Architectural panels. "PBR" panels shall have an extended purlin bearing leg.
- 3) Panels "R", "PBR", "U", "A", or "AM" shall either be 26 or 24 gauge Galvalume Plus or pre-coated Galvalume steel. "NuWall" panel shall either be 22 or 24 gauge Galvalume Plus or pre-coated Galvalume steel.
- 4) Agricultural Panel - "Stormproof" liner panels as specified shall be 29 gauge (.014 minimum) Galvalume Plus or pre-painted Galvalume steel.
- 5) Retro-Fit Panel - "Retro R" roof or wall panels as specified shall be 29 gauge Galvalume Plus or pre-painted Galvalume steel.
- 6) Standing Seam Roof Panels - see Section 5.3 and 5.4.

2. Panel Description

- 1) "R" Panel shall have major ribs 1 1/4" high spaced 12" on center. In the flat area between the major ribs are two smaller minor ribs. Each panel shall provide 36" net coverage in width. All sidelaps shall be at least one major rib.
- 2) "U" Panel shall have ribs 3/4" high spaced 6" on center. Each panel shall provide 36" net coverage in width. All sidelaps shall be at least one rib.
- 3) "PBR" (Purlin bearing leg) Panels shall have major ribs 1 1/4" high spaced 12" centers. In the flat area between the major ribs are two smaller minor ribs. Each panel shall provide 36" net coverage in width. All sidelaps shall be at least one major rib.
- 4) Architectural ("A" or "AM") Panel shall have a configuration consisting of ribs 1 1/8" or 1 3/16" deep. Major corrugations shall be spaced 12" on center. Panel design produces a decorative smooth shadow line with semi-concealed fasteners. Architectural panels shall provide a 36" net coverage in width. All sidelaps shall be at least one major rib.
- 5) Architectural ShadowRib Panel shall have a configuration consisting of a 5 1/4" flat area with a 1 1/2" deep indentation in the middle of the panel. The panel coverage is to be 16", with a panel depth of 3".
- 6) Architectural "NuWall" Panel shall be 2 1/2" deep x 12" wide with 1/2" deep fluting with concealed fasteners.

- 7) "Stormproof" Panel shall have major ribs 3/4" high spaced 9" on center. In the flat area between the major ribs are two smaller minor ribs. Each panel shall provide 36" net coverage in width. All sidelaps shall be at least one major rib.
- 8) "Retro R" (Retro-Fit) panels shall have major ribs 1" high at 12" centers. Each panel shall provide 36" net coverage in width. All sidelaps shall be at least one major rib. This panel is designed to go over existing "R" panel roofs. The existing roof panels do not have to be removed.
- 9) "Artisan 1" Liner/Soffit Panel shall be flat, 1" high and provide 12" net coverage width. Panels shall be interlocking and be fastened with a concealed fastener. Panels are also available with two stiffening ribs.
- 10) Panel Length: All wall panels shall be continuous from sill to roof line and all roof panels shall be continuous from eave to ridge except where lengths become prohibitive for handling purposes. All end laps shall be at least 6" on roof and 4" on walls.
- 11) Endwall Edge Cuts: All endwall panels for buildings with 1:12 or less roof slope shall be square cut. All endwall panels for buildings with more than 1:12 roof slope shall be bevel cut by the erector in the field.

3. Standing Seam Roof

4. Panel Type - WeatherRoof II (Snap-Lock) and WeatherRoof III (Machine Seamed)

- 1) Standing Seam Roof Panels shall be UL-90 rated, roll-formed, 24 or 22 gauge Galvalume, whether Galvalume Plus or pre-painted. Galvalume sheet shall have a coating weight of .5 oz./sq. ft. with a minimum yield of 50,000 ksi and conform to ASTM-792. Pre-painted finish shall be a premium Fluoropon? coating produced with either Kynar 500 or Hylar 5000 resins and have a full 20 year warranty.
- 2) Panels shall be 24" wide with 2 minor ribs in between seams. Panel seam is 3" high.
- 3) One side of the panel shall be female in configuration, which will have factory applied hot-melt mastic (see 5.3.9) inside the female seam. The female side will snap over the male side. When using WeatherRoof II Standing Seam, this procedure will form a self-locking snap system. If choosing WeatherRoof III Standing Seam, the male and female seams will be continuously locked together by an electrically powered mechanical seamer, forming a 360 degree Pittsburgh Seam.
- 4) The panels shall be factory notched at both ends so that field installation can commence or terminate from either end of the building. Panels cannot start at both ends of the building and work towards each other.
- 5) Maximum panel length shall be no more than 45'-0" unless otherwise discussed and approved by the sales or manufacturing manager.

6) Endlaps

1. Endlaps shall have a 16 gauge backup plate. The panel shall have five pre-punched holes in the flat and dimples in the trapezoidal legs for proper placement of fasteners.
2. Mastic (see 5.3.5) shall be applied between the panels and secured with 1/4" - #14 x 1 1/4 self drilling fasteners through the panels, and backup plate to form a compression joint.
3. Endlaps and eaves shall be the only places in the roof system where through the roof fasteners can be used inside the building envelope.

7) Fasteners

1. Eave - 1/4" - #14 x 1 1/4" long life self drilling with sealing washer.
2. Endlaps - 1/4" - #14 x 1 1/4 long life self drilling with sealing washer.
3. Ridge - #14 x 7/8" Lap Tek long life self-drilling with sealing washer.
4. Clips/to purlin - 1/4" - #14 x 1" Tek 2 long life self-drilling with Hex Washer Head and 5/8" O.D. washer.
5. Clips/floating to bar joists - #12-24 x 1 1/4" Tek 4.5 self-drilling with Washer Head and 5/8" O.D. washer.
6. Long Life fasteners, where exposed, are standard when using a Galvalume Plus roof panel.

8) Clips

1. All clips shall have factory applied mastic and be designed so that movement between the panel and the clip does not occur.
2. Low fixed clips - shall be 3 3/8" in height providing a 3/8" clearance for insulation between the panel and the purlin or joist.
3. High fixed clips - shall be 4 3/8" in height to accommodate a thermal spacer for added insulation at the purlins.
4. Low or high floating clips - shall be either 3 3/8" or 4 3/8" in height. Floating clips shall provide a minimum of 2" travel to allow for expansion and contraction.

9) Sealants & Closures

1. Factory applied sealant used in panel sidelaps shall be a hot melt, foamable mastic - Q41A.

2. Field applied sealant used at the endlaps, eave, ridge assembly, and gable flashings shall be 100% solids butyl-based elastomeric tape sealant, furnished in roll form or pre-cut to length. See manual for application.
3. Outside closures shall be manufactured from the same materials as the roof panels.
4. Inside closures shall be 18 gauge metal.

5. Standing Seam Roof – Architectural

6. Panel Type - SS216 and SuperLok (Machine Seamed)

1) Panel Description

1. Standing Seam Roof Panels shall be UL-90 rated, roll-formed, 24 or 22 gauge Galvalume, whether Galvalume Plus or pre-painted. Galvalume sheet shall have a coating weight of .5 oz./sq. ft. with a minimum yield of 50,000 ksi and conform to ASTM-792. Pre-painted finish shall be a premium Fluoropon coating produced with either Kynar 500 or Hylar 5000 resins and have a full 20 year warranty.
2. Panels profiles shall be 2" inches high x 16" wide. Panel seam is 2" high. All panels shall be striated.
3. One side of the panel shall be female in configuration, which will have factory applied hot-melt mastic (see 5.4.5) inside the female seam. The female side will fit over the male side and be continuously locked together by an electrically powered mechanical seamer.
4. Maximum panel length shall be no more than 45'-0" unless otherwise discussed and approved by the sales or manufacturing manager.

2) End Laps

1. Endlaps shall have pre-punched holes in panels and a 16 gauge backup plate for proper placement of fasteners.
2. Mastic (see 5.4.5) shall be applied between the panels and secured with #14 x 1" Long Life self drilling fasteners with sealing washer, through the upper panel, mastic, lower panel and backup plate to form a compression joint.
3. Endlaps and eaves shall be the only places in the roof system where through-the-roof exposed fasteners will be used inside the building envelope.
4. Maximum panel length shall be no more than 45'-0" unless otherwise discussed and approved by the sales or manufacturing manager.

3) Fasteners

1. Eave - #12 x 1" long life self drilling with sealing washer.
2. Endlaps - #14 x 1 1/4" long life self drilling with sealing washer.
3. Ridge - #14 x 7/8" Lap Tek long life self-drilling with sealing washer.
4. Clips to purlin - #12 x 1" Tek 2 self-drilling with Hex Head without washer.
5. Clips to bar joists - #12-24 x 1 1/4" Tek 4.5 self-drilling with Hex Head without washer.
6. Long Life fasteners, where exposed, either self-drilling or self-tapping, utilizing corrosion resistant head with an extended long life warranty, are standard. These fasteners are recommended for use when using a Galvalume Plus roof panel.
7. Special applications may require the use of other fastener types than what are listed above. Review Erection Manual.

4) Clips

1. All clips shall have factory applied mastic.
2. Fixed clips - shall be either 2 3/8" or 3" in height and are to be used with blanket insulation.
3. Floating clips - shall be either 2 3/8" or 3" in height and are to be used with blanket insulation.

5) Sealants & Closures

1. Factory applied sealant used in panel sidelaps shall be a hot melt, foamable mastic - Q41A.
2. Field applied sealant used at the endlaps, eave, ridge assembly, and gable flashings shall be 100% solids butyl-based elastomeric tape sealer, furnished in roll form or pre-cut to length.
3. Outside closures shall be manufactured from the same materials as the roof panels.