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SECTION 13 34 19
METAL BUILDING SYSTEMS

PART 1 – GENERAL

1.1 **SECTION INCLUDES-** (This Section can be used for Sludge dewatering building, Crane Canopy roof and framing, UV system Canopy, D.O Canopy, and Sludge Transfer Canopy)

- A. Metal Framing Components
- B. Metal Wall Panels and Trim
- C. Metal Roof Panels and Trim
- D. Metal Building Accessories

1.2 **RELATED SECTIONS**

- A. Section 03 30 00- Cast-in-place concrete.
- B. Section 05 21 00 - Steel joist framing.
- C. Section 05 31 00 - Steel decking.
- D. Section 08 31 00 - Overhead doors.
- E. Section 08 54 13 - Windows.
- F. Section 09 90 00 - Painting: Finish painting of primed steel surfaces.

1.3 **REFERENCE STANDARDS**

- A. American Institute of Steel Construction (AISC):
 - 1. AISC Specification for Structural Steel Buildings.
 - 2. AISC Serviceability Design Considerations for Low-Rise Buildings
- B. American Iron and Steel Institute (AISI):
 - 1. AISI North American Specification for the Design of Cold-Formed Steel Structural Members
- C. American Welding Society (AWS):
 - 1. AWS D1.1 / D1.1M – Structural Welding Code – Steel.

2. AWS D1.3 / D1. 3M – Structural Welding Code – Sheet Steel
- D. Association for Iron & Steel Technology (AISE):
1. AISE 13 – Specifications for Design and Construction of Mill Buildings.
- E. ASTM International (ASTM):
1. ASTM A 36 – Standard Specification for Carbon Structural Steel
 2. ASTM A 48 – Specification for Gray Iron Castings
 3. ASTM A 123 – Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
 4. ASTM A 307 – Specification for Carbon Steel Bolts and Studs, 60 000 psi Tensile Strength
 5. ASTM A 325 – Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
 6. ASTM A 354 – Standard Specification for Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners
 7. ASTM A 475 – Specification for Zinc-Coated Steel Wire Strand
 8. ASTM A 490 – Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength
 9. ASTM A 500 – Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
 10. ASTM A 529 – Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality.
 11. ASTM A 563 – Specification for Carbon and Alloy Steel Nuts
 12. ASTM A 572 – Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
 13. ASTM A 653 / A 653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
 14. ASTM A 792 / A 792M – Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
 15. ASTM A 992 – Standard Specification for Structural Steel Shapes.
 16. ASTM A 1011 – Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
 17. ASTM A 1039 – Specification for Steel, Sheet, Hot Rolled, Carbon, Commercial, Structural, and High-Strength Low-Alloy, Produced by Twin-Roll Casting Process
 18. ASTM E 96 / E 96M – Standard Test Methods for Water Vapor Transmission of Materials.
 19. ASTM E 108—Spread-of Flame Testing: Class 1A Rating.
 20. ASTM E 283 – Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
 21. ASTM E 331 – Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
 22. ASTM E 1592 – Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference

23. ASTM E 1646 – Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference
 24. ASTM E 1680 – Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems
 25. ASTM E 2140 – Test Method for Water Penetration of Metal Roof Panel Systems by Static Water Pressure Head
 26. ASTM F 436 – Specification for Hardened Steel Washers
 27. ASTM F 1145 – Specification for Turnbuckles, Swaged, Welded, Forged
 28. ASTM F 1554 – Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength
- F. IAS – International Accreditation Service
- G. LGSI – Light Gauge Steel Institute
- H. SJI – Steel Joist Institute
- I. FM Global:
1. FMRC Standard 4471 – Approval Standard for Class 1 Roofs for Hail Damage Resistance, Combustibility, and Wind Uplift Resistance.
- J. Metal Building Manufacturers Association (MBMA):
1. MBMA Metal Building Systems Manual

1.4 DEFINITIONS

- A. Metal Building System: A building system that will employ:
1. Either continuous or simple-span 'Z' or 'C'-shaped cold-formed purlins or open-web steel joists for support of the roof cladding.
 2. Simple-span 'Z' or 'C'-shaped cold-formed purlins or open-web steel joists for support of the steel wall cladding.
 3. Three-plate, built-up rigid space frames and/or cold-formed 'C' or hot-rolled I-shaped post-and-beam framing to support the roof and wall secondary members.
 4. All systems (cladding, roof and wall secondary, lateral primary framing, and longitudinal bracing) work together to provide resistance to vertical and lateral loading demands.
- B. Gable Symmetrical: A continuous frame building with the ridge in the center of the building, consisting of tapered or straight columns and tapered or straight rafters. The sidewall girts may be continuous (by-passing the columns) or simple span (inset in the column line). The rafters may or may not have interior columns.
- C. Gable Asymmetrical: A continuous frame building with an off-center ridge, consisting of tapered or straight columns and tapered or straight rafters. The eave height and roof slope may differ on each side of the ridge. The sidewall girts may be continuous (by-passing the columns) or simple span (flush in the column line). The rafters may or may not have interior columns.

- D. Single-Slope: A continuous frame building which does not contain a ridge but consists of one continuous slope from side to side. The building consists of straight or tapered columns and tapered or straight rafters. The sidewall girts may be continuous (by-passing the columns) or simple span (flush in the column line). The rafters may or may not have interior columns.
- E. Lean-To (LTO): 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 and supported by.
- F. Roof Slope: Pitch expressed as inches of rise for each 12" of horizontal run.
- G. Building Width: Measured from outside to outside of sidewall secondary structural member (girt).
- H. Building Eave Height: A nominal dimension measured from the finished floor to top flange of eave strut.
- I. Building Length: Measured from outside to outside of endwall secondary structural member.
- J. Auxiliary Loads: Dynamic loads induced by cranes, conveyors, or other material handling systems.
- K. Collateral Loads: The weight of any non-moving equipment or material, such as ceilings, electrical or mechanical equipment, sprinkler systems, plumbing, or ceilings shall be 3- 5 LB per SF.
- L. Roof Live Loads: Loads produced by maintenance activities, rain, erection activities, and other movable or moving loads but not including wind, snow, seismic, crane, or dead loads.
- M. 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.
- N. Seismic Loads: Loads acting in any direction on a structural system due to the action of an earthquake.
- O. Wind Loads: The loads on a structure induced by the forces of wind blowing from any horizontal direction.

1.5 DESIGN REQUIREMENTS

- A. General
 - 1. The building manufacturer will use standards, specifications, recommendations, findings and/or interpretations of professionally-recognized groups such as AISC, AISI, AWS, ASTM, CSA, CWB, MBMA, Federal Specifications, and unpublished research by MBMA as the basis for establishing design, drafting, fabrication, and quality criteria, practices,

and tolerances. The Manufacturer's design, drafting, fabrication and quality criteria, practices, and tolerances shall govern, unless specifically countermanded by the contract documents.

2. Design structural mill sections and built-up plate sections in accordance with:

- a. (US) code-appropriate edition of AISC's "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings", ANSI/AISC 360 ASD method.
- b. (Canada) CSA S16, "Design of Steel Structures", latest edition.

3. Cold-Formed steel structural members and panels will generally be designed in accordance with "Specifications for the Design of Cold-Formed Steel Structural Members", 2007 Edition, ANSI/AISI S-100-07 or CAN CSA S136-07.

4. Design weldments per the following:

- a. Structural Welding

- 1) (US) Design per AWS D1.1, "Structural Welding Code – Steel", Latest Edition.
- 2) (Canada) Design per CWB W59, "Welded Steel Construction (Metal Arc Welding)", Latest Edition.

- b. Cold-Formed Welding

- 1) (US) Design per AWS D1.3, "Structural Welding Code – Sheet Steel", Latest Edition.
- 2) (Canada) Design per CWB W59, "Welded Steel Construction (Metal Arc Welding)", Latest Edition.

B. Design Code:

1. Structural design for the building structural system shall be provided by the metal building system manufacturer for the following design criteria:
 - a. Governing Building Code: GSBC.
 - b. Year/Version: 2014
 - c. Occupancy Category:

C. Design Loads:

Design loads shall be as specified on structural drawings General Notes S1.0 and S1.1.

D. General Serviceability Limits:

1. Deflection Limits shall be in accordance with the applicable provisions of the Metal Building Systems Manual (MBMA), latest edition.
2. Vertical Deflections:
 - a. Roof Secondary (Purlins) – L/150.

- b. Main Frame roof beams – L/180.
- 3. Horizontal Deflections:
 - a. Wall Secondary (Girts) – L/90.
 - b. Main Frames – H/90.
- 4. Vertical deflection limits apply for snow load (50-year mean-recurrence interval) plus collateral load, or the code required live load. The horizontal drift and deflections limits apply for the loads induced by a basic wind speed corresponding to a 10 year mean-recurrence interval.

1.6 SUBMITTALS

- A. Submit under provisions of Section 01 33 00.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. Preparation instructions and recommendations.
 - 2. Storage and handling requirements and recommendations.
 - 3. Installation methods.
- C. Shop Drawings: Provide complete erection drawings for the proper identification and assembly of all building components. Drawings will show anchor bolt settings, transverse cross-sections, sidewall, endwall and roof framing, flashing and sheeting, and accessory installation details.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, two samples, representing actual product, color, and patterns.
- F. Certifications: Shop 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.
- G. Bill of Materials: Bills of material shall be furnished and shall include item weights.
- H. Preventative Maintenance Manual.
- I. Welder's Certifications: Certification of welder qualifications shall be furnished as specified by the Project Engineer.

1.7 QUALITY ASSURANCE

- A. Manufacturer / Fabricator Qualifications:
 - 1. (US) All primary products specified in this section will be supplied by a single IAS AC 472 Accredited Manufacturer /Fabricator with a minimum of five (5) years' experience.

- B. Weldments/Welder/Weld Inspection Qualifications:
 - 1. (US) Welding inspection and welding inspector qualification for structural steel shall be in accordance with AWS D1.1, "Structural Welding Code – Steel", latest edition. Welding inspection and welding inspector qualification for cold-formed steel shall be in accordance with AWS D1.3, "Structural Welding Code – Sheet Steel", latest edition.
- C. Erector Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five (5) years demonstrated experience in installing products of the same type and scope as specified.
- D. Design: Standard drawings and design analysis must bear the seal of a registered professional engineer. Design analysis must be on file and furnished by manufacturer upon request.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Acceptance Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Storage and Handling Requirements:
 - 1. Store and handle materials in accordance with manufacturer's instructions.
 - 2. Keep materials in manufacturer's original, unopened containers and packaging until installation.
 - 3. Do not store materials directly on ground.
 - 4. Store materials on flat, level surface, raised above ground, with adequate support to prevent sagging.
 - 5. Protect materials and finish during storage, handling, and installation to prevent damage.
- C. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- D. Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.

1.9 WARRANTY

- A. Building System Warranty
 - 1. Furnish manufacturer's standard warranty for the metal building system, excluding paint.

2. The manufacturer shall warranty the metal building system against failure due to defective material or workmanship for a period of one (1) year from date of shipment.
 3. The liability under this warranty shall be limited to furnishing, but not dismantling or installing, necessary replacement material F.O.B. manufacturer's plant. In no event shall the manufacturer be liable for loss of profits, or other incidental, consequential, or special damages.
- B. Roof and Wall Paint Finish Warranty
1. Paint Systems
 - a. Furnish manufacturer's standard warranty for the metal panel paint system against chipping, peeling, blistering, fading in excess of 5 NBS Hunter units as set forth in ASTM-D-2244, and chalking in excess of 8 units as set forth in ASTM-D-4214.
 - b. The warranty shall be for a period of 30 years from the date of shipment for PVDF paint systems.
 - c. The warranty shall be for a period of 25 years from the date of shipment for silicone-polyester paint systems.
 2. Galvalume® systems
 - a. Furnish manufacturer's standard warranty for the Galvalume® panels against rupture, structural failure, or perforation due to normal atmospheric conditions.
 - b. The warranty shall be for a period of 20 years from the date of shipment for Galvalume® systems.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Nucor Building Systems or equivalents

2.2 MATERIALS (All Primary, Secondary and other Misc. Framing shall be Hot Dip Galvanized)

- A. Primary Framing Steel:

1. Steel for hot rolled shapes must conform to the requirements of ASTM Specifications A-36, A-572 or A-992, with minimum yield of 36 or 50 ksi, respectively.
2. Steel for built-up sections must conform to the requirements of ASTM A-1011, A-1018, A-529, A-572 or A-36 as applicable, with minimum yield of 42, 46, 50, or 55 ksi as indicated by the design requirements.
3. Round Tube must conform to the requirements of ASTM A-500 Grade B with minimum yield strength of 42 ksi.

4. Square and Rectangular Tube must conform to the requirements of ASTM A-500 Grade B with a minimum yield strength of 46 ksi.
5. Steel for Cold-Formed Endwall "C" sections must conform to the requirements of ASTM A-1011 or A-1039 Grade 55, or ASTM A-653 Grade 55 with minimum yield strength of 55 ksi.
6. X-bracing will conform to ASTM A-36 or ASTM A-529 for rod and angle bracing or ASTM A-475 for cable bracing.

B. Secondary Framing Steel:

1. Steel used to form purlins, girts and eave struts must meet the requirements of ASTM A-1011 or ASTM A-1039 Grade 55 for primed material or ASTM A-653 Grade 55 for galvanized material with a minimum yield of 55 ksi.
2. Design Thicknesses – Gauge to be determined by design to meet specified loading conditions.

C. Panels:

1. Roll-formed Galvalume®, pre-painted Galvalume® or Galvanized G90 Exterior-Side and G60 Interior-Side. In Canada, Galvanized panel will have a coating thickness of G90 on both sides.
2. Standing Seam Panels must have:
 - a. (For US and Export) 50 percent minimum aluminum-zinc alloy-coating and conform to ASTM A-792 or ASTM A-653 with a minimum yield of 50 ksi.
 - b. (For Canada) 55 percent minimum aluminum-zinc alloy-coating with Galvalume® finish or 50 percent minimum aluminum-zinc alloy-coating with paint finish and conform to ASTM A-792 or ASTM A-653 with a minimum yield of 50 ksi.
3. Through-fastened panels must have:
 - a. 50 percent minimum aluminum-zinc alloy coating and conform to ASTM A-792 or ASTM A-653 with a minimum yield of 50 ksi.
4. Panel Finish:
 - a. SP Finish: Modified Siliconized Polyester paint system with a 25-year finish warranty.
 - b. PVDF Finish: 70% PVDF paint system with a 30-year finish warranty.

D. Panel Fasteners:

1. For Galvalume® and Painted finished roof panels: Long Life Cast Zinc head.
2. For wall panels: Coated carbon steel.
3. Color of exposed fastener heads to match the wall and roof panel finish.
4. Concealed Fasteners: Self-drilling type, of size required.

- E. Flashing and Trim: Match material, finish, and color of adjacent components. Provide trim at rakes, including peak and corner assemblies, high and low eaves, corners, bases, framed openings and as required or specified to provide weathertightness and a finished appearance.
- F. Roof Clips:
1. All clips must have factory-applied mastic and designed so that movement between the panel and the clip does not occur.
 2. Short or Tall Fixed clips; shall be either 3 ½ inches (89mm) or 4 ½ inches (114mm) in height. Used for applications where only a moderate amount of thermal expansion and contraction in the roof panel is expected.
 3. Short or Tall Sliding clips: shall be either 3 ½ inches (89mm) or 4 ½ inches (114mm) in height and provide either 1-7/8 inches or 3 7/8 inches of travel for panel thermal expansion and contraction, depending on clip choice.
- G. Sealant & Closures:
1. Sidelaps: Factory applied non-skinning Butyl mastic.
 2. Endlaps, Eave, Ridge Assembly, and Gable Flashings: Field applied 100% solids butyl-based elastomeric tape sealant, furnished in pre-cut lengths.
 3. Outside Closures: Closed-cell, plastic or metal
 4. Inside Closures: Closed-cell, plastic or metal

2.3 PRIMARY FRAMING

- A. Rigid Frames: Fabricated as welded built-up "I" sections or hot-rolled sections.
1. Frame Design: Gable Symmetrical.
 2. Frame Design: Gable Unsymmetrical.
 3. Frame Design: Single Slope.
 4. Frame Design: Lean-To.
 5. Frame Type: Clear-Span.
 6. Frame Type: Multi-Span.
- B. Rigid Frame Columns:
1. Straight/Uniform depth
 2. Tapered
- C. Rigid Frame Rafters:
1. Straight/Uniform depth
 2. Tapered
- D. Endwall Frames / Roof Beams: Fabricated as mill-rolled sections or built-up "I" sections depending on design requirements. Fabricate endwall columns of cold-formed "C" sections, mill-rolled sections, or built-up "I" sections depending on design requirements.
- E. Interior Columns: Columns supporting rafters of mainframes shall be of the following cross-section type(s):

1. Pipe (Round HSS).
 2. Tube (Square HSS).
 3. "I"-Shaped (Built-Up or Mill-Rolled depending on design requirements).
- F. Finish: Red-Oxide or Gray Primer, or galvanized (pre-coated galvanized cold-form, hot-dipped otherwise).
- G. Field Bolted Connections: All field bolted connections shall be designed and detailed utilizing ASTM A-325 or A-490 depending on design requirement.

2.4 SECONDARY FRAMING

- A. 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 and LGSI. They shall be pre-punched 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 purlin/girt webs, not purlin/girt flanges.
- B. Purlins (Excluding Open Web Joists): Horizontal structural members which support roof coverings.
1. Depth: To be determined by design (8", 10" or 12")
 2. Maximum Length: To be determined by design.
 3. Finish: Red Oxide Primer.
 4. Finish: Gray Primer.
 5. Finish: Pre-Coated Galvanized.
- C. Girts: Horizontal structural members that support vertical panels.
1. Depth: To be determined by design (8", 10", or 12")
 2. Maximum Length: To be determined by design.
 3. Finish: Red Oxide Primer.
 4. Finish: Gray Primer.
 5. Finish: Pre-Coated Galvanized.
- D. Eave Struts: Unequal flange, cold-formed "C" sections or "Z" purlins.
1. Depth: To be determined by design (8", 10" or 12")
 2. Maximum Length: To be determined by design.
 3. Finish: Red Oxide Primer.
 4. Finish: Gray Primer.
 5. Finish: Pre-Coated Galvanized.
- E. Base Framing: Base members to which the base of the wall covering may be attached to the perimeter of the slab. Secured to the concrete slab with mechanical anchors.
1. Formed base sill.
 2. Base channel.

- a. With flashing.
 - b. Without flashing.
 - 3. Base angle.
 - a. With flashing.
 - b. Without flashing.
 - 4. Base girt.
 - a. With flashing.
 - b. Without flashing.
 - 5. Finish: Red Oxide Primer.
 - 6. Finish: Gray Primer.
 - 7. Finish: Pre-Coated Galvanized.
- F. Building Systems roof joist system.
- 1. Open web, parallel chord, simple span load carrying members suitable for the direct support of roof systems utilizing material sizes and yield strengths as required.
 - 2. ClearBay™ roof joist system with reduced bridging on qualified "CFR" projects.
 - 3. Bridging
 - a. All Bolted
 - b. Welded
 - 4. Joist attachment
 - a. Welded
 - b. All Bolted (No welding required)
 - c. Alt. Bolted (Some welding required)
 - 5. Open web members shall be fabricated of material that conforms to the material specifications designated by the Steel Joist Institute as acceptable for this product.

2.5 ROOF PANELS

- A. Roof Panel: A through-fastened roof with 1 1/4-inch (32mm) ribs at 12 inches (305mm) on center. The area between the ribs is reinforced to minimize oil-canning.
 - 1. Gauge: 26 (Std.).
 - 2. Dimensions: 36 inches (915mm) wide by 1 1/4 inch (32mm) high.
 - 3. Finish/Color: As specified in Article 2.8 PANEL FINISH.

2.6 WALL PANELS

- A. Wall Panel: A through-fastened sidewall panel with 1 1/4-inch (32mm) ribs at 12 inches (305mm) on center. The area between the ribs is reinforced to minimize oil-canning.
1. Gauge: 26 (Std.).
 2. Dimensions: 36 inches (915mm) wide by 1 1/4 inch (32mm) high.
 3. Finish/Color: As specified in Article 2.8 PANEL FINISH.

2.7 ACCESSORIES

- A. Canopies: Overhanging or projecting roof structures off the sidewall or endwall with the extreme end usually unsupported. For aesthetic application or to cover entrance or walkway.
- B. Roof Line Trim:
1. Trim Type: Simple Eave/Rake Trim.
 2. Trim Type: Sculptured Eave/Rake Trim.
 3. Trim Type: Low-Eave Gutter / Sculptured Rake Trim.
- C. Purlin Extensions: Overhanging or projecting roof structure at the end of a building.
- D. Framed Openings: Used to frame out doors, windows, louvers, and any other openings. Refers to the framing members and flashing which surround an opening and includes jambs, header and or sill, trim, and fasteners.
- E. Walk Doors: Personnel entry doors.
1. Size: As noted on the Contract Drawings.
 2. Accessories: As noted on the Contract Drawings
 3. Size: 3 foot by 7 foot (914x2133mm) Single Leaf.
 4. Size: 4 foot by 7 foot (1219x2133mm) Single Leaf.
 5. Size: 6 foot by 7 foot (1828x2133mm) Double Leaf.
- F. Windows: Self-flashing, self-framing horizontal slide or fixed narrow-lite windows.
1. Type / Size: As noted on the Contract Drawings.
 2. Type: Fixed Glass
 - a. Size: 2 foot by 6 foot (610x1828mm).
 - b. Size: 4 foot by 4 foot (1219x1219mm).
 - c. Size: 5 foot by 4 foot (1524x1219mm).
 3. Type: Horizontal Slide
 - a. Size: 3 foot by 3 foot (914x914mm).
 - b. Size: 4 foot by 3 foot (1219x914mm).
 - c. Size: 4 foot by 4 foot (1219x1219mm).
 - d. Size: 5 foot by 3 foot (1524x914mm).
 - e. Size: 6 foot by 3 foot (1828x914mm).

- G. Translucent Roof and Wall Panels: Translucent Acrylit™ panels consisting of 8 oz. 100% acrylic translucent panel woven roving strand combined with chopped strand matrix fiberglass reinforcement. White in color with a minimum of 55-60 percent light transmittance. U/L 90 rated panel available. Allows natural light into the building.
- H. Liner Panels: A through-fastened sidewall panel with 1 1/4-inch (32mm) ribs at 12 inches (305mm) on center. The area between the ribs is reinforced to minimize oil-canning.
 - 1. Gauge: 26.
 - 2. Dimensions: 36 inches (915mm) wide by 1 1/4 inch (32mm) high.
 - 3. Finish: As specified in Article 2.8 PANEL FINISHES.
- I. Soffit Panels:
 - 1. Wall Panel: A through-fastened sidewall panel with 1 1/4-inch (32mm) ribs at 12 inches (305mm) on center. The area between the ribs is reinforced to minimize oil-canning.
 - a. Gauge: 26 (std.).
- J. Roof Vents: Accessories used on the roof to allow air to pass through.
 - 1. Gravity Ridge Vents: Can be used as single unit or continuous.
 - a. Size: 9 inch by 10 foot (229x3048mm) with Damper & Lockerpull.
 - b. Size: 12 inch by 10 foot (305x3048mm) with Damper & Lockerpull.
- K. Pipe Flashings: Aluminum base with EPDM boot. The base flange must bend to form a seal with surface irregularities or roof pitch.
 - 1. Size: 1/4" to 4" (6 to 102mm) Pipe
 - 2. Size: 4" to 7" (102 to 178mm) Pipe
 - 3. Size: 7" to 13" (178 to 330mm) Pipe

2.8 PANEL FINISHES

- A. Roof Panel:
 - 1. Galvalume® (GM)
- B. Wall Panel:
 - 1. Standard Panel Paint System (Siliconized Polyester Resin, 25-year Finish Warranty):
 - a. Color: Burnished Slate (BS)
 - b. Color: Evergreen (EG)
 - c. Color: Aztec Blue (AB)

- d. Color: Brick Red (BR)
- e. Color: Sagebrush Tan (SB)
- f. Color: Fox Gray (FG)
- g. Color: Lightstone (LS)
- h. Color: Polar White (PW)

C. Liner Panel:

- 1. Standard Panel Paint System (Siliconized Polyester Resin, 25-year Finish Warranty):
 - a. 26: gauge
 - 1) Color: Burnished Slate (BS)
 - 2) Color: Evergreen (EG)
 - 3) Color: Aztec Blue (AB)
 - 4) Color: Brick Red (BR)
 - 5) Color: Sagebrush Tan (SB)
 - 6) Color: Fox Gray (FG)
 - 7) Color: Lightstone (LS)
 - 8) Color: Polar White (PW)

D. Soffit Panel:

- 1. Standard Panel Paint System (Siliconized Polyester Resin, 25-year Finish Warranty):
 - a. Color: Burnished Slate (BS)
 - b. Color: Evergreen (EG)
 - c. Color: Aztec Blue (AB)
 - d. Color: Brick Red (BR)
 - e. Color: Sagebrush Tan (SB)
 - f. Color: Fox Gray (FG)
 - g. Color: Lightstone (LS)
 - h. Color: Polar White (PW)

2.9 FABRICATION

A. General:

- 1. Shop-fabricate all framing members for field bolted assembly. The surfaces of the bolted connections must be smooth and free from burrs or distortions.
- 2. Shop connections must conform to the manufacturer's standard design practices as defined in this section. Certification of welder qualifications will be furnished when required and specified in advance.
- 3. All framing members must carry an identifying mark.

B. Primary Framing:

- 1. Plates, Stiffeners and Related Members.: Factory weld base plates splice plates, cap plates, and stiffeners into place on the structural members.

2. Bolt Holes and Related Machining: Shop fabricate base plates, splices and flanges to include bolt connection holes. Shop fabricated webs to include bracing holes.
 3. Secondary structural connections (purlins and girts) to be ordinary bolted connections, which may include welded clips.
 4. Manufacturer is responsible for all welding inspection in accordance with the manufacturer's IAS Accreditation or CAN/CSA A660 Certification. Special inspection by the buyer or owner may be done in the manufacturer's facility and must be noted on the Contract Documents.
 5. Non-Destructive Testing (NDT) - NDT shall be performed and documented as required by the governing building code for this project.
- C. Zee Purlins:
1. Fabricate purlins from cold-formed "Z" sections with stiffened flanges. Size flange stiffeners to comply with the requirements of the latest edition of AISI. Connection bolts will install through the webs, not the flanges.
- D. Girts
1. Girts must be simple or continuous span as required by design. Connection bolts will install through the webs, not the flanges.
- E. Bracing:
1. Diagonal Bracing:
 - a. 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 or seismic forces. Diagonal bracing in the roof and sidewalls may be used to resist longitudinal loads (wind, crane, etc.) in the structure if diaphragm action cannot be used.
 - b. Diagonal bracing will be furnished to length and equipped with hillside 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. Special Bracing: When diagonal bracing is not permitted in the sidewall, a rigid frame type portal or fixed base column will be used. Shear walls can also be used where adequate to resist the applied wind or seismic forces.
 3. Flange Braces: The compression flange of all primary framing must be braced laterally with angles connecting to the bottoms chords of purlins or to the webs of girts so that the flange compressive stress is within allowable limits for any combination of loading.
 4. Bridging:

- a. Laterally bridge the top and bottom chords of the open-web bar joists as required by design thereof and specified on the building erection drawings.

PART 3 – EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Before erection proceeds, survey elevations and locations of concrete and masonry bearing surfaces and locations of anchor rods, bearing plates and other embedment's to receive structural framing, with Erector present, for compliance with requirements and metal building system manufacturer's tolerances.
- C. Proceed with erection only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Provide temporary shores, guys, braces, and other supports during erection to keep structural framing secure, plumb, and in alignment against temporary construction loads equal in intensity to design loads. Remove temporary supports when permanent structural framing connections and bracing are in place, unless otherwise indicated.

3.3 INSTALLATION

- A. The erection of the building system shall be performed by a qualified erector, in accordance with the appropriate erection drawings, erection guides and /or other documents furnished by manufacturer, using proper tools, equipment and safety practices.
- B. Erection practices shall conform to "Common Industry Practices", Section 6, MBMA (LR)-Building Systems Manual.
- C. There shall be no field modifications to primary structural members except as authorized and specified by manufacturer.

3.4 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION