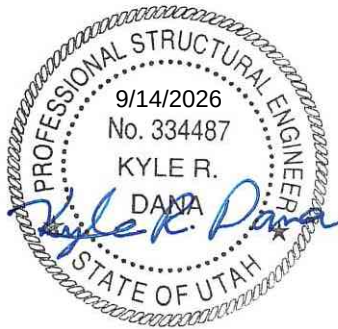


SPECIFICATIONS FOR USU BEEF TEACHING FACILITY CATTLE PEN BUILDING

WELLSVILLE, UTAH

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PREPARED BY:

FORSGREN
Associates Inc.

Forsgren Associates Inc 95 West 100 South, Suite 115 • Logan, UT 84321 • Tel 435 227-0333 • Fax 435 227-0334

SECTION 13 34 19
METAL BUILDING SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Manufacturers
- B. Design Criteria
- C. Metal roof panels
- D. Metal trim
- E. Building accessories
- F. Fabrication

1.2 RELATED SECTIONS

- A. Bidding Requirements," "Contract Forms," and "Conditions of the Contract.

1.3 QUALITY ASSURANCE

A. Referenced Standards:

- 1. Aluminium Association (AA):
 - a. Aluminum Design Manual
- 2. Americans with Disabilities Act (ADA):
 - a. Accessibility Guidelines for Buildings and Facilities
- 3. American Institute of Steel Construction (AISC):
 - a. Specifications for Structural Steel Buildings (referred to herein as AISC specification)
 - b. Steel Construction Manual, 16th Edition
- 4. 2024 International Building Code (IBC), or current edition
- 5. American Iron and Steel Institute (AISI)
 - a. 2008 Edition of the Cold-Formed Steel Design Manual
- 6. ASTM International (ASTM):
 - a. A6, Standard Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling.
 - b. A36, Specification for Carbon Structural Steel.
 - c. A47, Specification for Ferritic Malleable Iron Castings.
 - d. A48, Specification for Gray Iron Castings.
 - e. A53, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
 - f. A108, Specification for Steel Bars, Carbon, Cold Finished, Standard Quality.
 - g. A123, Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - h. A153, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - i. A197, Specification for Cupola Malleable Iron.
 - j. A269, Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
 - k. A276, Specification for Stainless Steel Bars and Shapes.
 - l. A307, Specification Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
 - m. A312, Specification for Seamless and Welded Austenitic Stainless Steel Pipe.

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- n. A475, Specification for Zinc-Coated Steel Wire Strand
- o. A496, Specification for Steel Wire, Deformed, for Concrete Reinforcement.
- p. A500, Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
- q. A501, Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing
- r. A529, Specification for High Strength Carbon Manganese Steel of Structural Quality
- s. A536, Specification for Ductile Iron Castings.
- t. A554, Specification for Welded Stainless Steel Mechanical Tubing.
- u. A563, Specification for Carbon and Alloy Steel Nuts
- v. A572, Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
- w. A582, Specification for Free-Machining Stainless Steel Bars.
- x. A653, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot Dip Process
- y. A666, Specification for Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- z. A668, Specification for Steel Forgings, Carbon and Alloy, for General Industrial Use.
- aa. A780, Practice for Repair of Damaged and Uncoated Areas of Hot-Dipped Galvanized Coatings.
- bb. A786, Specification for Rolled Steel Floor Plates.
- cc. A792, Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
- dd. A924, Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
- ee. A1011, 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
- ff. A3125, Standard Specification for High Strength Structural Bolts and Assemblies, Steel and Alloy Steel, Heat Treated, Inch Dimensions 120 ksi and 150 ksi Minimum Tensile Strength.
- gg. B26, Specification for Aluminum-Alloy Sand Castings.
- hh. B36, Specification for Brass Plate, Sheet, Strip, and Rolled Bar
- ii. B209, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
- jj. B221, Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- kk. B308, Specification for Aluminum-Alloy 6061-T6 Standard Structural Shapes.
- ll. B429, Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
- mm. B632, Specification for Aluminum-Alloy Rolled Tread Plate.
- nn. F467, Specification for Non-Ferrous Nuts for General Use.
- oo. F468, Specification for Non-Ferrous Bolts, Hex Cap Screws, and Studs for General Use.
- pp. F593, Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
- qq. F594, Specification for Stainless Steel Nuts.
- 7. American Welding Society (AWS):
 - a. A5.1, Standard Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding
 - b. D1.1, Structural Welding Code Steel
 - c. D1.2, Structural Welding Code Aluminum
 - d. D1.3, Structural Welding Code Sheet Steel
- 8. National Association of Architectural Metal Manufacturers (NAAMM):
 - a. AMP 510, Metal Stairs Manual.
- 9. National Association of Corrosion Engineers (NACE)
- 10. Research Council on Structural Connections:
 - a. Specification for Structural Joints Using ASTM A325 or A490 Bolts (referred to herein as Specification for Structural Joints).

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11. U. S. Department of Labor, Occupational Safety and Health Administration (OSHA):
 - a. 29 CFR 1910, OSHA Safety and Health Standards for General Industry (referred to herein as OSHA standards).
12. Provide all fabricated items complying with 2024 International Building Code, or current edition, and OSHA Regulations.

B. Qualifications:

1. The proposed supplier/Licenser shall have a minimum of 10 years' experience in the installation of metal buildings.
2. The proposed supplier/Licenser shall also submit a list of no less than 10 installations in the United States as evidence of meeting the experience requirement.
3. Structural framing and cover shall be the design of a professional engineer licensed in the State for which the project will be constructed and experienced in design of this work.
4. The proposed fabricator shall be a company specializing in performing the work of this Section with minimum 10 years documented experience.

1.4 DEFINITIONS

- A. Installer or Applicator: Installer or applicator is the person actually installing or applying the product in the field at the Project site.
 1. Installer and applicator are synonymous.
- B. The building eave height shall be measured from the bottom of the base plate of the frame column to the top of the eave strut.
- C. Hardware: As defined in ASTM A153.
- D. Galvanizing: Hot-dip galvanizing per ASTM A123 or A153 with minimum coating of 2.0 OZ of zinc per square foot of metal (average of specimens) unless noted otherwise or dictated by standard.
- E. Traditional Metal Building System: Building system using either continuous or simple span "Z" purlins for support of roof covering material.
- F. Long Bay System (LBS): Building system using simple span, cold-formed, open web purlins to support roof covering material.
- G. Single Slope: Continuous frame building which does not contain 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 columns) or simple span (flush in column line). Rafters may or may not have interior columns.
- H. Roof Slope: Pitch expressed as inches of rise for each 12 inches of horizontal run.
- I. Acrylic-Coated Galvalume: Aluminum-Zinc coated steel with a thin clear acrylic finish coating eliminating the need for roll-forming oil and reducing incidence of field marking by handling or foot traffic.
- J. Building Eave Height: Nominal dimension measured from finished floor to top flange of eave strut.
- K. Building Width: Measured from outside to outside of side wall secondary structural member.
- L. Building Length: Measured from outside to outside of end wall secondary structural member.

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- 1
- 2 M. Collateral Loads: Weight of any non-moving equipment or material, such as ceilings,
- 3 electrical or mechanical equipment, sprinkler systems, plumbing, or ceilings.
- 4
- 5 N. Dead Load: Actual weight of building system as supplied by manufacturer supported by
- 6 given member.
- 7
- 8 O. Floor Live Loads: Loads induced on floor system by building occupants and possessions
- 9 including but not limited to furniture and equipment.
- 10
- 11 P. Roof Live Loads: Loads produced by maintenance activities, rain, erection activities, and or
- 12 movable or moving loads but not including wind, snow, seismic, crane, or dead loads.
- 13
- 14 Q. Roof Snow Loads: Gravity load induced by weight of snow or ice on roof, assumed to act on
- 15 horizontal projection of roof.
- 16
- 17 R. Seismic Loads: Loads acting in any direction on structural system due to action of an
- 18 earthquake.
- 19
- 20 S. Wind Loads: Loads on structure induced by forces of wind blowing from any horizontal
- 21 direction.
- 22
- 23

24 **1.5 SUBMITTALS**

25

- 26 A. Shop Drawings:
- 27 1. Fabrication and/or layout drawings and details:
- 28 a. Submit drawings for all fabrications and assemblies. Include erection drawings,
- 29 plans, sections, details, and connection details.
- 30 b. Identify materials of construction, shop coatings and third-party accessories.
- 31
- 32 2. Product technical data including:
- 33 a. Acknowledgement that products submitted meet requirements of the referenced
- 34 standards.
- 35 b. Manufacturer's installation instructions
- 36
- 37 3. Provide manufacturer's design values for:
- 38 a. Dead Load
- 39 b. Collateral Load
- 40 c. Live Load
- 41 d. Snow Load
- 42 e. Wind Speed
- 43 f. Wind Exposure
- 44 g. Seismic Coefficient
- 45
- 46 4. Stamped and signed from a licensed engineer in the State the project will be
- 47 constructed in One (1) set each of the following:
- 48 a. Design Drawings
- 49 b. Design Calculations
- 50 c. Summary of Loads applied to concrete foundations and walls.
- 51
- 52 5. Buy American/ARRA Compliance Letter of Certification.
- 53
- 54 B. Samples:
- 55 1. Submit color chips showing manufacturer's full range of available colors and patterns
- 56 for each finish product.

2. After color selection submit samples representing actual product, color, and patterns.
- C. Quality Control Submittals:
 1. IAS AC472 Certificate for each facility involved in the design and fabrication of the Metal Building System.
 2. Certified Erector Certificate issued to the erector by the manufacturer.
 3. Material Test Reports (MTR) for all steel material used in the manufacture of primary and secondary framing members, panels and bolts specified in this section and when required by ASTM A 6/A 6M

1.6 MATERIALS

- A. Primary Framing Steel:
 1. Hot-rolled shapes: ASTM A 36, A572, or ASTM A 992, minimum yield of 36 ksi or 50 ksi.
 2. Built-up sections:
 - a. Webs:
 - 1) ASTM A 1011 or ASTM A1018, SS or HSLAS, Grade 55 for webs 3/16 inch thick and thinner.
 - 2) ASTM A 572 Grade 50 or ASTM A572 Grade 55 or ASTM A 529 Grade 55 for webs thicker than 3/16 inch.
 - b. Flanges: ASTM A 529 Grade 55 or ASTM A 572 Grade 50 or 55.
 3. Round tube: ASTM A 500, Grade B with minimum yield strength of 42 ksi.
 4. Square and rectangular tube: ASTM A 500, Grade B, minimum yield strength of 46 ksi.
 5. Cold-formed C sections: ASTM A 1011, Grade 55, or ASTM A 653, Grade 55.
 6. X-bracing: ASTM A 529 or A 572 for rod bracing 36 ksi or 50 ksi, ASTM A 36 for angle bracing or ASTM A 475 for cable bracing.
 7. Finish: .
- B. Secondary Framing Steel:
 1. Purlins, girts, and eave struts: ASTM A 1011 Grade 55, or ASTM A 653, Grade 55.
 2. Thickness:
 - a. 16 gauge: 0.056-inch minimum uncoated thickness.
 3. Finish: Pre-galvanized, hot-dipped.
- C. Panels:
 1. Materials: ASTM A 792.
 2. Thickness and yield strength:
 - a. 24 gauge: ? minimum uncoated thickness, 50 ksi yield strength.
 - b. 26 gauge: 0.0172-inch minimum uncoated thickness, 80 ksi yield strength.
 3. Finishes:
 - a. Aluminum-Zinc Alloy Coating, 55% Aluminum, 50% Zinc coated steel per ASTM A 792 AZ55.
 4. Fasteners:
 - a. Through-fastened panels: Self-drilling with sealing washer.
 - b. Standing seam panels: Long life self-drilling with sealing washer.
 - c. Ridge: Long-life self-drilling with sealing washer.
 - d. Clips to purlin or bar joists: Long-life self-drilling with hex washer head and washer.

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5. Clips:
 - a. Low or high fixed clips: Use where moderate thermal expansion and contraction in roof panel is expected.
 - b. Low or high sliding clips: Provide 2 to 4 inches of travel for panel thermal expansion and contraction.
6. Sealants and closures:
 - a. Side-laps: Factory applied, hot melt, foamable mastic.
 - b. End-laps, eave flashings: Field-applied non-skinning sealant.
 - c. Through-Fastened Roof Closures: Provide closed-cell polyethylene inside and outside foam closures.
 - 1) Bulk Density: 2 pounds per cubic foot.
 - 2) Service Temperature: -100 to 180 degrees Fahrenheit.
 - 3) Shore Hardness: 7 on AA scale or 51 on 00 scale when tested to ASTM D 2240.

1.7 PRIMARY FRAMING

- A. Frame Design: As indicated on Drawings.
- B. Sidewall Column Profile: As indicated on Drawings.
- C. Frame Span: As indicated on Drawings.
- D. Modular Frame Interior Column Profile: As indicated on Drawings.
- E. Bracing: Standard X-Bracing.

1.8 SECONDARY FRAMING

- A. Roof Zee Purlins:
 1. Horizontal structural members which support roof coverings.
 2. Depth: As required by design.
 3. Thickness: As required by design, 16 gauge minimum.
 4. Finish: Pre-coated Galvanized.
- B. Long Bay Purlins:
 1. Horizontal structural members that support roof systems, with virtual square shaped top and bottom chords and web members.
 2. Open Web Purlins for Long Bay applications.
 3. Finish: Pre-coated Galvanized.
 - 4.

1.9 BOLTS

- A. Rigid Frame Connections: Provide High Strength Bolts, Nuts and Washers:
 1. Bolts: ASTM F 3125 Grade A325 Heavy Hex Structural Type I.
 2. Washers: ASTM F 436 Type 1 Hardened Steel.
 3. Nuts: ASTM A 563 Grade C Heavy Hex. Nuts shall be wax coated by emulsion such that the torque required to complete a Rotational Capacity (RC) test shall be reduced by 40% from the un-waxed state.
 4. Coating: Hot-Dipped Galvanized.
- B. Other Connections: Provide High Strength or Machine Bolts as required by manufacturer design:
 1. High Strength Bolts and Nuts:

- a. Bolts: ASTM F 3125 Grade A325 Heavy Hex Structural Type I.
 - b. Nuts: ASTM A 563 Grade C Heavy Hex.
 - c. Coating: ASTM F 1941 Electrodeposited Yellow Zinc.
2. Machine Bolts:
- a. Bolts: ASTM A 307 Grade Carbon Steel.
 - b. Nuts: ASTM A 563 Grade A Hex Nut.
 - c. Coating: ASTM F 1941 Electrodeposited Clear Zinc.

1.10 ROOF SYSTEM

- A. Assembly Performance Requirements:
- 1. Class 90 rated and listed in accordance with UL-580 for Wind Uplift.
 - 2. Class A rated and listed in accordance with UL-790 for External Fire.
 - 3. Class 4 rated and listed in accordance with UL-2218 for Impact Resistance.
- B. Through-Fastened Panels:
- 1. Type: Single skin ribbed panels with exposed fasteners.
 - 2. Strength: Determine and certify allowable panel strengths in accordance with AISI S100.
 - 3. Panel profile(s): PBR; 1-1/4-inch ribs at 12-inch centers, 1/4:12 minimum roof slope.
 - a. Thickness: 26 gauge.
 - b. Finish: Selected from manufacturer standard finish by owner.
 - c. Color: Selected from manufacturer standard color by owner.
 - 1) External Fire: Class A.
 - 2) Internal Fire: Class 1.
 - 3) Hail: Severe.
 - 4. 03ASCE 7. Panel fasteners: Long-life finish.
 - 5. Sidelap mastic: 1 inch x 3/32 inch.
- C. Accessories:
- Eave trim condition: Simple eave.

1.11 DELIVERY, STORAGE, AND HANDLING

- A. Deliver and handle fabrications to avoid damage.
- B. Store above ground on skids or other supports to keep items free of dirt and other foreign debris and to protect against corrosion.
- C. Protect steel products from weather as specified by manufacturer instructions.

1.12 WARRANTY

- A. Structural Components: A 1 year replacement with parts of similar size and configuration.
- B. Paint/Finish:
- 1. Exterior; wall siding, roof panels - 30 Years
 - 2. Exterior Trim: wall siding trim, roof panel trim, eave trim, soffit trim, fascia trim, and any other miscellaneous trim – 30 years
- C. Weather Tightness:
- 1. All trim, roof, - 5 years

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PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Anthem Steel
- B. Behlen Building Systems
- C. Butler Manufacturing
- D. Garco Building Systems
- E. Icon Building Systems
- F. Kelly Klosure
- G. Metallic Building Systems
- H. Nucor Building Systems
- I. United Steel
- J. Varco Pruden Buildings
- K. Or approved equal.
 - 1. Submit requests for substitution to Utah State University for review and approval.

2.2 GENERAL

- A. Building shall be designed by an engineer licensed in the state for which the project will be constructed.
 - 1. Construction shall be at USU South Farm 3600 South Highway 89, Wellsville, UT 84339.
 - 2. Design and design loading shall be in accordance with IBC 2024 and referenced standards.
- B. The Fabricator and Contractor shall be solely responsible for the safety, design, and construction of the entire building. They shall also be responsible for the compatibility between the metal building and the concrete foundation and retaining wall as shown on the design drawings. Materials shall not be ordered, and fabrication shall not start until the drawings and calculations have been reviewed and accepted by the Engineer. Review and acceptance of the drawings and calculations in no way relieves the Contractor and Fabricator of complete responsibility for the items previously listed.
- C. Building shall be clear span rigid frame with a single slope profile with interior center column.
- D. Moment Frame location, column locations, bracing locations, door locations, and bay spacing shall be as indicated on drawings. The metal building designer shall not deviate from the layout of building without written approval from the structural engineer of record.
- E. Building foundations have been designed with preliminary reactions. Final design of the building foundations will occur after receiving final building reactions from metal building designer. Final foundation plans may be revised to accommodate final building design loads.

F. Review of metal building structural calculations and shop drawings will be provided for (2) submittals. After (2) submittals, the contractor will be responsible for paying additional submittal reviews.

G. All structural steel sections and welded plate members shall be designed in accordance to the AISC "Specifications for the Design, Fabrications, and Erection of Steel for Buildings."

H. All light cold formed, structural members shall be designed in accordance to the AISI "Specifications for the Design of Light Gage Cold-Formed Steel Structural Members."

2.3 DESIGN CRITERIA

A. Dimensions:

1. Refer to design drawings for building dimensions.
2. 1/4:12 roof pitch with single slope.

B. Building materials shall meet the following:

- | | |
|---|--|
| 1. Wide Flange Steel Shapes: | ASTM A992 |
| 2. Miscellaneous Steel Shapes: | ASTM A36, Yield Strength 36 KSI |
| 3. Steel Pipes: | ASTM A53 Gr. B, Yield Strength 35 KSI |
| 4. Structural Rectangular HSS: | ASTM A500 Gr. B, Yield Strength 46 KSI |
| 5. Structural Round HSS: | ASTM A500 Gr. B, Yield Strength 42 KSI |
| 6. Structural Steel Web Plate: | ASTM A572/A1011, Yield Strength 50 KSI |
| 7. Structural Steel Flange Plates/bars: | ASTM A529/A572, Yield Strength 55 KSI |
| 8. Cold Form Light Gauge: | ASTM A653/A1011, Yield Strength 55 KSI |
| 9. Roof and Wall Sheets: | ASTM A792/A653, Yield Strength 80 KSI |
| 10. Girts and Purlins: | ASTM A570, Yield Strength 55 KSI |
| 11. Cable Brace: | ASTM A475 Type 1, Extra High Strength |
| 12. Rod Brace: | ASTM A36, Yield Strength 36 KSI |
| 13. Mill Sections: | ASTM A36, Yield Strength 36 KSI |
| 14. Machine Bolts and Nuts: | ASTM A307, Tensile Strength 60 KSI |
| 15. High Strength Bolts (<1" Dia.): | ASTM A325, Tensile Strength 120 KSI |
| 16. High Strength Bolts (>1" Dia.): | ASTM A325, Tensile Strength 105 KSI |
| 17. Girt and Purlin Bolts: | ASTM A307, Tensile Strength 60 KSI |

C. Self-Drilling and self-tapping fasteners with neoprene washers to be supplied with both wall and roof panels.

D. All framing members shall be shop fabricated for bolted field assembly.

E. Building anchor bolts and related anchorage shall be designed to resist the column reactions resulting from the design loads. The diameter of the anchor bolts shall be as designed and specified by the building manufacturer. Anchor bolts shall be compatible with concrete foundations and supports shown in the design drawings.

F. The roof dead load shall be assumed to be distributed over the entire roof area.

G. The application of the roof live load to roof covering shall be in accordance with the minimum allowed by the governing building code.

H. Wind velocity pressures shall be applied as prescribed by the specified building code.

I. Load magnitudes shall be as specified by local building codes or other governing bodies.

J. Columns shall be supported only at the locations designated on the design drawings.

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- 1 K. Column reactions shall be verified by the engineer of record during the review of the metal
2 building submittal. If reactions exceed the capacities of the foundations and supports, the
3 foundations and supports will need to be revised. Allow 5 weeks for review of the metal
4 building submittal and any required revisions to the foundations and supports.
5
6 L. Deflection requirements shall be in accordance with the applicable provisions of the AISC
7 Steel Design guide or as specified by local governing bodies.
8
9 M. All wall girts and roof purlins shall be designed as simple or continuous beams. Each
10 interior rigid frame shall be designed to carry equal loads that result from a simple span
11 purlin or girt system. Purlins and girts shall be designed to have a depth and gage as
12 needed to conform to the particular design criteria.
13
14 N. Preformed Panel to match the slope and profile of adjoining roof panels to help insure
15 constant alignment and weather tightness.
16
17 O. Building penetrations shall be sealed against water penetration in accordance to plans or
18 manufacturer's instructions.
19
20 P. Sealant: For roof sidelaps, endlaps, and flashing at eave. Use nominal 3/8" thick pressure
21 sensitive tape sealant.
22
23 Q. Governing Design Code: Structural design for the metal building system shall be performed
24 by the manufacturer of the metal building system in accordance with the building code
25 provided in the contract documents.
26
27 R. Design Basis:
28 1. Use standards, specifications, recommendations, findings, and interpretations of
29 professionally recognized groups as basis for establishing design, drafting, fabrication,
30 and quality criteria, practices, and tolerances, including the AISC Code of Standard
31 Practice for Steel Buildings and Bridges.
32 2. Design structures in accordance with MBMA Practices and Manual including fabrication
33 and erection tolerances.
34 3. Design structural mill sections and welded plate sections in accordance with AISC 360,
35 ASD Method.
36 4. Design the lateral force resisting systems and related components for seismic loads in
37 accordance with AISC 341.
38 5. Design cold-formed steel structural members and panels in accordance with AISI S-
39 100.
40 6. Design all bolted joints in accordance with RCSC Specification.
41
42 S. Design Loads:
43 1. In accordance with Contract Documents and manufacturer's standard design practices.
44 2. Design loads include dead loads, roof live loads, wind loads, seismic loads, collateral
45 loads, auxiliary loads, floor live loads and applied or specified loads.
46

2.4 FABRICATION

- 47 A. General:
48
49 1. Verify field conditions and dimensions prior to fabrication.
50 2. Provide drilled or punched holes with smooth edges.
51 a. Punch or drill for field connections and for attachment of work by other trades.
52
53 3. Conceal fastenings where practicable.
54 4. Fabricate work in shop in as large assemblies as is practicable.
55
56

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- 1 B. Primary Framing:
- 2 1. Plates, stiffeners, and related members: Factory welded base plates, splice plates, cap
- 3 plates, and stiffeners into place on structural members.
- 4 2. Bolt holes and related machining: Shop fabricate base plates, splices, and flanges to
- 5 include bolt connection holes. Shop-fabricate webs to include bracing holes.
- 6 3. Secondary structural connections (purlins and girts): Ordinary (not pretensioned) bolted
- 7 connections with welded clips.
- 8 4. Welding inspection: Per IAS AC472 Part A.
- 9
- 10 C. Long Bay Purlins:
- 11 1. Fabricate purlins from cold-formed open web long bay system assemblies with stiffened
- 12 chords.
- 13 2. Install connection bolts through purlin seats.
- 14 3. Pre-punch assemblies to allow for attachment of frame flange brace angles,
- 15 compression strut extensions, and diagonal X-bridging at centerline.
- 16 4. Furnish bridging as light-gauge cold-formed angles secured using self-drilling fastener.
- 17 5. Manufacture sections in IAS AC472 Part A and B Accredited facility.
- 18 6. Top and bottom chords: Nominal 4-inch width formed so that top surface is continuous
- 19 and flat to facilitate easy assembly of roof system.
- 20 7. Fabricate all elements of minimum 16-gauge steel.
- 21 8. Subject finished assemblies to periodic testing to loads equal to 110 percent of design
- 22 loads.
- 23
- 24 D. Zee Purlins:
- 25 1. Fabricate purlins from cold-formed Z-shaped sections with stiffened flanges.
- 26 2. Size flange stiffeners to comply with requirements of ASTM A1011 Grade 55.
- 27 3. Purlin flanges unequal in width for easier nesting during erection.
- 28 4. Purlins pre-punched at factory to provide for field bolting to rigid frame clips
- 29
- 30
- 31 E. Bracing:
- 32 1. Diagonal Bracing:
- 33 a. Diagonal bracing in roof and sidewalls may be used to resist longitudinal loads in
- 34 structure when panel diaphragm cannot be used.
- 35 b. Furnish to length and equipped with hillside washers and nuts at each end.
- 36 c. Bracing may consist of rods threaded at each end or galvanized cable with suitable
- 37 threaded end anchors.
- 38 d. If load requirements dictate, bracing may be of structural angle or pipe, bolted in
- 39 place.
- 40
- 41 2. Special Bracing:
- 42 a. When diagonal bracing is not permitted in sidewall use rigid frame type portal or
- 43 fixed base column.
- 44 b. Shear walls may be used where adequate to resist applied wind or seismic forces.
- 45
- 46 3. Flange Braces: Brace compression flange of primary framing laterally with angles
- 47 connecting to purlin or girt webs so that flange compressive stress is within allowable
- 48 limits for any combination of loading.
- 49
- 50 4. Bridging:
- 51 a. Laterally brace top chord of long bay purlins with horizontal bridging if roof system
- 52 being used will not supply adequate lateral support to top chord.
- 53
- 54 5. Horizontally bridge bottom chord for lateral bracing. One row of bolted diagonal bridging
- 55 required for long span purlins 40 feet long and longer.
- 56

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F. End Laps:

1. Fabricate with 16-gauge backup plates and eight end lap joint fasteners installed in six pre-punched holes in flat and in dimples in trapezoidal legs.
2. Apply mastic between panels and secure with self-drilling fasteners through panels and backup plate.
3. Through roof fasteners may be used only at end laps and eaves.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Prior to installation, inspect and verify condition of foundation, floor slab, mechanical and electrical utilities, placed anchors and any other appurtenances are in the correct position. Installation of product constitutes installer's acceptance of these conditions for product compatibility.
- B. Correct surface defects or conditions which may interfere with or prevent a satisfactory installation.
 1. Field welding aluminum is not permitted unless approved in writing by Engineer.
- C. Clean Surfaces prior to installation.
- D. Prepare surfaces using methods recommended by manufacturer for best result for substrate.

3.2 INSTALLATION

- A. All work shall be performed in a workmanlike manner.
- B. Install all systems in accordance with manufacturer's instructions and approved Shop Drawings.
- C. Set metal work level, true to line, plumb.
- D. Bolt Field Connections: Where practicable, conceal fastenings.
- E. Grind welds smooth where field welding is required.
- F. Remove all burrs and radius all sharp edges and corners of miscellaneous plates, angles, framing system elements, etc.
- G. Metal Connections:
 1. Connect steel and aluminum members with high strength bolts or screws.
 2. Provide dissimilar metals protection.
 3. Connect aluminum and steel members to concrete and masonry using stainless steel expansion anchor bolts or adhesive anchor bolts unless shown otherwise. Provide dissimilar materials protection.
 4. Provide washers and nuts for all bolted connections.
- H. Install and tighten high-strength bolts in accordance with 16th Edition of Manual of Steel Construction.
 1. Provide hardened washers for all ASTM A3125 Gr. A325 or Gr. A490 bolts. Provide the hardened washer under the element (nut or bolt head) turned in tightening.

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- I. After bolts are tightened, upset threads of unfinished bolts or anchor bolts to prevent nuts from backing off.
- J. Do not field splice fabricated items unless said items exceed standard shipping length or change of direction requires splicing. Provide full penetration welded splices where continuity is required.
- K. Provide each fabricated item complete with attachment devices as indicated or required to install.
- L. Anchor such that work will not be distorted nor fasteners overstressed from expansion and contraction.
- M. Tie anchor bolts in position to embedded reinforcing steel using wire. Tack welding prohibited. Coat bolt threads and nuts with heavy coat of clean grease. Anchor bolt location tolerance: 1/16 IN. Provide steel templates for all column anchor bolts.
- N. Accurately locate and place frames for openings before casting into floor slab so top of plate is flush with surface of finished floor. Keep screw holes clean and ready to receive screws.
- O. Seal wall and roof accessories weather tight.
- P. Repair damaged surfaces in accordance.
 - 1. Prepare damaged surfaces by abrasive blasting or power sanding.
 - 2. Apply repair paint in accordance with manufacturer's instructions.

3.3 FRAMING

- A. Erect framing in accordance with MBMA Low Rise Building Systems Manual, Common Industry Practices.
- B. The erector shall furnish temporary guys and bracing where needed for squaring, plumbing, and securing the structural framing against loads, such as wind loads acting on the exposed framing and seismic forces, as well as loads due to erection equipment and erection operation, and loads resulting from the performance of work by others. Bracing furnished by the manufacturer for the metal building system cannot be assumed to be adequate during erection. The temporary guys, braces, falseworks, and cribbing are the property of the erector, and the erector shall remove them immediately upon completion of erection.
- C. Do not field cut or alter structural members without approval of the metal building manufacturer and owner.

3.4 WALL AND ROOFING SYSTEMS

- A. Install in accordance with manufacturer's instructions.
- B. Exercise care when cutting pre-finished material to ensure cuttings do not remain on finish surface.
- C. Fasten cladding system to structural supports, aligned level and plumb.

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3.5 CLEANING

- A. After erection, installation, or application, clean all miscellaneous metal fabrication surfaces of all dirt, weld slag and other foreign matter.
- B. Protect installed products until completion of project.
- C. Touch up, repair, or replace damaged products before Substantial Completion.

END OF SECTION