STEELWAY
BUILDING SYSTEMS

Steelway Building Systems'

Product Specification Guide

AN ARDENT COMPANY

SBS Product Specification Guide
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Product Specification
Guide

STEELWAY BUILDING SYSTEMS

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Part 1 General

1.1 Scope

A. The following Specification Guide will provide the owner or design professional a detailed description of all standard Steelway Building Systems (Steelway) products. This guide is designed to aid the architect or engineer of record in the process of specifying our superior building system solution.
B. These product specifications are intended for use as an outline of the performance requirements for the various materials used within Steelway's steel building system. They are further intended to ensure that architects, engineers, builders and owners understand the basis for design, manufacture and application of these materials.
C. Engineering and mechanical properties of materials utilized by Steelway in its product line are provided or referenced within these specifications, as they are industry specification standards, where applicable.
D. Steelway utilizes those standards, specifications, interpretations and recommendations of professionally recognized groups and agencies, such as CSSBI, CSA, CWB, CISC, MBMA, AISC, AISI, AWS, ASTM, as the basis in establishing its own design, fabrication and quality criteria, standards, practices, methods and tolerances.
    1. In all cases unless stipulated otherwise in the contract documents, Steelway's design, fabrication and quality criteria, standards, practices, methods and tolerances will govern the work.
E. Statements, descriptions, specifications and dimensions contained herein are in effect as of the date of this issue. Steelway reserves the right to make material substitutions and changes in specifications and construction methodology as, and when, deemed necessary.

1.2 Materials

A. Standard materials furnished for Steelway's steel building systems will include primary and secondary structural steel framing members, bracing, steel panels for roofing and siding, flashings, fasteners, sealants, accessories and all other miscellaneous component parts required for a complete building (with the exception of insulation, doors, windows, hardware, foundations, anchor bolts and other embedded items, which are excluded). Specific items beyond the scope of standard material may also be furnished if called for by contract documents.

1.3 Drawings, Reactions And Calculations

A. Steelway will provide erection information and drawings as required to assemble all parts, components and accessories furnished by Steelway.
    1. Erection drawings will bear the stamp and signature of a professional engineer registered in the province in which the building is to be erected.
    2. Steelway documents are in accordance with the CSSBI 30M paragraph 13; erection drawings showing foundation loads, anchor bolt setting details, part numbers, connections and assembly details.
    3. Drawings will indicate plans and grid lines, structural members and connection details, bearing and anchorage details, roof cladding, wall cladding, framed openings, camber (as required), loads and reaction forces, fasteners and field welds (as required), sealant locations and details.
    4. Drawings will indicate shop and erection details including cuts, copes, connections, holes, threaded fasteners, rivets and welds.
    5. Erection drawings will indicate related provisions required for mechanical, electrical and other work, when such information can be supplied to Steelway at time of the initial order.
B. Drawings will include anchor bolt setting plans, roof framing plan, wall framing elevations and cross-sections.
C. Steelway will supply both factored and unfactored / basic "service" column reactions for use in designing foundations for the building, however, Steelway will not be responsible for the design nor the adequacy of the foundation.
    1. It is the responsibility of the foundation designer to use our reported unfactored / basic "service" column reactions in conjunction with the applicable load combinations, codes and standards that correspond to the design of the foundation.

2. Steelway understands that it's common for the foundation designer to reference our maximum factored reactions as an approximate check, however we do not recommend or endorse the use of the maximum reactions for the foundation design as there may be different load combinations exclusive to the foundation that may govern.

D. If required by the contract documents, Steelway will furnish design calculations for the structural framing and covering panels of the steel building system. At the discretion of Steelway, design calculations may be computer-generated or prepared manually.

1.4 Reference Standards

A. CAN/CSA:
1. A660 – Certification of Manufacturers of Steel Building Systems.
2. S16 – Design of Steel Structures.
3. S136 – North American Specification for the Design of Cold Formed Structural Steel Members.
4. W47.1 – Certification of Companies for Fusion Welding of Steel.
5. W55.3 – Certification of Companies for Resistance Welding of Steel and Aluminum.
6. W59 – Welded Steel Construction (Metal Arc Welding).
7. G40.20 / G40.21 – General requirements for rolled or welded structural quality steel

B. Canadian Institute of Steel Construction (CISC):
1. CISC – Handbook of Steel Construction.
2. CISC/CPMA - 1-73a A Quick Drying One-Coat Paint for use on Structural Steel.
3. CISC/CPMA – 2-75 A Quick Drying Primer for use on Structural Steel.

C. Canadian Sheet Steel Building Institute (CSSBI):
1. C1 – Certificate of Design and Manufacturing Conformance with NBCC.
2. S8 – Quality and Performance Specification for Pre-Finished Sheet Steel for Building Products.
3. B15B-17 – Serviceability Design Criteria for Low Rise Steel Building Systems

D. ASTM International (ASTM):
1. ASTM A 325 – Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
2. ASTM A 653 / A 653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
3. ASTM A 792 / A 792M – Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
4. ASTM A490 – Standard Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength
5. ASTM A572 / A5772M – Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel
6. ASTM A529 / A529M - Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality
7. ASTM A1011 / A1011M - 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.
8. ASTM A992 / A992M - Standard Specification for Structural Steel Shapes
9. ASTM A500 Grade C – Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes

E. American Institute of Steel Construction (AISC):
1. AISC Specification for Structural Steel Buildings.
2. AISC Serviceability Design Considerations for Low-Rise Buildings.

F. American Iron and Steel Institute (AISI):
1. AISI North American Specification for the Design of Cold-Formed Steel Structural Members.

G. 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.

H. Association for Iron & Steel Technology (AISE):
1. AISE 13 – Specifications for Design and Construction of Mill Buildings.

I. Federal Specifications (FS):
   1. SSPC-Paint 15 - Primer for Use Over Hand Cleaned Steel performs to SSPC-Paint 15 standards
   2. SSPC-SP2 – Hand Tool Cleaning.

J. Metal Building Manufacturers Association (MBMA):
   1. MBMA Metal Building Systems Manual.

K. North American Insulation Manufacturers Association (NAIMA):
   1. NAIMA 202 – Standard for Flexible Fiber Glass Insulation to be Laminated for Use in Steel Buildings.

L. The Society for Protective Coatings (SSPC):
   1. SSPC-Paint 15 - Primer for Use Over Hand Cleaned Steel performs to SSPC-Paint 15 standards.
   2. SSPC-SP2 – Hand Tool Cleaning.

M. Underwriters Laboratories (UL):
   1. UL 580 – Standard for Tests for Uplift Resistance of Roof Assemblies.
   2. UL 723 – Standard for Test for Surface Burning Characteristics of Building Materials.

1.5 Certification

A. CSA A660 Certified
   1. Steelway will submit, for each project, an A660 Certificate of Design and Manufacturing Conformance stating design criteria used and loads assumed in design. The certificate shall be stamped and signed by a professional engineer registered in the province in which the building is to be erected.
   2. CSA A660 certification ensures that the manufacturer (Steelway) has been audited to the following items: (a) Personnel; (b) Design and engineering; (c) Materials control; (d) Fabrication; (e) Warehousing, packaging and shipping; (f) Erection responsibility; and (g) Plant quality program.
   3. The issued A660 certificate of design and manufacturing conformance is a confirmation of process and manufacturing quality control and conformance to national building code standards that is rigorously audited through an annual certification process.
   4. No modifications, substitutions or alterations may be made in the field without prior authorization from Steelway. Any unauthorized modifications, substitutions or alterations made to the construction of the building are not the responsibility of Steelway and are not covered in the CSA A660 certification.

B. CSA W47.1 Certified
   1. As a steel building systems manufacturer, Steelway is certified under CSA W47.1, Division 2.1, for welded fabrication.

C. ISO 9000 Compliant and ISO 9000 certified
   1. Standard: ISO 9001:2015

1.6 Submittals

A. Erection Drawings: Submit steel building system manufacturer's erection drawings, including plans, elevations, sections, and details, indicating roof framing, transverse cross-sections, covering and trim details, and accessory installation details to clearly indicate proper assembly of building components.

B. Product Data: Submit steel building system manufacturer's product information, specifications, and installation instructions for building components and accessories.

C. Warranty Documentation: Submit manufacturer's standard warranty.

1.7 Quality Assurance

A. Manufacturer's Qualifications:
   1. Steelway Building Systems has been engaged, for past 40+ years, in the manufacturing of steel building systems of similar type to that specified.
   2. Accredited based on the requirements of CSA A660 Certification.
      a. Specifier Notes: For more information about the CSA A660 Certification program refer to the CSA or CSSBI websites.

B. Installer's Qualifications:
   1. Installer requires to be significantly engaged in the installation of steel building systems of similar type to that specified.

2. Employ persons qualified for installation of steel building systems.

C. ISO 9000 Compliant and ISO 9000 certified
   1. Standard: ISO 9001:2015

D. Certificate of design and manufacturing conformance:
   1. Steel building system manufacturer shall submit written certification prepared and signed by a Professional Engineer, registered to practice in the applicable province verifying that building system design and steel roof system design (including panels, clips, and support system components) meet indicated loading requirements and codes of authorities having jurisdiction.
   2. Certification shall reference specific dead loads, live loads, snow loads, wind loads concentrated loads, collateral loads, seismic loads, end-use categories, governing code bodies, including year, and load applications.
   3. Certificate shall be on steel building system manufacturer's letterhead.
   4. Refer to Submittals article of this specification section.

E. Material Testing:
   1. In addition to material certifications of structural steel, steel building system manufacturer shall provide, upon request at time of order, evidence of compliance with specifications through testing.
   2. This quality assurance testing shall include testing of structural bolts, nuts, screw fasteners, mastics, and steel coatings (primers, metallic coated products, and painted coil products).

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 tilted surface, raised above ground, with adequate support to prevent sagging.
   5. Protect materials and finish during storage, handling, and installation to prevent damage.
   6. Ensure that ponding does not occur as the warranty will be deemed invalid.

1.9 Warranty Program

A. Review the Corporate Warranty Program on our website: steelway.com

Part 2 Products

2.1 Manufacturer

A. Steel Building System Manufacturer:
   Steelway Building Systems
   7825 Springwater Road, Aylmer, Ontario, N5H 2R4
   Phone: 1.800.265.7740 Website: steelway.com

2.2 Building Description

Steelway Buildings are designed to meet the exact requirements of the customer therefore the information listed below must be included in the contract documents, in order to fully specify the building. The Steelway building contract will be the primary contract document used to define an order.

A. Size (width, length, eave height, bay spacing)
   1. The building width will be measured from side wall steel line to the opposite side wall steel line.
      a. The steel for the walls is the exterior face of the wall girts.
   2. The building length will be measured from end wall steel line to the opposite end wall steel line.
      a. Steel line for the walls is the exterior face of the wall girts.
   3. The building eave height will be measured from the underside of the base plate to top of the eave strut. The top of the eave strut is the point of intersection between the side wall steel line and the roof steel line.
      a. Steel line for the roof is the top face of the roof purlins.

4. The bay spacing will be measured as follows:
   a. Interior bays: from centre-line to centre-line of interior frames.
   b. End bays: from end wall steel line to centre-line of first interior frame.
   c. Bay spacing for interior bays and end bays, specified to nearest 1/16" (1.6 mm).

B. Roof Slope
   1. The "roof slope" is the angle of the roof with respect to the horizontal. The most common roof slopes are (0.5:12), 1/2" (12.7 mm) to 12" (305mm) and 1:12, 1" (25mm) to 12" (305mm). However, any practical roof slope is possible.

C. Primary Frame Type:
   1. Rigid Frame Clear Span:
      a. Primary frames will be a bolted rigid frame design, clear span type, with a gable or single slope roof and pin base columns**. Columns will be either tapered, constant depth, constant/tapered or multiple depths as specified. Rafters will be variable or parallel, depth.
   2. Rigid Frame Multi-Span:
      a. Primary frames will be a bolted rigid frame design, multi-span type (number of spans to be specified), with a gable or single slope roof, pin base side wall columns** and rafter supported at intervals (intervals to be specified) by interior columns, typically HSS tubes.
      b. Interior columns may also be fabricated from built-up plate or hot-rolled members. Interior columns can be recessed below the floor as required by design.
      c. Side wall columns will be either tapered, constant depth, constant/tapered or multiple depths as specified. Rafters will be variable or parallel, depth.
   3. Lean-To
      a. Primary frames will be a post and beam design with high side of frame connected to and supported by the Main building. Frame will be a clear span type with single slope roof. Columns and rafters are pinned at both ends. Columns will be straight sections. Rafter will be either a tapered beam or beam with parallel flanges as required by design.
   4. Girts for all Primary Frame types will be either by-pass (exterior), inset or flush in relation to the outside face of the frame columns.

D. Expandable or Non-Expandable End Walls.
   1. Load Bearing End Frame - Hot Rolled or Built-Up Plate:
      a. This type of end frame will be a post and beam design with rafter pin-connected at corner posts but continuous over, and supported by, end wall posts spaced at intervals along the end wall.
      b. Corner posts and end wall posts will be designed as being pinned at both ends.
      c. Rafter, corner posts and end wall posts will be either hot-rolled mill sections or welded, "H"-shaped, constant depth sections. Positive bracing is required for this type of end wall, typically cross rod bracing.
   2. Rigid End Frame (Full Load):
      a. End frames will be a bolted rigid frame design of same type and design as Primary Frames in the building.
      b. End posts will be furnished to provide support for girts, if a sheeted end wall is specified. End posts will be either hot-rolled mill sections or welded, "H"-shaped, constant depth sections. The End Frame is designed for future expansion. (*Future bay space must be specified.)
   3. Rigid End Frame (Half Load):
      a. End Frames will be a bolted rigid frame design of same type and design as Primary Frames in the building but will be designed for only half-bay loading.
      b. End posts will be furnished to provide support for girts, if a sheeted end wall is specified. End posts will be either hot-rolled mill sections or welded, "H"-shaped, constant depth sections.
   4. Girts for all End Frame types will be either by-pass (exterior), inset or flush in relation to the outside face of the End Frame posts.

E. Steel Roof System as specified in this specification section.

F. Steel Wall System as specified in this specification section.

**Column bases for all frame types may be "fixed" or moment resisting if required by design.

Part 3 Design

3.1 General

A. All structural steel sections and welded plate members shall be designed in accordance with the latest editions of:
   1. Canada: CSA Specification for Structural Steel Buildings (S16), CSA Welded steel construction (metal arc welding) (W59) and CSA Specification W47/1-09.

B. All light gauge cold-formed structural members and exterior covering shall be designed in accordance with latest editions of:
   1. Canada: CSA 136-12 "North American Specification for Design of Cold Formed Steel Structural Members".

3.2 Design Loads

A. Design load requirements will be determined by local conditions, applicable codes, building end use, etc. Magnitude of design loads will be specified by the contract documents. Application of design loads will be in accordance with:
   1. Applicable National and/or Provincial Building Code, unless specified otherwise.

B. Governing Design Code:
   1. Structural design for the building structural system shall be provided by the steel building system manufacturer for the NBCC or applicable Provincial Code.

C. Roof Live Load:
   1. Roof live loads are loads produced during the life of the structure by moveable objects. Wind, snow, seismic or dead loads are not live loads. Minimum Roof Live Loads are applied based on a load of 21 psf (1 Kpa).

D. Floor Live Loads: Those loads induced on a floor system by the use and occupancy of the building.

E. Roof Snow Load:
   1. The vertical load induced by the weight of snow, assumed to act on the horizontal projection of the roof of the structure as specified by the Code and contract documents for building location and relevant parameters.
   2. The roof snow load used for designing the structure may not be reduced and shall be the product of the following criteria defined in the NBCC Division B Section 4.1.6:
      a. Snow Importance Factor (Is)
      b. Ground Snow (Ss 1/50)
      c. Basic Snow load Factor (Cb)
      d. Wind Exposure Factor (Cw)
      e. Slope Factor (Cs)
      f. Shape Factor (Ca)
      g. Rain Component (Sr)
      h. Roof Snow Load (S) = Is*[Ss*(Cb*Cw*Cs*Ca) + Sr]

F. Wind Load:
   1. The wind load used for designing the structure shall be the product of the following criteria defined in the NBCC Division B Section 4.1.7
      a. Wind Importance Factor (Iw)
      b. Reference Velocity Pressure (q 1/50)
      c. Wind Exposure Factor (Ce)
      d. Wind Gust Factor (Cg)
      e. Wind Pressure Coefficient (Cp)
      f. Wind Importance Factor (Iw)
      g. Building Wind Load (p) = Iw*q*Ce*Cg*Cp
   2. Wind Pressure Coefficients and the design pressures shall be applied per the governing code.

G. Seismic Load:
   1. The seismic load used for designing the structure shall be based on the following criteria defined in the NBCC Division B Section 4.1.8:
      a. Spectral acceleration for Sa (0.2)
      b. Spectral acceleration for Sa (0.5)

c. Spectral acceleration for Sa (1.0)
d. Spectral acceleration for Sa (2.0)
e. Site Classification (for Seismic Site Response)
f. Seismic Importance Factor (Ie)

2. Seismic loads shall be applied in accordance with the governing code.

H. Dead Load:
1. Dead load shall consist of the weight of building system construction, such as roof, framing, and covering members.

I. Collateral Load:
1. Collateral load in pounds per square foot shall be applied to the entire structure to account for the weight of additional permanent materials other than the building system, such as sprinklers, mechanical systems, electrical systems, hung partitions, and ceilings.
2. This allowance does not include the weight of hung equipment weighing 50 pounds or more.
3. Equipment loads of 50 pounds or more shall be indicated on the Drawings and the structure shall be strengthened as required.
4. An architect or design consultant will provide the steel building system manufacturer with the magnitude and approximate location of concentrated loads greater than 50 pounds before design of the building starts.

J. Auxiliary Loads: Auxiliary loads shall include dynamic loads, such as cranes and material handling systems, and will be defined in the Contract Documents.

K. Crane Loads:
1. Crane loads shall be a function of the Service Class as defined by the governing code, Guide For The Design Of Crane-Supporting Steel Structures (CISC) and Crane Manufacturers Association of America (CMAA) and the rated tonnage (A- Standby or Infrequent service, B- Light service, C- Moderate service, D- Heavy Service, E- Severe Service, F- Continuous Severe Service).
2. Cranes in Service Class E or F shall be in accordance with AISE 13.
a. CMAA Service Class of Crane.
b. Deflection Criterion for Crane.
3. Unfactored Crane loads will be obtained from the crane manufacturer and supplied by the Engineer of record and/or Architect to the metal building system manufacturer at the time of bid.
4. Building structure shall be designed for the crane loads in accordance with the governing code.
5. Multiple cranes in the same bay or aisle shall be designed in accordance with the governing code.
6. If the governing code does not address multiple crane design practices, MBMA Metal Building Systems Manual shall be used.

L. Load Combinations: Load combinations used to design primary and secondary structural members shall be in accordance with the governing code.

M. Information on attached and adjacent structures or future structures and/or expansion.

3.3 Structural Framing System

A. Shop primer Coating of Steel Framing System
1. All primary steel framing members will be cleaned to remove loose rust and mill scale, and given one shop coat except where members are zinc coated or zinc-aluminum alloy coated or to be encased in concrete. Shop coat will be formulated to equal or exceed, under laboratory conditions, performance requirements of:
a. Canadian Projects: 2-75 Structural Primer excluding clause 4.1.2.
b. Shop coat is only intended to provide temporary protection during transportation and erection.
1. Shop Primer Paint: Single Coat Grey Oxide Primer to CISC/CPMA Standard 2-75 excluding clause 4.1.2, 1.5 to 2 mils film thickness. Standard primer not to exceed 90 days exposure to weather. Hot dip galvanized or epoxy paint available upon request (extra).
2. Secondary structural steel framing will be cold-formed using coil stock.
a. In compliance with the ASTM Standards for Steel Building Systems
b. Shop Primer Paint: Single Coat Grey Oxide Primer to CISC/CPMA Standard 2-75 excluding clause 4.1.2, 1.0 to 1.5 mils film thickness. Grey Powder Coat Primer (hybrid), 1.5 mils film thickness. Standard primer not to exceed 90 days exposure to weather.

B. Primary Members
   1. Rigid Frame:
      a. A structural frame consisting of members joined to render the frame stable with respect to the design loads, without the need for bracing in its plane.
      b. Rigid Frames are three plate beam sections, forming an 'I' shape consisting of flange plates, web plates, and endplates. Depending on the size and complexity of the building, rigid frame members could consist of multiple flanges and webs of various material sizes.
      c. Rigid frame columns and rafters allow for large open interior spaces without obstruction created by interior columns. These types of frames not only allow for large open spaces, but do so with an efficient and minimum weight of material.
   2. Interior Column:
      a. A hot rolled column supporting a rigid frame located between the sidewall columns to provide support to the rigid frame rafter(s).
   3. End wall Column & Rafter:
      a. A hot rolled structural member located at the end wall of a building supporting the building girts and purlins respectfully. In post and beam (bearing type) end walls, the end wall columns also support the end wall rafter.
   4. Material:
      a. Sheet, plate, strip mill plate, plate coils and flat bar stock used to fabricate welded, structural members will conform to one of the following ASTM specifications as appropriate: CSA G40.20/ G40.21, Type W, ASTM A572/A572M, A529/A529M, A1011/A1011M, HSLAS or SS, 50 ksi or 55 ksi (350/345/340 MPa) minimum yield.
      b. Members fabricated from hot-rolled structural sections will conform to one of the following ASTM specifications: G40.20/G40.21, Type W, ASTM A992/A992M, A572/A572M, A529/ A529M, 50 ksi (350/345 MPa) minimum yield.
      c. Members fabricated from other hot-rolled structural sections (S-shapes, channels, angles) will conform to one of the following ASTM specifications: G40.20/G40.21, Type W, ASTM A992/ A992M, A572/A572M, A529/A529M, 50 ksi (350/345 MPa) minimum yield.
      d. Members fabricated from HSS tube sections will conform to one of the following ASTM specifications of G40.20/G40.21, Class C, 50 ksi (350 MPa) or ASTM A-500, Grade C, 46 ksi (317 MPa).
      e. Members fabricated by cold forming process will conform to ASTM specification ASTM A- 1011, Grade 55 (380 MPa) or ASTM A-1011-HSLAS, Grade 55 (380 MPa), Class 1.
      f. Bolts: ASTM A325M (ASTM A490M when required) complete with nuts and washer, plain. Hot dip galvanized (A325 only), F1136 ZC grade 3 (A490 only) available upon request (extra cost).
      g. Anchor Bolts: G40.20/G40.21, ASTM A572/A572M, A529/A529M, 50 ksi (350/345 MPa) minimum yield, plain (no coating). Hot dip galvanized available upon request (extra cost)

C. Secondary Structural Members:
   1. Purlins (for roofs) and girts (for walls) shall be roll-formed "Z" or "C" sections of adequate size and thickness as determined by the design criteria.
   2. Eave Purlins: A unique shaped purlin placed at the low and/or high eave along the sidewall formed by the intersection of the roof and wall steel lines.
   3. Openings: Framework that surrounds an opening in the wall or roof of a building. These openings can be either field located and/or factory located.
   4. Strut: A hot rolled brace beam fitted into a framework to resist force in the direction of its length.
   5. Portal Frame: a frame configuration consisting of three hot rolled members designed to brace a building system where cross bracing is not permitted.
   6. Material:
      a. Purlins, Girts and Framed Openings: minimum 16 gauge (0.060 inch/1.52 mm); Hot Rolled Sheet Steel conforms to G40.21, ASTM A653/A653M, A1011/A1011M, HSLAS Class 1 or 2, or SS, 55 ksi (380 MPa) minimum yield.
      b. Bolts: to SAE J429 Grade 8.2.

D. Bracing Systems
   1. Girt/Purlin Stabilizers: A cold formed member used to brace a girt or purlin in the direction of its weak axis, stabilizing top and bottom flanges preventing the purlins from rolling down-slope under heavy snow loads.
   2. Cross Bracing: Rods and/or cables used on roof and walls of buildings to transfer wind, seismic, and lateral crane forces to the foundation. Cross bracing might also be referred to as "Brace Rods" or "cables".
   3. Flange Braces: A bracing member used to provide lateral support to the flange of a structural member.
   4. Material:
      a. Flange brace: to G40.21, ASTM A653/A653M, A1011/A1011M, HSLAS Class 1 or 2, or SS, 55 ksi (380 MPa) minimum yield. Z275 (G90) pre-galvanized coil.
      b. Rod: to G40.21, ASTM A572/A572M, A529/A529M, 50 ksi (350/340 MPa) minimum yield, shop primed with single coat Grey Oxide Primer to CISC/CPMA Standard 2-75, 1.5 to 2 mils film thickness.
      c. Cable: Galvanized strand to ASTM A475, Grade EHS, 7 wire strand, Class A coating (CSA G12). Design strength based on Steelway's published breaking strengths.
      d. Eye bolts: Forged, 1030 carbon steel, hot dip galvanized. Design strengths based on Steelway's published breaking strengths.
         1. Hillside/Sloped Washers: to ASTM A-47, galvanized to A153
         2. Bracer Hillside Washers: to ASTM 526, grade 65, gray enamel or hot dip galvanized to A153, class A.

E. Welding:
   1. Welding Procedures, Operator Qualifications, and Welding Quality Standards: CSA W59 – Welded Steel Structures and AWS D1.3 - Structural Welding Code – Sheet Steel.
   2. Welding inspection, other than visual inspection as defined by CSA W59, shall be identified and negotiated before bidding.
   3. Certification of Welder Qualification: Supply when requested.

Part 4 Steel Roof Systems

4.1 RTL-24 Standing Seam Roof System

A. Roof System Design:
   1. Design roof panels in accordance with CSA – S136 North American Specification for the Design of Cold-Formed Steel Structural Members.
   2. Design roof paneling system for a minimum roof slope of 0.25:12, 1/4" (6 mm) to 12" (305 mm).
   3. Design roof paneling system to support design live, snow, and wind loads.
   4. End wall Trim and Roof Transition Flashings: Allow roof panels to move relative to wall panels and/or parapets as roof expands and contracts with temperature changes.

B. Roof System Performance Testing:
   1. Meets UL Wind Uplift Classification Rating, UL 580: Class 90.

C. Roof Panels:
   1. Factory roll-formed panels shall have 3" (76 mm) deep trapezoidal ribs spaced 24" (610 mm) on centre. Three minor ribs are spaced in the flat of the panel between the major ribs.
      a. Minimum Length: 4'-0" (1.219 m).
      b. Maximum Length: 60'-0" (18.288m).
   2. Panel Material and Finish:
      a. Standing Seam: 24 (0.024 inch/0.61 mm) or 22 gauge (.031 inch/.79 mm) panel minimum, 3" (76 mm) raised panel seams, 24" (610 mm) coverage. Major corrugations at 24" (610 mm) on centre, shallow corrugations in panel flat. Factory applied mastic for side lap, pre-punched and factory notched.
      b. Steel Sheet, Aluminum-Zinc Coated: to ASTM A792/A792M, structural quality, class 1 or 4, Grade 50 (340 MPa) with AZM165 Galvalume Plus coating, regular spangle surface, passivated for unpainted finish and AZM150 un-passivated for paint finish.

3. Paint System:
   a. Exterior – Minimum Standard 20000 series colours, use a Silicone Modified Polyester paint system
   b. Interior – Wash coat (minimum)
   c. Colour – Choose from manufacturers Minimum Standard Series 20000.
   d. Screws – Corrosion resistant purpose made, head colour to match cladding.
4. Extend eave panels beyond structural line of sidewalls.
5. Panel End Splices: Factory punched and factory notched.
6. Panel End Laps: Locate directly over, but not fastened to, a supporting secondary roof structural member. Self-Drilling Fasteners: Not permitted
7. End Laps: Floating. Allows roof panels to expand and contract with roof panel temperature changes.
8. Ridge Assembly:
   a. Design ridge assembly to allow roof panels to move lengthwise with expansion and contraction as roof panel temperature changes.
   b. Factory punch parts for correct field assembly.
   c. Install panel closures and interior reinforcing straps to seal panel ends at ridge.
   d. Do not expose attachment fasteners on weather side.
   e. High-Tensile Steel Ridge Cover: Span from panel closure to panel closure and flex as roof system expands and contracts.

D. Provision for Expansion and Contraction:
1. Standing Seam Panel Thermal Clips and Related Panel Fasteners: extra heavy duty, 20 gauge (0.036 inch/0.91 mm), corrosion resistant, purpose made clips with movable tabs.
2. Spacing of clips and fasteners to be Steelway's design to suit the loads indicated.
3. Floating clips to allow the roof a 3-1/2" inch (89 mm) range of thermal movement (1-3/4 inch (44 mm) of expansion and 1-3/4 inch (44 mm) of contraction).
4. Thermal Block Spacers: continuous 1" (25 mm) thick, extruded polystyrene meeting CAN/CGSB-51.20-M87, Type 4, 210 KPa compressive strength.

E. Panel Clip and Fasteners:
1. Our Standard fixed panel clips shall only be used with panel runs of less than 35' (36.576 m). Floating panel clips shall be used up to a 250' (76.2 m) panel run and shall be self-centering and allow for up to 1-1/2" (38 mm) expansion and/or contraction of total movement from the centered position. The clip design shall insure that movement does not occur between the panel and clip. Our wide based clips can accommodate great slope lengths.
2. The panel clips shall have factory-applied mastic to insure a weather-tight installation.
3. Each clip shall be attached to the joist or purlin with a minimum of two fasteners. Size and type of clip will be recommended by Steelway for the specific application. Clip fasteners for retrofit applications are not by Steelway and must be specified by the owner or his agent.
4. Panel end lap fasteners shall be a No. 17 self-tapping carbon steel screw (JS 1000), hex washer head, 1 1/4" (32mm) long. Fastener shall have a 20-year corrosion resistant coating.
5. Make connections of roof panels to structural members, except at eaves, with clips with movable stainless-steel tabs, seamed into standing seam side lap.
6. Fasten panel clips to structural members with No. 14 fasteners in accordance with erection drawings furnished by steel building system manufacturer.
7. Exposed fasteners penetrating steel roof membrane must follow the erection drawings and erection manual.

F. Roof-Top Units and Curb Supports
1. The Steelway RTL-24 Roof Curb Framing System is level with roof secondary structural members. The outer roof curb in a single wall system, will have channels attached to accommodate the clip off set of 1/2" (13 mm) for short clips, 1-1/2" (38 mm) for regular clips and 3" (76.2 mm) for tall clips. Refer to the details for proper dimensions.
2. The Steelway RTL-24 Roof System is designed as a floating system. Curb framing and flashing must be designed accordingly to allow the curb system to float with the RTL-24 roof during thermal expansion and contraction.

4.2 StormSeal Roof System

A. Roof System Design:
   1. Design roof panels in accordance with CSA - S136 North American Specification for the Design of Cold-Formed Steel Structural Members.
   2. Design roof paneling system for a minimum roof slope of (1:12), 1" (25 mm) to 12" (305 mm). Steelway does not recommend using slopes (<1:12) for through fastened panels.
   3. Design roof-paneling system to support design live, snow, and wind loads.
   4. Maximum recommended continuous slope length of 30' (9.144 m) horizontal for "Z" purlin roofs. Steelway profiles shall be used in conjunction with zee or cee purlins as supports.
   5. Please note: Steelway does not offer a weather tightness warranty for screw-down roofs. These roof systems are susceptible to leaking due to thermal expansion and contraction. The problem is exacerbated by low slopes (<1:12), and long roof surfaces (>30'-0" (9.144 m)). Steelway expressly disclaims responsibility for weather tightness performance of screw-down roofs.

B. Roof Panels:
   1. General:
      a. Factory roll-formed to provide width coverage of 36" (914 mm).
      b. Four major corrugations spaced 12" (305 mm) on centre
         1. Each Major Corrugation: 1-1/2" (38 mm) high, 4" (100 mm) wide, tapering to 1-1/8" (29 mm) at top.
      c. In Panel Flat: Two additional minor corrugations, 1-3/8" (35 mm) wide, 1/8" (3 mm) high, spaced 4-3/8" (111 mm) on each side of major corrugations.
      d. Structural bearing side edge for stable side lap.
   2. Roof Panel Side Laps:
      a. Overlap 1 major corrugation.
      b. One of the Outboard Corrugations: Formed as overlapping corrugation.
      c. Other Outboard Corrugation: Formed as underneath corrugation.
         1. Full corrugation to provide bearing support to side lap.
   3. Roof Panel End Laps:
      a. 6" (152 mm) wide.
      b. Supply maximum possible panel lengths, up to 50'-0" (15.24m), to minimize panel end laps.
      c. Design end laps to occur over and be fastened to secondary structural members.
   4. Ridge Panels:
      a. One-piece, factory formed to match roof slope, for roof slopes less then 3:12, 3" (75mm) to 12" (305mm), ridge trims are supplied for roof slopes that are 3:12, 3" (75mm) to 12" (305mm) and greater.
      b. Ridge Panel Cross Section: Match roof panels.
      c. Ridge Panel Splices: Occur over first purlin on either side of building ridge.
   5. Eave Panels: Extend beyond building structural line.
   6. Panel Material and Finish:
      a. Through Fastened Panel: Sheet Steel: 26 gauge (0.018 inch/0.46 mm) or 24 gauge (0.024 / 0.61 mm) factory pre-formed steel sheet aluminum-zinc coated, pre-finished profile.
      b. Includes closures, gaskets, caulking, flashings and fasteners to effect weather tight installation.
      c. Steel Sheet, Aluminum-Zinc Coated: to ASTM A792/A792M, structural quality, class 1 or 4, Grade 50 (340 MPa) with AZM165 Galvalume Plus coating, regular spangle surface, passivated for unpainted finish and AZM150 un-passivated for paint finish.
      d. Paint System:
         1. Exterior – Minimum Standard 20000 series colours, use a Silicone Modified Polyester paint system.
         2. Interior – wash coat (minimum).
      e. Colour: choose from manufacturers Minimum Standard Series 20000.

C. Fasteners:
   1. Fastener Locations and Quantities: Indicated on erection drawings furnished by steel building system manufacturer.

2. Roof panel to secondary structural fastener shall be a No. 14 self-drilling carbon steel screw, hex washer head with sealing washer, 1-1/2" (32 mm) long. Fastener shall have a 20-year corrosion resistant coating. Fastener shall have a painted head to match panel and/or trim colour when used with painted material.
3. Panel to panel, flash to flash, (stitch) fastener for roof shall be a No. 14 self-drilling carbon steel screw, hex washer head with sealing washer, 7/8" (22 mm) long. Fastener shall have a 20-year corrosion resistant coating. Fastener shall have a painted head to match panel and/or trim colour when used with painted materials.

D. Roof Stand-off Systems
1. Notched Zee: 16 gauge (0.06 inch/1.52 mm) minimum, factory notched zee to suit the liner profile. The depth must suit the insulation value required. Hot Rolled Sheet Steel conforms to G40.21, ASTM A1011/A1011M, A653/A653M, HSLAS or SS, Class 1 or 2, 55 ksi (380 MPa) minimum yield, galvanized to G90. Include the required fasteners.
2. Hat and Chair: 16 gauge (0.060 inch/1.52 mm) minimum, brake or roll formed to suit the liner profile. The depth must suit the insulation value required. Hot Rolled Sheet Steel conforms to G40.21, ASTM A1011/A1011M, A653/A653M, HSLAS or SS, Class 1 or 2, 55 ksi (380 MPa) minimum yield, galvanized to G90. Include the required fasteners.

4.3 General Info: Roof Systems

A. Roof System Performance Testing:
1. Meets UL Wind Uplift Classification Rating, UL 580: Class 90.

B. Closures
1. Closures shall be closed cell polyethylene foam to match the panel configuration.
2. Closures shall be provided at the eave of roof panels.

C. Sealants
1. Sealant for interior and exterior locations - a Polyurethane `Dymonic 100' sealant, conforming to CAN/CGSB-19,13-M87 manufactured by Tremco Manufacturing Co. (Canada) Ltd. or an approved equal manufacturer. Colour selected to match background.
2. Sealant for vertical surfaces of structural expansion joints - Sikaflex 2C NS by Sika Canada Inc. or Sikaflex 1a.
3. Polyethylene backer rod is recommended as joint backing to control sealant depth and ensure intimate contact of sealant with joint substrate.
4. Excess sealant and smears adjacent to the joint interface can be carefully removed with xylene or mineral spirits before the sealant cures.
5. Insulation as recommended by Steelway.
6. Vapour Barrier and Sealing Tape: as recommended by insulation supplier.
7. Sealant & tape mastic: as recommended by Steelway.

D. Energy Conservation:
1. Insulate purlins (optional) to eliminate "thermal short circuits" between purlins and roof panels.
2. Minimize heat loss (thermal short circuit) caused by compression of blanket insulation between structural members and roof panels by use of thermal block at each purlin location.

E. Accessories:
1. Accessories (i.e., ventilators, skylights, fascia): Standard with steel building system manufacturer, unless otherwise noted and furnished as specified.
2. Accessories to Roof Cladding: brake or bend to shape, the material and finish to match roof cladding or wall cladding where applicable, comprising cap flashing, drip flashing, coping and closures for corners, soffit and fascia.

F. Trim and Flashing
1. Standard trims are available in 20'-2" (6.147 m) lengths.
2. Neither counter-flashing for parapet conditions nor tie-in flashing to existing buildings shall be provided by Steelway, unless specifically requested.
3. All exposed trim and flashing material shall be manufactured from painted steel.

4. High eave flashing and flashing parallel to the roof panels shall accommodate the thermal expansion and contraction of the roof without damage to the roof panels or flashing. Counter-flashing for parapet conditions and flash to existing buildings are not provided by Steelway.
5. Ridge Cap: brake or bend to shape, 26 gauge (0.018 inch/0.46mm) minimum, and colour to suit roof cladding or as specified.
6. Gutters: 26 gauge (0.018 inch/0.46 mm) factory brake formed, material and finish to match roof or wall cladding. Include brackets, fasteners, end caps and closures as required.
7. Downspouts shall be manufactured in 20'-2" (6.147 m) lengths whenever possible.
   a. Downspouts: 28 Ga. Available in QC28305 Stone Grey or QC28317 White White, 10'-0" (3.048 m) lengths.
   b. Downspout Elbows: Available in QC28305 Stone Grey, QC28317 White White, QC28229 Dark brown and QC28273 Bone White, 135° only.
8. Material used in flashing and transition parts and furnished as standard by steel building system manufacturer may or may not match roof panel material.
   a. Parts: Compatible and not cause corrosive condition.

G. Installation
1. Storage and installation of the roofing system shall be in accordance with Steelway's printed instructions.
2. To ensure the highest quality of work proper tools and equipment must be on hand. The tools must be in good condition and operators should adhere to safety precautions at all times. Improperly operated tools, too few tools, inadequate power source, or equipment deficiencies slow down the installation process. The cost of inefficient working is usually greater than the cost of providing good equipment.
3. RTL-24
   a. Under no circumstances shall the Steelway approved crimper be used on another manufacturer's roof system. In addition, under no circumstances is another manufacturer's crimper to be used on the Steelway RTL-24™ roof (even if they appear to be the same). Permanent damage to the seam and/or the panel finish may occur if the Steelway approved crimping tool is not used and shall void all warranties.
4. StormSeal
   a. All end laps and side laps under 4/12" pitch on roof panels shall be sealed with a continuous row of tape mastic (butyl tape) to prevent air and water from infiltrating the building
5. Temperature extremes must be considered during installation of the roof due to the sensitivity of sealants the recommended installation temperature range is –7 °C (20 °F) to 49 °C (120 °F). At colder temperatures the sealant stiffens resulting in loss of adhesion and compressibility. At hotter temperatures, the sealant becomes too soft for practical handling. On cold but sunny days, the panel's surface may become warm enough to accept the application of a heated sealant even though the air temperature is below –7 °C (20 °F). Heated sealant will stay warmer if stored in plastic coolers while working on the roof.
6. Abrasive saws are not recommended for cutting roof panels or flashing. Abrasive saws create high heat that may burn away the protective coating from the panel edge, causing the edge to rust. Also, abrasive saw dust contains fine, hot steel particles, which accumulate on panel and flashing surfaces where they rust and can cause staining and rusting of those surfaces. Rust caused by abrasive saw damage or abrasive dust particles may be excluded from warranty claims.
7. The use of cutting tools that damage the panel finish shall not be allowed.
8. Panels shall not be marked with any graphite or lead markers.

H. Clean-up
1. The roof surface should be cleaned daily during construction of all filings, cuttings, screws, pencil markings, and debris to prevent damage due to oxidation of foreign materials.
2. The Contractor shall thoroughly clean all panels, trim, and gutters of all foreign material upon completion of construction.

I. Maintenance
1. The owner shall keep the roof free and clean of debris and corrosive materials at all times.
2. Gutters and downspouts shall be cleaned periodically and kept free-flowing at all times.

3. Flashing and sheeting interfaces shall be inspected yearly to ensure connection and water-tightness.
4. End laps, eaves, ridges, curbs, translucent panels, and other interfaces shall be inspected and maintained yearly. Normal adjustments or tightening of fasteners may be required.
5. The use of tar and other topical applied products shall not be permitted unless specified by the manufacturer.
6. Copper, lead flashing, exposed iron, or debris shall not be permitted on the roof.
7. Pipes and supports for roof-supported units shall be of a non-corrosive or rust- free material. Field painting of pipes and supports may be required to resist corrosion. Condensation from roof-top units shall be piped to interior or exterior locations. Damage due to condensate water is not covered under manufacturer's warranty.

J. Erection Sequence
   1. Steelway roof systems are designed to be erected starting from any end of the building. In rare cases, due to the building layout, it may be required to start erection from a specified end. In those cases, it will be noted as such on the erection drawings.

K. Erection Care
   1. The erector must be skilled in the erection of steel building systems and is responsible for complying with all applicable local, federal and provincial construction and safety regulations. The Erector remains solely responsible for the safety and appropriateness of all techniques and methods utilized by its crews in the erection of the steel building system and/or the roof system. The Erector is also responsible for supplying any safety devices such as scaffolds, runways, nets, etc., which may be required by the governing codes to safely erect the steel building system and/or roof systems.
   2. Anchorage for safety devices may be added at an additional cost provided specific connections are designed and clearly noted on the order documents. All anchorage points must be noted with exact location, magnitude, and direction of force for a fully-braced structure.
   3. The erector of the Steelway erection drawings shall exercise great care and attention to the details as shown on the erection drawings and in the Steelway erection manual to insure a secure and proper fit of all components. Steelway shall not be responsible for supervising and/or coordinating the erection of the Roof System with other trades. Erection drawings take precedence when a situation differs from that shown in the erection manual.
   4. Due consideration must be given by the erector to the effects of thermal expansion and contraction when erecting a roof tie-in to an existing structure to insure a safe, secure, weather-tight condition. Flashing for tie-ins to existing buildings is typically not included as part of the material provided by Steelway. Refer to the sections and details for specific materials provided by Steelway.
   5. The erector acknowledges that all details for all conditions can be noted on the plans and that due care and judgment are required to make a safe and watertight condition. Sealants and caulking may be required based upon actual conditions encountered.

L. Field-Cutting of Panels
   When field-cutting or mitering Steelway panels, non-abrasive cutting tools such as nibblers or tin-snips shall be used. Abrasive cutting tools such as mechanical grinders, saws, shears, or scissors can damage the Galvalume® or painted finish and create excess metal shavings that can corrode the panels. The use of non-approved cutting devices may void your manufacturer's warranty.

Part 5 Steel Wall System

5.1 StormSeal Wall System

A. Wall System Design: Design wall panels in accordance with CSA – S136 North American Specification for the Design of Cold-Formed Steel Structural Members.

B. Wall Panels:
   1. Factory roll-formed to provide width coverage of 36" (914 mm).
   2. Four major corrugations spaced 12" (305 mm) on centre (oriented either "narrow rib out" or "wide rib out").
      a. Each Major Corrugation: 1-1/2" (38 mm) high, 4" (102 mm) wide, tapering to 1-1/8" (29 mm) at top.

3. In Panel Flat: Two additional minor corrugations, 1-3/8" (35 mm) wide, 1/8" (3 mm) high, spaced 4-3/8" (111 mm) on each side of major corrugations.
4. Structural bearing side edge for stable side lap.
5. One piece from base to building eave. Wall panels can be spliced as per Steelway standard detail.
6. Field drill wall panels in structural members for proper alignment.
7. Panel Material and Finish:
   a. Through Fastened Panel: 26 gauge (0.018 inch/0.46 mm) or 24 gauge (0.024 /0.61 mm) factory pre-formed steel sheet aluminum-zinc coated, pre-finished profile.
   b. Includes closures, gaskets, caulking, flashings and fasteners to effect weather tight installation.
   c. Steel Sheet, Aluminum-Zinc Coated: to ASTM A792/A792M, structural quality, class 1 or 4, Grade 50 (340 MPa) with AZM165 Galvalume Plus coating, regular spangle surface, passivated for unpainted finish and AZM150 un-passivated for paint finish.
   d. Paint System:
      1. Exterior – Minimum Standard 20000 series colours, use a Silicone Modified Polyester paint system.
      2. Interior – Wash coat (minimum).
   e. Colour – Choose from manufacturers Minimum Standard Series 20000.

C. Trim and Flashing
1. Exterior Corners: The material must match the finish and profile of adjacent cladding material, shop cut and brake formed to the correct angle.
2. Accessories to Exterior Wall Cladding: Brake or bend shape, of material and finish to match wall cladding, consisting of cap flashings, drip flashings, corner flashings, header, jamb and sill trims. Closures to be foam (grey only) or metal (colour to be Stone Grey QC28305 and material to match wall cladding). All trim material is to be pre-finished 26 gauge (0.018 inch/0.46 mm) minimum.
3. Foam closures: Cross-linked polyethylene with UV stabilizers. Field applied tape sealant as required.
4. Downspouts: 26 gauge (0.018 inch/0.46 mm) factory brake formed, material and finish to match wall cladding. 28 gauge (0.015 inch/0.38 mm) minimum, roll formed, aluminum alloy #3105-H14 (Stone Grey QC28305, White White QC28317).

5.2 StrucSeal Wall System

A. Wall System Design: Design wall panels in accordance with CSA – S136 North American Specification for the Design of Cold-Formed Steel Structural Members.

B. Wall Panels:
1. Factory roll-formed to provide width coverage of 30" (762 mm) and 36" (914 mm) depending on colour selection, (oriented either "narrow rib out" or "wide rib out").
2. Six major corrugations spaced 6" (152 mm) on centre for a 30" (762 mm) panel.
3. Seven major corrugations spaced 6" (152 mm) on centre for a 36" (914 mm) panel.
4. Each Major Corrugation: 1-1/2" (38 mm) high, 3 1/4" (83 mm) wide, tapering to 1 3/4" (44 mm) at top.
5. Option to have fluted corrugations.
6. Structural bearing side edge for stable side lap.
7. One piece from base to building eave. Wall panels can be spliced as per Steelway standard detail.
8. Field drill wall panels in structural members for proper alignment.
9. Panel Material and Finish:
   a. Through Fastened Panel: 26 gauge (0.018 inch/0.46 mm) or 24 gauge (0.024 /0.61 mm) factory pre-formed steel sheet aluminum-zinc coated, pre-finished profile.
   b. Includes closures, gaskets, caulking, flashings and fasteners to effect weather tight installation.
   c. Steel Sheet, Aluminum-Zinc Coated: to ASTM A792/A792M, structural quality, class 1 or 4, Grade 50 (340 MPa) with AZM165 Galvalume Plus coating, regular spangle surface, passivated for unpainted finish and AZM150 un-passivated for paint finish.
   d. Paint System:
      1. Exterior – Minimum Standard 20000 series colours, use a Silicone Modified Polyester paint system.
      2. Interior – Wash coat (minimum)

e. Colour – Choose from manufacturers Minimum Standard Series 20000.

C. Trim and Flashing
   1. Exterior Corners: The material must match the finish and profile of adjacent cladding material, shop cut and brake formed to the correct angle.
   2. Accessories to Exterior Wall Cladding: Brake or bend shape, of material and finish to match wall cladding, consisting of cap flashings, drip flashings, corner flashings, header, jamb and sill trims. Closures to be foam (grey only) or metal (colour to be Stone Grey QC28305 and material to match wall cladding). All trim material is to be pre-finished 26 gauge (0.018 inch/0.46 mm) minimum.
   3. Foam closures: Cross-linked polyethylene with UV stabilizers. Field applied tape sealant as required.
   4. Downspouts: 26 gauge (0.018 inch/0.46 mm) factory brake formed, material and finish to match wall cladding. 28 gauge (0.015 inch/0.38 mm) minimum, roll formed, aluminum alloy #3105-H14 (Stone Grey QC28305, White White QC28317).

5.3 DiamondSeal Wall System

A. Wall System Design: Design wall panels in accordance with CSA – S136 North American Specification for the Design of Cold-Formed Steel Structural Members.

B. Wall Panels:
   1. Factory roll-formed to provide width coverage 36" (914 mm), (oriented either "narrow rib out" or "wide rib out").
   2. Seven major corrugations spaced 6" (152 mm) on centre
      a. Each Major Corrugation: 5/8" (16 mm) high, 2 3/8" (60 mm) wide, tapering to 1" (25 mm) at top
   3. In Panel Flat: One additional minor corrugation, 1-1/16" (27 mm) wide, 1/16" (2 mm) high, centered between each major corrugation.
   4. Structural bearing side edge for stable side lap.
   5. One piece from base to building eave. Wall panels can be spliced as per Steelway standard detail.
   6. Field drill wall panels in structural members for proper alignment.
   7. Panel Material and Finish:
      a. Through Fastened Panel: 26 gauge (0.018 inch/0.46 mm), 24 gauge (0.024 /0.61 mm), 29 gauge (0.013 / 0.33 mm) factory pre-formed steel sheet aluminum-zinc coated, pre-finished profile.
      b. Includes closures, gaskets, caulking, flashings and fasteners to effect weather tight installation.
      c. Steel Sheet, Aluminum-Zinc Coated: to ASTM A792/A792M, structural quality, class 1 or 4, Grade 50 (340 MPa) with AZM165 Galvalume Plus coating, regular spangle surface, passivated for unpainted finish and AZM150 un-passivated for paint finish.
      d. Paint System:
         1. Exterior – Minimum Standard 20000 series colours, use a Silicone Modified Polyester paint system.
         2. Interior – wash coat (minimum).
      e. Colour: choose from manufacturers Minimum Standard Series 20000.

C. Trim and Flashing
   1. Exterior Corners: The material must match the finish and profile of adjacent cladding material, shop cut and brake formed to the correct angle.
   2. Accessories to Exterior Wall Cladding: Brake or bend shape, of material and finish to match wall cladding, consisting of cap flashings, drip flashings, corner flashings, header, jamb and sill trims. Closures to be foam (grey only). All trim material is to be pre-finished 26 gauge (0.018 inch/ 0.46 mm) minimum.
      a. Note: If panel is 29 gauge (0.013 / 0.33 mm), trim material is to be pre-finished 29 gauge (0.013 / 0.33 mm).
   3. Foam closures: Cross-linked polyethylene with UV stabilizers. Field applied tape sealant as required.
   4. Downspouts: 26 gauge (0.018 inch/0.46 mm) factory brake formed, material and finish to match wall cladding. 28 gauge (0.015 inch/0.38 mm) minimum, roll formed, aluminum alloy #3105-H14 (Stone Grey QC28305, White White QC28317).

5.4 VersaSeal Wall System

A. Wall System Design: Design wall panels in accordance with CSA – S136 North American Specification for the Design of Cold-Formed Steel Structural Members.
B. Wall Panels:
   1. Factory roll-formed to provide width coverage 36" (914 mm).
   2. Five major corrugations spaced 9" (229 mm) on centre, deep profile oriented "narrow rib out"
      a. Each Major Corrugation: 3/4" (19 mm) high, 1-3/4" (44 mm) wide, tapering to 3/4" (19mm) at 5/8" (16 mm) high; tapering to 3/8" (10 mm) at top
   3. In Panel Flat: Two additional minor corrugations, 1-3/8" (35 mm) wide, 1/8" (3 mm) high, spaced 3-1/8" (79 mm) on each side of major corrugations.
   4. Factory applied caulking at laps.
   5. Structural bearing side edge for stable side lap.
   6. One piece from base to building eave. Wall panels can be spliced as per Steelway standard detail.
   7. Field drill wall panels in structural members for proper alignment.
   8. Panel Material and Finish:
      a. Through Fastened Panel: 26 gauge (0.018 inch/0.46 mm), 24 gauge (0.024 /0.61 mm), 29 gauge (0.013 / 0.33 mm) factory pre-formed steel sheet aluminum-zinc coated, pre-finished profile.
      b. Includes closures, gaskets, caulking, flashings and fasteners to effect weather tight installation.
      c. Steel Sheet, Aluminum-Zinc Coated: to ASTM A792/A792M, structural quality, class 1 or 4, Grade 50 (340 MPa) with AZM165 Galvalume Plus coating, regular spangle surface, passivated for unpainted finish and AZM150 un-passivated for paint finish.
      d. Paint System:
         1. Exterior – Minimum Standard 20000 series colours, use a Silicone Modified Polyester paint system.
         2. Interior – Wash coat (minimum).
      e. Colour – Choose from manufacturers Minimum Standard Series 20000.
C. Trim and Flashing
   1. Exterior Corners: The material must match the finish and profile of adjacent cladding material, shop cut and brake formed to the correct angle.
   2. Accessories to Exterior Wall Cladding: Brake or bend shape, of material and finish to match wall cladding, consisting of cap flashings, drip flashings, corner flashings, header, jamb and sill trims. Closures to be foam (grey only). All trim material is to be pre-finished 26 gauge (0.018 inch/ 0.46 mm) minimum.
      a. Note: If panel is 29 gauge (0.013 / 0.33 mm), trim material is to be pre-finished 29 gauge (0.013 / 0.33 mm).
   3. Foam closures: Cross-linked polyethylene with UV stabilizers. Field applied tape sealant as required.
   4. Downspouts: 26 gauge (0.018 inch/0.46 mm) factory brake formed, material and finish to match wall cladding. 28 gauge (0.015 inch/0.38 mm) minimum, roll formed, aluminum alloy #3105-H14 (Stone Grey QC28305, White White QC28317).

5.5 LinerSeal Wall & Roof Liner

A. System Design: Design wall panels in accordance with CSA – S136 North American Specification for the Design of Cold-Formed Steel Structural Members.
B. Panels:
   1. Factory roll-formed to provide width coverage 31.5" (800 mm), 1-3/16" (30 mm) high; includes factory applied caulking
   2. Low profile panel consisting of four major corrugations spaced 6-5/16" (160 mm) on centre.
      a. Each Major Corrugation: 3/16" (5 mm) high, 9/16" (229 mm) wide.
   3. In Panel Flat: Two additional minor corrugations, 1-5/16" (33 mm) wide, 1/16" (2 mm) high, tapered to 1 1/8" (29 mm) at top, spaced 1-7/8" (48 mm) on each side of major corrugations.
   4. Applied as first skin, on exterior side of the building with the use of standoff zee system.
   5. Wall panels greater than 28'-0" (9.144 m) to be spliced as per Steelway standard detail.
   6. Field drill wall panels in structural members for proper alignment.

7. Panel Material and Finish:
   a. Through Fastened Panel: 26 gauge (0.018 inch/0.46 mm), 24 gauge (0.024 /0.61 mm), 22 gauge (0.030 / 0.76 mm) factory pre-formed steel sheet aluminum-zinc coated, pre-finished profile.
   b. Includes closures, gaskets, caulking, flashings and fasteners to effect weather tight installation.
   c. Steel Sheet, Aluminum-Zinc Coated: to ASTM A792/A792M, structural quality, class 1 or 4, Grade 50 (340 MPa) with AZM165 Galvalume Plus coating, regular spangle surface, passivated for unpainted finish and AZM150 un-passivated for paint finish.
   d. Paint System:
      1. Exterior – Minimum Standard 20000 series colours, use a Silicone Modified Polyester paint system.
      2. Interior – Wash coat (minimum)
   e. Colour – Choose from manufacturers Minimum Standard Series 20000.

C. Trim and Flashing
   1. Corners: The material must match the finish and profile of adjacent cladding material, shop cut and brake formed to the correct angle.
   2. Accessories to Wall Liner: Brake or bend shape, of material and finish to match wall cladding, consisting of cap flashings, drip flashings, corner flashings, header, jamb and sill trims. All trim material is to be pre-finished 26 gauge (0.018 inch/0.46 mm) minimum.
   3. Field applied tape sealant as per Building Manufacturer's standard details.

5.6 General Info: Wall Systems

A. Fasteners:
   1. Wall panel to secondary structural fastener shall be a No.14 self-drilling carbon steel screw, hex washer head with sealing washer, 1-1/2" (38 mm) long, 2" (50 mm) long also available. Fastener shall have a 20-year corrosion resistant coating. Fastener shall have a painted head to match panel and/or trim colour when used with painted material.
   2. Panel to panel, flash to flash, (stitch) fastener for wall shall be a No.14 self-drilling carbon steel screw, hex washer head with sealing washer, 7/8" (22 mm) long. Fastener shall have a 20-year corrosion resistant coating. Fastener shall have a painted head to match panel and/or trim colour when used with painted materials.

B. Sealants
   1. Sealant for interior and exterior locations - a Polyurethane `Dymonic 100' sealant, conforming to CAN/CGSB-19,13-M87 manufactured by Tremco Manufacturing Co. (Canada) Ltd. or an approved equal manufacturer. Colour selected to match background.
   2. Sealant for vertical surfaces of structural expansion joints - Sikaflex 2C NS by Sika Canada Inc. or Sikaflex 1a.
   3. Polyethylene backer rod is recommended as joint backing to control sealant depth and ensure intimate contact of sealant with joint substrate.
   4. Excess sealant and smears adjacent to the joint interface can be carefully removed with xylene or mineral spirits before the sealant cures.
   5. Insulation as recommended by Steelway.
   6. Vapour Barrier and Sealing Tape: as recommended by insulation supplier.
   7. Sealant & tape mastic: as recommended by Steelway.

C. Closures
   1. Closures shall be closed cell polyethylene foam to match the panel configuration.
   2. Closures shall be provided at the eave of the roof panels.

D. Installation
   1. Storage and installation of the wall system shall be in accordance with Steelway's erection drawings.
   2. To ensure the highest quality of work proper tools and equipment must be on hand. The tools must be in good condition and operators should adhere to safety precautions at all times. Improperly operated tools, too few tools, inadequate power source, or equipment deficiencies slow down the installation process. The cost of inefficient working is usually greater than the cost of providing good equipment.

3. All end laps and side laps on roof panels shall be sealed with a continuous row of tape mastic (butyl tape) to prevent air and water from infiltrating the building.
4. Abrasive saws are not recommended for cutting panels or flashing. Abrasive saws create high heat that may burn away the protective coating from the panel edge, causing the edge to rust. Also, abrasive saw dust contains fine, hot steel particles, which accumulate on panel and flashing surfaces where they rust and can cause staining and rusting of those surfaces. Rust caused by abrasive saw damage or abrasive dust particles may be excluded from warranty claims.
5. The use of cutting tools that damage the panel finish shall not be allowed.
6. Panels shall not be marked with any graphite or lead markers.

E. Clean-up
1. The Contractor shall thoroughly clean all panels, trim, and gutters of all foreign material upon completion of construction.

F. Maintenance
1. Flashing and sheeting interfaces shall be inspected yearly to ensure connection and water-tightness.
2. End laps and other interfaces shall be inspected and maintained yearly. Normal adjustments or tightening of fasteners may be required.
3. The use of tar and other topical applied products shall not be permitted unless specified by the manufacturer.
4. Copper, lead flashing, exposed iron, or debris shall not be permitted on the wall.
5. Pipes and supports for wall-supported units shall be of a non-corrosive or rust- free material. Field painting of pipes and supports may be required to resist corrosion. Condensation from wall units shall be piped to interior or exterior locations. Damage due to condensate water is not covered under manufacturer's warranty.

G. Erection Sequence
1. Steelway wall systems are designed to be erected starting from any side of the building. In rare cases, due to the building layout, it may be required to start erection from a specified side. In those cases, it will be noted as such on the erection drawings.

H. Erection Care
1. The erector must be skilled in the erection of steel building systems and is responsible for complying with all applicable local, federal and provincial construction and safety regulations. The Erector remains solely responsible for the safety and appropriateness of all techniques and methods utilized by its crews in the erection of the steel building system and/or the roof/wall system. The Erector is also responsible for supplying any safety devices such as scaffolds, runways, nets, etc., which may be required by the governing codes to safely erect the steel building system and/or roof/wall systems.
2. Anchorage for safety devices may be added at an additional cost provided specific connections are designed and clearly noted on the order documents. All anchorage points must be noted with exact location, magnitude, and direction of force for a fully-braced structure.
3. The erector of the Steelway erection drawings shall exercise great care and attention to the details as shown on the erection drawings and in the Steelway erection manual to insure a secure and proper fit of all components. Steelway shall not be responsible for supervising and/or coordinating the erection of the Roof/Wall Systems with other trades. Erection drawings take precedence when a situation differs from that shown in the erection manual.
4. The erector acknowledges that all details for all conditions can be noted on the plans and that due care and judgment are required to make a safe and watertight condition. Sealants and caulking may be required based upon actual conditions encountered.

I. Field-Cutting of Panels
1. When field-cutting or mitering Steelway panels, non-abrasive cutting tools such as nibblers or tin-snips shall be used. Abrasive cutting tools such as mechanical grinders, saws, shears, or scissors can damage the Galvalume® or painted finish and create excess metal shavings that can corrode the panels. The use of non-approved cutting devices may void your manufacturer's warranty.

5.7 Rake/Eave Extensions/Canopies

A. Roof rake/eave extensions shall consist of cantilevered extension beams or roof purlins beyond steel line, complete with all trim, closures, and all necessary flashing to provide a weather-tight overhang. Soffit panel is required for rake/eave extensions.
B. Canopies shall consist of roof panels supported by cantilevered beams and purlins, complete with trim, closures, and all necessary flashing to provide a weather-tight overhang. Soffit panel may be requested on the order documents.

Part 6 Insulation

6.1 Recommended insulation thickness (insulation supplied by others)

A. Wall or roof blanket insulation over 3" (76 mm) may cause dimpling at support locations.
B. The maximum thickness available for use with the Steelway StormSeal is 6" (152 mm) of blanket insulation. (Please note: the maximum thickness allowed under UL® 30, 60, and 90 shall be 6" (152 mm).)
C. Steelway RTL-24 standing seam roof with 3-1/2" (89 mm) short panel clip may be installed over blanket insulation from 2" (51 mm) to 4" (102 mm) thick.
D. Steelway RTL-24™ with 4-1/2" (114 mm) standard panel clip may be installed over blanket insulation from 4" (102 mm) to 6" (152 mm) thick provided a thermal block is placed under the clip.
E. Steelway RTL-24™ with 6" (152 mm) tall clip may be installed over blanket insulation from 8" (203 mm) to 9" (228 mm) thick provided that the insulation is slit to allow the clip to seat on top of the purlin.
F. With the introduction of updated energy codes and standards, such as the National Energy Code of Canada for Buildings (NECB), provincial jurisdictions are enacting more stringent requirements on the thermal transmittance of building envelopes. Steelway Building Systems now offers many roof and wall assemblies that will meet or exceed these new energy code requirements.

Part 7 Serviceability/Deflection Criteria

7.1 Standard Serviceability Criteria (Canada)

The most commonly addressed serviceability criteria in steel building systems are deflections and thermal expansion/contraction. Steelway Building Systems deflection standards in Canada are based upon the CSSBI Design Criteria for Low Rise Steel Building systems. All projects meet or exceed the following criteria unless otherwise specified on the quote or order documents.

7.2 Serviceability Limit States

The NBC Structural Commentaries (Part 4 of Division B) notes that loads and load combinations depend very much on the serviceability limit state and on the properties of structural materials (e.g. creep and cracking). The commentary goes on further to provide some guidance on the load combinations depending on the SLS to be considered. For example, three load combinations are suggested for displacement under the limit state of damage to non-structural components:

$$L + \alpha S$$
$$S + \alpha L$$
$$W$$

These are the recommended limit states for the short term effects that could cause undesirable effects on non-structural members. Note that S and W include an Importance Factor for the serviceability limit state (see Table 1.1 for SLS). The companion factor, α, is usually assumed to be 0.5 for live loads due to use and occupancy, except in the case of storage uses, where it is assumed to be 1.0, and 0.5 for snow loads.

7.3 Table 1.1 - Importance Factors

Importance Category	Wind, I_w		Snow, I_s	
	ULS	SLS	ULS	SLS
Low	0.8	0.75	0.8	0.9
Normal	1.0	0.75	1.0	0.9
High	1.15	0.75	1.15	0.9
Post-disaster	1.25	0.75	1.25	0.9

Source: Tables 4.1.6.2.-A and 4.1.7.3. NBC 2015

The following tables give recommendations for the serviceability limit states of steel roofing (Table 2.1), cladding (Table 2.2) and cranes (Table 2.3). The application of these limits is intended for low rise steel building systems, but may be used as a guide for other building types. The design professional is responsible for determining if these limits are appropriate for the specific building project.

7.4 Table 2.1 - Serviceability Considerations for Steel Roofing

Roofing Type	Structural Element	Deformation	Recommended Serviceability Limit	Loading
Through Fastened (no interior finish)	Expansion Joint	Horz. Movement	100-200 ft. max (along slope of roof)	*T*
	Roof	Slope	0.5/12 min.	*Drainage*
	Purlin	Vert. Deflection	Span/150	$S^{(1)}$ *or L or* $W^{(1)}$
	Purlin	Vert. Deflection	Positive Drainage[3]	$D+\alpha^{(2)}S^{(1)}$
Standing Seam (no interior finish)	Expansion Joint	Horz. Movement	150-200 ft. max (along slope of roof)	*T*
	Roof	Slope	0.25/12 min.	*Drainage*
	Purlin	Vert. Deflection	Span/150	$S^{(1)}$ *or L or* $W^{(1)}$
	Purlin	Vert. Deflection	Positive Drainage[3]	$D+\alpha^{(2)}S^{(1)}$
Through Fastened (interior finish susceptible to cracking(4))	Expansion Joint	Horz. Movement	100-200 ft. max	*T*
	Roof	Slope	0.5/12 min.	*Drainage*
	Purlin	Vert. Deflection	Span/360	$S^{(1)}$ *or L or* $W^{(1)}$
	Purlin	Vert. Deflection	Positive Drainage[3]	$D+\alpha^{(2)}S^{(1)}$

7.5 Table 2.1 (Cont'd) - Serviceability Considerations for Steel Roofing

Roofing Type	Structural Element	Deformation	Recommended Serviceability Limit	Loading
Standing Seam (interior finish susceptible to cracking[4])	Expansion Joint	Horz. Movement	100-200 ft. max	*T*
	Roof	Slope	0.25/12 min.	*Drainage*
	Purlin	Vert. Deflection	Span/360	*$S^{(1)}$ or L or $W^{(1)}$*
	Purlin	Vert. Deflection	Positive Drainage[3]	*$D+\alpha^{(2)}S^{(1)}$*
Through Fastened (interior finish not susceptible to cracking[5])	Expansion Joint	Horz. Movement	100-200 ft. max	*T*
	Roof	Slope	0.5/12 min.	*Drainage*
	Purlin	Vert. Deflection	Span/150	*$S^{(1)}$ or L or $W^{(1)}$*
	Purlin	Vert. Deflection	Positive Drainage[3]	*$D+\alpha^{(2)}S^{(1)}$*
Standing Seam (interior finish not susceptible to cracking[5])	Expansion Joint	Horz. Movement	100-200 ft. max	*T*
	Roof	Slope	0.25/12 min.	*Drainage*
	Purlin	Vert. Deflection	Span/150	*$S^{(1)}$ or L or $W^{(1)}$*
	Purlin	Vert. Deflection	Positive Drainage[3]	*$D+\alpha^{(2)}S^{(1)}$ or D+5 psf*
Through Fastened (suspended ceiling)	Expansion Joint	Horz. Movement	100-200 ft. max	*T*
	Roof	Slope	0.5/12 min.	*Drainage*
	Purlin	Vert. Deflection	Span/240	*$S^{(1)}$ or L or $W^{(1)}$*
	Purlin	Vert. Deflection	Positive Drainage[3]	*$D+\alpha^{(2)}S^{(1)}$*
Standing Seam (suspended ceiling)	Expansion Joint	Horz. Movement	100-200 ft. max	*T*
	Roof	Slope	0.25/12 min.	*Drainage*
	Purlin	Vert. Deflection	Span/240	*$S^{(1)}$ or L or $W^{(1)}$*
	Purlin	Vert. Deflection	Positive Drainage[3]	*$D+\alpha^{(2)}S^{(1)}$*
Insulated Metal Panels	Expansion Joint	Horz. Movement	Specified by panel manufacturer	*T*
	Roof	Slope	Specified by panel manufacturer	*Drainage*
	Purlin	Vert. Deflection	Span/240 or specified by panel manufacturer	*$S^{(1)}$ or L or $W^{(1)}$*
	Purlin	Vert. Deflection	Positive Drainage[3]	*$D+\alpha^{(2)}S^{(1)}$*

Table Notes:
(1) S and W include an importance factor for serviceability (see Table 1.1).
(2) The companion factor, α, is usually assumed to be 0.5 for live loads due to use and occupancy, except in the case of storage uses, where it is assumed to be 1.0, and 0.5 for snow loads.
(3) For more information on positive drainage and ponding refer to NBC Structural Commentaries.
(4) Interior finish susceptible to cracking would include gypsum drywall.
(5) Interior finish not susceptible to cracking would include Steel liner panels.

7.6 Table 2.2 - Serviceability Considerations for Cladding

Cladding Type/ Support Type	Structural Element	Deformation	Recommended Serviceability Limit	Loading
Steel Panels/ Foundation (no interior finish or interior finish not susceptible to cracking[5])	Bare Frame	Drift perpendicular to wall	Height/60	*W*[1]
	Wind Frame	Drift parallel to wall (racking)	Height/100	*W*[1]
	Secondary Structure	Horz. Deflection	Span/90	*W*[1]
	Wind Columns	Horz. Deflection	Height/90	*W*[1]
Steel Panels/ Foundation (interior finish susceptible to cracking[4])	Bare Frame	Drift perpendicular to wall	Height/120	*W*[1]
	Wind Frame	Drift parallel to wall (racking)	Height/240	*W*[1]
	Secondary Structure	Horz. Deflection	Span/240	*W*[1]
	Wind Columns	Horz. Deflection	Height/240	*W*[1]
Insulated Metal Panels/Foundation	Bare Frame	Drift perpendicular to all	Height/120	*W*[1]
	Wind Frame	Drift parallel to wall (racking)	Height/240	*W*[1]
	Secondary Structure	Horz. Deflection	Height/240	*W*[1]
	Wind Columns	Horz. Deflection	Height/240	*W*[1]
EIFS /Foundation (interior finish not susceptible to cracking[5])	Bare Frame	Drift perpendicular to wall	Height/120	*W*[1]
	Wind Frame	Drift parallel to wall (racking)	Height/240	*W*[1]
	Secondary Structure	Horz. Deflection	Span/240	*W*[1]
	Wind Columns	Horz. Deflection	Height/240	*W*[1]
Tilt-Up Precast Panels/Foundation	Bare Frame	Drift perpendicular to wall	Height/100	*W*[1]
	Wind Frame	Drift parallel to wall (racking)	Height/200	*W*[1]
	Secondary Structure	Horz. Deflection	Span/240	*W*[1]
	Wind Columns	Horz. Deflection	Height/240	*W*[1]
Unreinforced Masonry Wall/ Foundation	Bare Frame	Drift perpendicular to wall	1/16 in. crack in base of wall	*W*[1]
	Wind Frame	Drift parallel to wall (racking)	Height/360	*W*[1]
	Secondary Structure	Horz. Deflection	Span/240 ≤ 1.5 in.	*W*[1]
	Wind Columns	Horz. Deflection	Span/240	*W*[1]

7.7 Table 2.2 (Cont'd) - Serviceability Considerations for Cladding

Cladding Type/ Support Type	Structural Element	Deformation	Recommended Serviceability Limit	Loading
Reinforced Masonry Wall/Foundation	Bare Frame	Drift perpendicular to wall	Height/100 with appropriate base details for max 1/16 in. crack in base of wall, or H/200 without	*W*(1)
	Wind Frame	Drift parallel to wall (racking)	Height/240	*W*(1)
	Secondary Structure	Horz. Deflection	Span/240 ≤ 1.5 in.	*W*(1)
	Wind Columns	Horz. Deflection	Span/240	*W*(1)
Glass Curtain Wall/ Foundation	Bare Frame	Drift perpendicular to all	Height/240	*W*(1)
	Wind Frame	Drift parallel to wall (racking)	Height/360	*W*(1)
	Secondary Structure	Horz. Deflection	Span/360 or specified by curtain wall manufacturer	*W*(1)
	Wind Columns	Horz. Deflection	Span/360 or specified by curtain wall manufacturer	*W*(1)
Glass Curtain Wall/ Spandrel Beams	Bare frame	Drift perpendicular to all	Height/240	*W*(1)
	Wind frame	Drift parallel to wall (racking)	Height/240	*W*(1)
	Secondary structure	Horz. Deflection	Span/360 or specified by curtain wall manufacturer	*W*(1)
	Wind columns	Horz. Deflection	Span/360 or specified by curtain wall manufacturer	*W*(1)
	Spandrels	Vert. Deflection	Span/400 or specified by curtain wall manufacturer	*D*

Technical Notes:
(1) S and W include an importance factor for serviceability (see table 1.1).
(2) The companion factor, α, is usually assumed to be 0.5 for live loads due to use and occupancy, except in the case of storage uses, where it is assumed to be 1.0, and 0.5 for snow loads.
(3) For more information on positive drainage and ponding refer to NBC Structural Commentaries.
(4) Interior finish susceptible to cracking would include gypsum drywall.
(5) Interior finish not susceptible to cracking would include Steel liner panels.

7.8 Table 2.3 - Serviceability Considerations for Cranes

Crane Type	Structural Element	Deformation	Recommended Serviceability Limit	Loading
Top Running Cranes	Runway Supports	Relative lateral deflection of runway rails (change in gauge)	1.0 in. max.	$D + \alpha S$
	Runway beam Structural class of service 'A','B','C','D','E','F'	Horz. Deflection	Span/400	$C_{SS}^{(3)}$ or $0.5C_{SM}^{(4)}$
	Runway Beam Structural class of service 'A','B'&'C',	Vert. Deflection	Span/600	$C_{VS}^{(5)}$ or $C_{VM}^{(6)}$
	Runway beam Structural class of service 'D'	Vert. Deflection	Span/800	$C_{VS}^{(5)}$ or $C_{VM}^{(6)}$
	Runway beam Structural class of service 'E'&'F'	Vert. Deflection	Span/1000	$C_{VS}^{(5)}$ or $C_{VM}^{(6)}$
Top Running Cab Operated or Radio Operated Cranes	Bare frame Structural class of service 'A','B'&'C'	Lateral drift at runway elev.	Height/240 ≤ 2 in. max.	$C_{SS}^{(3)}$ or $0.5C_{SM}^{(4)}$ or q1/10
	Bare frame Structural class of service 'D','E'&'F'	Lateral drift at runway elev.	Height/400 ≤ 2 in. max.	$C_{SS}^{(3)}$ or $0.5C_{SM}^{(4)}$ or q1/10
Top Running Pendant Operated Cranes	Bare frame Structural class of Service 'A','B','C','D'	Lateral drift at runway elev.	Height/100 ≤ 2 in. max.	$C_{SS}^{(3)}$ or $0.5C_{SM}^{(4)}$ or q1/10
Underhung Crane (supported by frames)	Runway Supports	Relative lateral deflection of runway rails (change in gauge)	1.0 in. max.	$D + \alpha S$
	Runway beam Structural class of service 'A','B'&'C'	Vert. Deflection	Span/450	$C_{SS}^{(3)}$ or $0.5C_{SM}^{(4)}$
	Bare frame Structural class of service 'A','B','C'	Lateral drift at runway elev.	Height/100	$C_{VS}^{(5)}$ or $C_{VM}^{(6)}$
	Bare frame Structural class of service 'A','B','C'	Vertical deflection at runway	Span/240	$C_{VS}^{(5)}$ or $C_{VM}^{(6)}$

Technical Notes:
(1) S and W include an importance factor for serviceability (see Table 1.1)
(2) S and W include an importance factor for serviceability (see Table 1.1)
(3) The companion factor, α, is usually assumed to be 0.5 for live loads due to use and occupancy, except in the case of storage uses, where it is assumed to be 1.0, and 0.5 for snow loads.
(4) CSS refers to the side-thrust due to a single crane.
(5) CSM refers to the side-thrust due to multiple cranes.
(6) CVS refers to the vertical load due to a single crane, not including impact.
(7) CVM refers to the vertical load due to multiple cranes, not including impact.

Part 8 Wall & Roof Thermal Performance

8.1 U-Factor / R-Value Chart – Wall Assemblies

A. Notched Thermal Z-Wall System
   1. Notched Thermal Z-Wall assembly is made up of an interior 24 gauge steel liner with continuous horizontal z-bars outboard, spaced 60" o.c., supporting insulation and metal cladding. The flanges of the Z-bars that are attached to the interior steel liner are notched with a 1 1/4" gap every 5"o.c. The Z-bars vary in depth from 6" to 8.5".
   2. Mineral wool insulation (R- 4.2/inch) is infilled between the Z-bars and up against the cladding.

B. Through Fastened Wall (Base System)
   1. The base Through Fastened Wall assembly, shown in Figure 2, contains an interior 26 Ga liner with horizontal girts spaced 60" o.c. which supports insulation and metal corrugated cladding. The girt depth varies from 8" to 12".
   2. The insulation in the system is in two layers of fiberglass batt insulation. The front layer is a 3" blanket hung in front of the girts and compressed against the cladding. The cladding is fastened through this layer and is further compressed to 1/4" in front of the girts. The second layer is infilled between the girts and compresses against the first layer.

C. Through Fastened Wall (Alternative System)
   1. There are three commonly used alternative scenarios that can be created by adjusting the base system.
      a. The first was use of a wide rib cladding in lieu of the standard smaller ribbed cladding, which allows the draped batt to expand more in the cavity.
      b. The second scenario examined using a 1" thermal block at the girts and only infill insulation (no draped batts).
      c. The final scenario examined using a 1" continuous board of rigid insulation as the top layer instead of the compressed and draped batt insulation.

A. Table 1: U-values and R-values for insulated sheet steel wall assemblies with Z-bars, 5mph Exterior Wind

Insulation Thickness	**Insulation Nominal R-Value** $hr \cdot ft^2 \cdot {}^oF/BTU$ (m2K/W)	**Assembly U-Value** $BTU/hr \cdot ft^2 \cdot {}^oF$ (W/m2K)	**Effective Assembly R-Value** $hr \cdot ft^2 \cdot {}^oF$ /BTU (m2K/W)
18 Ga Intermittent Z-Bar, No Thermal Block			
6" MW	R-25.2 (4.44)	0.046 (0.263)	R-21.6 (3.80)
18 Ga Continuous Notched Z-Bar, With Thermal Block			
6" MW	R-25.2 (4.44)	0.044 (0.247)	R-23.0 (4.05)
16 Ga Notched Z-Bar, No Cut-Out Profile			
6" MW	R-25.2 (4.44)	0.058 (0.328)	R-17.3 (3.05)
16 Ga Notched Z-bar, Cut-Out Profile			
6" MW	R-25.2 (4.44)	0.047 (0.267)	R-21.3 (3.75)
7.5" MW	R-31.5 (5.55)	0.040 (0.225)	R-25.2 (4.44)
8.5" MW	R-35.7 (6.29)	0.036 (0.206)	R-27.6 (4.85)

B. Table 2: U-values and R-values for Through Fastened Wall Assembly, 5mph Wind

	Girt Depth, Insulation Between Girt Nominal Thickness	**Insulation Nominal R-Value** hr·ft²·°F/BTU (m2K/W)	**Assembly U-Value** BTU/hr·ft²·°F (W/m2K)	**Effective Assembly R-Value** hr·ft²·°F /BTU (m2K/W)
Base System – Standard Cladding, No Thermal Block				
3"	8"	R-11 + 25 (RSI 1.93 + 4.40)	0.055 (0.312)	R-18.2 (3.21)
	10"	R-11 + 33 (RSI 1.93 + 5.80)	0.048 (0.273)	R-20.8 (3.66)
	12"	R-11 + 38 (RSI 1.93 + 6.69)	0.043 (0.245)	R-23.2 (4.09)
Wide Rib Cladding, No Thermal Block				
3"	8"	R-11 + 25 (RSI 1.93 + 4.40)	0.045 (0.255)	R-22.3 (3.93)
Standard Cladding, With 1" Thermal Block				
None	8" girt, 9" infill insulation	R-30 (RSI 5.28)	0.043 (0.244)	R-23.3 (4.11)
	10" girt, 11" infill insulation	R-35.5 (RSI 5.80)	0.038 (0.215)	R-26.4 (4.65)
Standard Cladding, With 1" Rigid Board				
1" Rigid Board	8"	R-5 + 25 (RSI 1.76 + 4.40)	0.041 (0.232)	R-24.5 (4.32)

FEA Model U-Factor:
These values are based upon a calculated U-factor using Finite Element Analysis, which reflect in-place performance. This FEA method has been calibrated by thermal tests and is the currently accepted method for determining accurate thermal performance expectations. R-value = 1/U-factor.

8.2 U-Factor / R-Value Chart – Roof Assemblies

A. Standing Seam Roof Liner System with Insulated Cavity Between Thermal Chairs
   1. This analyzed roof assembly is made up of a standing seam roof supported by a hat track and intermittent thermal chair framing system. Intermittent standoff clips at 24"o.c. are attached to 2" continuous hat tracks and space off the cladding by either 1 5/8". The hat tracks sit on thermal chairs that are spaced 48" o.c. The chair height was varied between 7" to 13". The thermal chairs are fastened to a 24ga steel liner and supported by purlins.
   2. The insulation for the system is in two layers. A top layer is draped over the hat tracks and a second layer sits between the thermal chairs and varies in thickness depending on the chair height. The top layer of draped insulation is mainly compressed between the cladding and the bottom layer of insulation, however, directly at the hat tracks the insulation is compressed to ¼" by the clips and a 1" thermal block (R-5 equivalent) used between the cladding and the hat tracks.

B. Standing Seam Roof Liner System with Insulated Cavity between Purlins
   1. The standing seam roof is supported by purlins spaced 24" or 60" o.c. intermittent standoff clips at 24"o.c. are attached to the purlins and space off the cladding by either 1 5/8" or 3 5/8" depending on the size of the clip. A 26ga steel liner is attached below the purlins to enclose the cavity.
   2. As with the hat track and thermal chair system, the insulation is in two layers: a draped top layer over the purlins and a second layer between the purlins. The top layer insulation is similarly compressed to ¼" at the purlins by the clips and thermal block.

Table 2: U-values and R-values for standing seam roof liner system with insulated cavity between purlins

Draped Insulation Over Purlins Nominal Thickness	Purlin Depth/ Insulation Between Purlins Nominal Thickness	Insulation Nominal R-Value2 hr·ft²·°F/BTU (m2K/W)	Purlins at 24" o.c. Spacing		Purlins at 60" o.c. Spacing	
			Assembly U-Value BTU/hr·ft²·°F (W/m2K)	Effective Assembly R-Value hr·ft²·°F /BTU (m2K/W)	Assembly U-Value BTU/hr·ft²·°F W/m2K)	Effective Assembly R-Value hr·ft²·°F /BTU (m2K/W)
3"	8"	R-11 + 25 (RSI 1.94 + 4.40)	0.058 (0.328)	R-17.3 (3.04)	0.040 (0.228)	R-24.9 (4.38)
	10"	R-11 + 33 (RSI 1.94 + 5.80)	0.054 (0.306)	R-18.6 (3.27)	0.036 (0.203)	R-27.9 (4.92)
	12"	R-11 + 38 (RSI 1.94 + 6.69)	0.050 (0.286)	R-19.8 (3.49)	0.032 (0.183)	R-31.0 (5.46)
5"	12"	R-16.5 + 38 (RSI 2.90 + 6.69)	0.042 (0.239)	R-23.7 (4.18)	0.028 (0.158)	R-36.0 (6.34)

FEA Model U-Factor:
These values are based upon a calculated U-factor using Finite Element Analysis, which reflect in-place performance. This FEA method has been calibrated by thermal tests and is the currently accepted method for determining accurate thermal performance expectations. R-value = 1/U-factor.