Sheet Steel Facts 8

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Glossary of Commonly Used Terms for Structural Building Products

Introduction

This Fact Sheet is written to provide assistance in understanding the engineering terms commonly used in the sheet steel building products industry.

Air Barrier: Is a membrane in the building enclosure (i.e. wall or roof assemblies) designed to restrict the flow of air through the enclosure.

Cellular Steel Deck: A deck profile with a flat sheet attached to the bottom creating enclosed cells through which electrical or communication services can run.

Cladding: Those components of a building exposed to the outdoor environment and intended to provide protection against wind, water and vapour. Sheet steel cladding are those components of sheet steel which form the exposed exterior surface of a wall or roof of a building.

Composite Slab: Is the combination of a composite steel deck and a concrete cover slab that have cured together and bonded structurally to act together as one element.

Composite Steel Deck: A steel deck, either cellular or non¬cellular, which acts initially as a form and subsequently as positive moment reinforcement for the composite slab. The cured concrete interlocks with the deck to achieve composite action.

Embossments: Regularly spaced embossments, indentations or lugs on the various surfaces of a composite steel deck for the purpose of achieving composite action by interlocking with the cured structural concrete.

Girt: Is a secondary structural member in a wall assembly the transfers the wind loads from the wall cladding to the principal structural frame.

Limit States Design (LSD): Limit states design is a method of design that is mandated by all Canadian building codes and separates the “factor of safety” into two parts: a load factor and a resistance factor. The load factor is applied to the specified loads to recognize that loads higher than those anticipated may occur and is independent of the structural material. A resistance factor is applied to the theoretical member strength, or resistance, to recognize that the strength of the member cannot be predicted exactly due to variability in material properties, dimensions and workmanship.

Liner Sheet: The interior sheet of a double skin wall or roof assembly which acts as the air and vapour barrier for the assembly as well as creating an aesthetic interior finish.

Load - Axial: Is a load in a structural member (e.g. a column or beam-column) that is applied in a direction parallel to the long axis of the member and through the centroid of the cross section.

Load - Dead: Is the load on a structural member resulting from the weight of the member itself, applied finishes, and permanent partitions or equipment.

Load - Factored: Is the product of a specified load and the appropriate load factor.

Load - Live: Is the load on a structural member resulting from its intended use. This load could be the result of traffic, occupancy, storage of materials, snow, wind, earthquake, or other transient loads.

Load - Specified: Is the unfactored load (dead or live) specified by the building code for the intended use and occupancy of the structure.

Load - Superimposed: This is the sum of the live load plus the dead load minus the self weight of the structural member. (Often used for composite slab load tables).

Load Factor: Is a factor, normally greater than 1.0, intended to account for the unpredictability of loads.

Metallic Coating: A coating of zinc or aluminum-zinc alloy applied to the sheet steel, usually by a hot-dip process, intended to provide corrosion protection for the steel substrate.

Modulus of Elasticity: See Young’s Modulus.

Moment of Inertia: Is a geometric property of the cross-section that is used to determine the deflections caused by flexural stresses.

Oil Canning: Is the regular undulations or waves that can form in large flat surfaces of thin material.

Passivation: A chemical treatment given to the galvanized sheet steel to prevent the formation of white rust.

Point Load: Is a concentrated load on a structural member.

Post-Painting: Refers to painting of a component (e.g. cladding) after it has been rollformed.

Prefinished: Refers to a material in coil form factory-coated with a paint, or laminate system, prior to delivery to a fabricator.

Purlin: Is a secondary structural member in a roof assembly that transfers the loads from the roof cladding to the principal structural frame.

Rain Screen: A wall assembly that has a vented cavity allowing the equalization of air pressures on both sides of the exterior cladding.

Reinforcement - Negative: Reinforcing steel added near the top of a concrete slab to carry the tensile forces caused by negative moments. Negative moment reinforcement is also required in a composite slab in regions of negative moment.

Reinforcement - Positive: Reinforcing steel added near the bottom of a concrete slab to carry the tensile forces caused by positive moments. The steel deck acts as the positive moment reinforcement for a composite slab.

Resistance - Nominal: The strength, or resistance, of a member calculated in accordance with the governing design standard (i.e. CSA-S136 for cold formed steel).

Resistance - Factored: Is the product of the nominal resistance and the appropriate resistance factor which reduces the resistance to recognize variability in material properties, dimensions and workmanship.

Roof: A surface which is inclined less than 70 degrees from the horizontal.

Section Modulus: The section modulus is a property of the cross section which is used to determine the bending stress in the extreme fibre of the section.

Shear-Bond: Is the interlocking between a concrete slab and the composite steel deck. A shear-bond failure is when this interlocking breaks down under the ultimate shear stresses.

Shear Diaphragms: Steel roof and floor deck, if properly connected to the supporting structure, can be designed to carry in-plane shear forces and act as the primary lateral bracing. In many cases the steel deck diaphragm will eliminate the need for an independent horizontal bracing system.

Shear Studs: Shear studs are steel members (resembling a bolt) that are resistance welded through a steel floor deck to the supporting structural steel members prior to placing the concrete. These studs interlock the supporting steel beams with the concrete slab to create a composite beam.

Shear Studs - Efficiency: In some composite beams it is not necessary to develop the full shear capacity of the studs and a partial shear connection is adequate. The effectiveness of the shear transfer between the studs and the concrete is also affected by the distance between studs and the mass of concrete enclosed by the deck flute. If the studs are placed in pairs the efficiency of the shear stud is reduced.

Snow Guards: These are accessories attached on sloping roofs to inhibit the sliding of snow.

Span: Is the length of a flexural member (e.g. beam, cladding, deck) between supports.

Span - Continuous: Is when a flexural member spans continuously over a number of supports.

Span - Double: Is when a flexural member is continuous over three supports creating two separate spans.

Span - Simple: Is when a flexural member spans between only two supports.

Steel Building System: Means a building system, intended primarily for commercial, industrial, recreational or institutional occupancies, featuring steel structural and cladding components in conjunction with applicable appurtenances. Components are engineered to facilitate mass production and assembly in various combinations.

Steel Studs: Are structural framing members, usually C-sections. These members can be designed as combined axial and lateral loading bearing, wind load bearing only, or non-load bearing interior partitions.

Stress: Is a force per unit area. If the stress tends to stretch or lengthen the material, it is called tensile stress; if to compress or shorten the material, a compressive stress; and if to shear the material, a shearing stress.

Sub-Girt: A structural member within the cavity of a wall assembly that separates the exterior steel cladding from the interior steel liner and creates the cavity for the insulation.

Structural Quality Sheet Steel: Sheet steel produced to a published material specification that guarantees minimum material properties.

Temperature Mesh: A nominal amount of reinforcing steel (usually welded wire mesh) added to a concrete slab, or composite slab, to limit the size of cracks caused when the concrete cures and shrinks. This mesh needs to be located near the top of the slab to be most effective.

Thermal Resistance: The ability of a material to slow the transfer of heat energy from a hot environment to a colder one.

Thickness - Base Steel: Thickness of the sheet steel, excluding any metallic or organic coatings.

Thickness - Minimum: Sheet steel is manufactured to a specified thickness which falls within certain tolerances plus or minus. The minimum thickness of the sheet measured in the field will be 95% of the design thickness.

Thickness - Design: Structural sheet steel building products are engineered to carry certain design loads. These loads are given in the load tables published by the manufacturer. These load tables will specify a steel thickness which is the thickness used by the engineer in the calculations.

UDL: Is the abbreviation for “uniformly distributed load” and is an idealized load condition where the load is assumed to be the same over the entire length of a beam or surface of a deck.

Ultimate Strength: Is the maximum strength of the member before failure occurs. The symbol F_u is used to denote the ultimate tensile stress.

Uplift: The action of wind over the roof of a building will cause areas of suction that create uplift forces on the roof assembly.

Vapour Barrier: Is a continuous membrane in a building enclosure (i.e. wall or roof assembly) designed to prevent the migration of moisture from inside the building out through the enclosure. In an insulated assembly the control of moisture is important to stop condensation from building up in the wall or roof cavity.

Wall: A surface which is vertical or inclined not more than 20 degrees from the vertical.

Yield Strength: Is the maximum stress that can be applied without permanent deformation of the member. The symbol F_y is used to denote this stress.

Young’s Modulus: Is a physical property of the material that is a measure of its elasticity and is used in calculating deflections.

Common Acronyms

AISI: American Iron and Steel Institute
ASTM: The American Society for Testing and Materials
CMHC: Canada Mortgage and Housing
CISC: Canadian Institute of Steel Construction
CSA: Canadian Standards Association
CSSBI: Canadian Sheet Steel Building Institute
FM: Factory Mutual
MBMA: Metal Building Manufacturers Association (United States)
MCA: Metal Construction Association (United States)
NBCC: National Building Code of Canada
OBC: Ontario Building Code
UL: Underwriters’ Laboratories Inc. (United States)
ULC: Underwriters’ Laboratories of Canada.

For More Information

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