A Look at Cold-Formed Steel Structures

The use of cold-formed steel in today's construction

American Iron and Steel Institute
These buildings have all been recognized for their outstanding design.
They all make extensive use of cold-formed steel products.
Cold-formed steel offers versatility in building because of its light weight and ease of handling and use. Cold-formed steel represents over 45 percent of the steel construction market, and this share is increasing.
Cold-formed shapes are used for entire buildings and for complete roof, floor and wall systems. They are also used as individual framing members such as studs, joists and truss members.
Door

Cold-formed steel is also used for a wide variety of building products such as doors, windows and partitions.
Culvert

In highway construction cold-formed steel is used for culverts, guard rails, median and glare barriers, permanent bridge deck forms, signs and other components.
**Space Framing**

A working knowledge of the use of cold-formed steel is important for architects as well as civil and structural engineers. As material use and cost become critical, cold-formed steel products become an increasingly more attractive design solution.
Framing
This low-rise condominium is being built with cold-formed steel studs and joist instead of lumber. This helps minimize cost and reduce construction time. At the same time, these products eliminate callbacks for shrinking, warping, warping and twisting lumber. They are also vermin- and termite-proof.
Culvert

Cold-formed, corrugated steel pipe is used for everything from storm sewers to utility tunnels, and simple tunnels under roadways to huge bridge structures. The corrugated steel pipe can be installed in a cut, covered with filled and topped out with a roadway to form an inexpensive and durable bridge. The light weight and easy handling properties of the thin steel provide construction and cost advantages.
**Racks**

Material handling and storage specialists rely on cold-formed steel racks and rack systems to efficiently store and retrieve everything from groceries to heavy steel bars. New rack systems are so huge they fill entire buildings and have stacker cranes that rise as high as 100 feet (30m).
**Pre-Engineered Building**

There is a whole industry built around cold-formed steel building components. Manufacturers of pre-engineered metal building provide custom designed structures for anything from a small tool shed to a range of sophisticated structures such as schools, churches and complex manufacturing facilities.
School

A variety of cold-formed steel roof systems are available for new and reroofing projects. Steel offers a cost effective alternative that is long lasting and attractive.
Advantages

In summary, cold-formed steel offers many advantages, including: ease of prefabrication and mass production, uniformity of quality, low weight, economy of transportation and handling, and quick and simple erection or installation.
What is cold-formed steel?
Comparison of Corrugated vs. Flat
The basis of cold-formed steel design is very simple. A thin flat sheet will support very little load, because of its low rigidity. However, if the sheet is formed into corrugations, it acquires substantial rigidity and strength. The necessary structural qualities are obtained, not by increasing thickness, but by forming the sheet into an engineered shape.
**Framing cross sections**

Forming is done at room temperature, hence the word cold-formed. This method of fabrication also enhances the characteristics of the material as will be explained later. Most cold-formed steel is made from flat sheets or coils from 0.011 inches (0.28mm) to 0.188 inches (4.8mm) thick, although some sections are formed from steel as thick as 3/4 or 1 inch (19mm to 25mm). These are some of the shapes used for framing components.

The design of cold-formed steel shapes has evolved into a precise process and permits a wide variety of shapes, designed to give strength to the component in a specific way.
### Deck and Panel Shapes

These shapes are used for floor panels, roof decks and exterior enclosure panels. The geometry stiffens and strengthens the shapes.
Steels Available

Generally, the grades of carbon steel and high strength low alloy steel used for cold-formed steel products are characterized by two main properties: The yield point and the tensile strength. Other important properties are ductility, hardness and weldability.

The yield point of the steels commonly used for cold-forming ranges from 33 to 50 ksi (230 to 345 MPa), and may be higher. Tensile strength and ductility are important because of the way they relate to formability, and because of the local deformation demands of bolted and other types of connection. In members that include bolted connection or that, because of special design, may be subject to high stress concentrations, the tensile strength often must be taken into account. The ratio of tensile strength to yield strength for cold-formed steels commonly ranges from 1.21 to 1.80. However, steels with a lower ratio can be used for specific applications.
How is steel cold-formed?

Once the steel for structural application has been chosen, the next step is to form it into required shapes. Cold-formed steel shapes are formed at room temperature, while hot-rolled steel shapes are formed at elevated temperatures. The main methods of shaping cold-formed steel are press-braking and roll-forming.
Press Brake

In a press-brake, as the one shown here, there is a moving top beam to which an upper die is attached and a similarly long bed with a bottom die. The steel sheet to be formed is placed on the bottom die and the beam moves down and forms the steel. The final shape of the component results from a sequence of different press-brake operations. Press-brake forming is generally more suitable for large structural shapes, but is economically feasible only for short to medium production runs. A decision to use press-break forming also depends upon the shape of the piece and the complexity of the tooling required to achieve that shape.
Roll Forming Machine

Cold roll-forming is the most widely used method for production of roof, floor and wall panels. It is also used for the production of structural components such as Cees, Zees, and hat sections. In addition, window and door frames, gutters, downspouts and other products can be roll formed. Sections can usually be made from sheet up to 60 inches (1.5m) wide and from coils more than 3,000 feet (1,000m) long.
Roll Forming Machine
In cold roll-forming, sheet stock is fed longitudinally through a series of rolls, each of which works the sheet progressively until it reaches the desired shape. A simple section may require as few as six pairs of roll, but a complex shape can require as many as 24 to 30. The thickness of material that can be formed generally ranges between 0.004 (0.10mm) up to 0.312 inches (0.79mm), although heavy duty cold forming mills can handle steel up to 3/4 of an inch (19mm) thick.
Rolled Shape

This slide shows the shaping of a 0.060 inch (1.52mm) thick piece of strip into a door buck. As you can see, each roll bends the steel a little more through all the six stations until the desired shape is reached.
**Effect of Cold Work**

When steel is formed by press brake of cold rolled-forming, there is a change in the mechanical properties of the material by virtue of the cold working of the metal.

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When a member is cold-formed from flat sheet or plate, the yield strength, and to a lesser extent the ultimate strength, are increased as a result of this cold working, particularly in the bends of the section. The right part shows the developed centerline of the section and the variation of yield and ultimate strength along the centerline. One can see that these strengths are unaffected in the three flat portions where little cold work has taken place and the strength is much higher in the corners, which have been strongly cold-worked in the forming process.

Since cold work produced during forming increases the strength of the steel, it is economical to take advantage of this improvement because it will permit the designer to treat the formed steel as a stronger material than the original unformed steel. Often, it is possible to take a weighted average of the post forming strength of the cross section and use this higher figure as the overall strength of the steel.
Shape in Production

This is an interesting point because it may affect how the designer or engineer decides on the shape to use. A shape that is cold worked to a higher degree will have a higher yield strength, which may make it more appropriate for certain applications. Sometimes cold work is added by overbending and straightening. The end result is that a more complex shape may have higher strength than a less complex shape. Other factors that can affect cold working include roll pressure, corner radius and the properties of the steel.
In the final determination of a shape and how it will be formed, the designer or engineer must determine how the costs of the various forming methods compare and how much material can be saved through the judicious use of cold working.

**Cold-Former Steel Design**

One of the advantages of cold-formed steel is that it is possible for the structural engineer to design custom shapes to fill any given structural and aesthetic requirements. However, it is often possible to find on the market, readily available, shapes that will do the necessary job. Building component suppliers manufacture a wide variety of shapes.
Cross Sections of Cold-Formed & Hot-Rolled Shapes
This slide shows a comparison of typical cold-formed and hot rolled steel. The differences are not only in the thickness and the shapes. Since cold-formed steel members are formed at room temperature, the material becomes harder and stronger. Its light weight makes it easier and more economical to mass produce, transport and install.

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One of the main differences between designing with cold-formed steel shapes and with hot-rolled structural shapes is that with the hot rolled, one is primarily concerned about two types of instability: column buckling and lateral buckling of unbraced beams. The dimensions of hot-rolled shapes are such that local buckling of individual constituent elements generally will not occur before yielding.
This is not the case with cold-formed members. Here local buckling must also be considered because, in most cases, the material used is thin relative to its width. This means that the individual flat, or plate, elements of the section often have width to thickness ratios that will permit buckling at stresses well below the yield point.
Local Buckling

Local buckling, for such plate elements, is not the same as overall beam or column buckling. Although the element begins to deflect out of its original straight or plane shape, it does not fail when the initial buckling stress is reached. On the contrary it can resist increasing compression stresses often well in excess of those at which local buckling first appears. In this case, the member develops out-of-plane deformations which are shown (highly exaggerated) for these beams and columns, but they will continue to carry increasing load. This is known as their post-buckling strength.
Square Wave Buckling

There are two types of thin, compressed sheet elements. One type is stiffened by other components along both longitudinal edges. Such elements are called stiffened compression elements, and you see them in the compression flange of the C-section beam, or in all four faces of the box column. The other type is called unstiffened compression elements and are stiffened only along one of the two longitudinal edges. The other edge remains free. These elements appear in the compression flange of the channel section beam, and in all flanges of the I-section column. The behavior of these two types of elements is similar, though not identical.

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Stiffened compression elements, at higher stresses, buckle into approximately square waves. For simplicity, we will look at one such square, or square half-wave to be exact.
Buckling Forces

To facilitate visualizing behavior, suppose one represents the plate by this grid of rods. If the total compression force on the real plate is $P$, each of the longitudinal struts in the grid model will carry $P/5$, since there are five such struts. As the load is gradually increased, nothing happens until the buckling load of each of these five roads is reached. Since the rods are identical their buckling loads are identical. If they were individual, unconnected, compression struts, they would all buckle and fail at that load.
However, a plate is two dimensional. Its transverse action is represented here by the horizontal tie rods. Clearly these restrain and limit the amount of deflection of the five compression struts. Hence, when buckling occurs, the grid simply deforms as shown, but it does not fail because the horizontal rods, going into tension, keep the vertical struts from collapsing.

Now, what happens is that the struts near the center bend most, and the struts near the edges, being more effectively restrained, bend least. This redistributes the load among them. Those struts in the middle which bend the most, partially get away from their loads, while those near the edges, being held almost straight, resist increasing shares of the total load. Hence, the total load $P$, which was uniformly distributed among all five struts before buckling, is redistributed. The larger share is now concentrated near the stiffened edges.
Force VS. Width

The same happens in compressed elements such as flanges or webs. Once they start to buckle, the total compressive force is no longer uniformly distributed over the width. It concentrates near the stiffened edges. The initially uniform compressive stresses become redistributed as shown by the yellow line. As loading continues, stress redistributes until the edge stress reaches the yield strength.

Tests have shown that the plate elements will fail only when the maximum stress near the edges, $F$, reaches the yield point of the steel. That is, when the strips of the elements adjacent to the stiffened edges yield, then the entire element has reached its maximum load capacity.
To know this is one thing but to deal with it in design is another. This is where the concept of effective width comes in. Considering the element as the compression flange of some member, the total compressive force is the area under this stress distribution curve, times the thickness of the element. What is needed in design, really, is only this total compressive force. It is convenient to replace the actual variable stress distribution with a fictitious uniform stress distribution, of the same intensity of the edge stress, $F$, as in the real element as indicated by the dotted lines.

In order to get the same total compression force in the fictitious (dotted) as in the real (solid) distribution, the areas under the two must be equal. This means adjusting the width of each of the two fictitious rectangles, $\frac{b}{2}$, until the combined area of the two rectangles is equal to that under the solid curve. This width is known as the effective width, $b$. 
Effective Width Diagram

Once this effective width, $b$, is known, structural members, such as beams or columns, can be designed simply by replacing the real width, $w$, of each compression element by its effective width, $b$. This is shown for several frequently used shapes. To the left is a flexural member, to the right a compression member. The two effective portions of the compression elements are shown solid, and the portions considered removed are dotted. For each element, the total effective width is, of course, $b$.

Then, effective section properties, such as area, section modulus, and moment of inertia, can be calculated by using for each compression element its effective width, $b$, instead of its real width, $w$. 
**Effective Width Equation**

The basic equations for the effective width, \( b \), are the result of very extensive research, and are shown on the next two slides. The effective width is calculated by multiplying the actual width, \( w \), by a reduction factor \( \rho \), when the slenderness parameter \( \lambda \) is greater than 0.673. As \( \lambda \) increases, the effective width decreases.
Effective Width Equation

It is seen that the slenderness parameter, \( \lambda \), depends on the ratio of actual width, \( w \), to thickness, \( t \), and on the maximum edge stress, \( f \). \( \lambda \) increases with the increasing edge stress, \( f \), and also with increasing flat width-to-thickness ratio, \( w/t \).
Cold-Formed Steel Product

There are two major types of cold-formed steel products: structural shapes and panels. Of the former, there are a variety of shapes produced. They include open sections, closed sections, and built-up sections, such as Cee sections, (also called lipped channels,) zee sections, double channel I beams with stiffened flanges, hat sections with and without intermediate stiffeners, box sections, U sections and others. These are used in buildings for such structural functions as eave struts, purlins, and girls as well as joists and studs and other components.
Such sections can be used as primary framing members in buildings or as secondary or non-load bearing members. They are also used as chord and web members of open web steel joists, space frames, arches and racks, to mention only a few major applications.

Generally, the depth of cold-formed individual framing members range from 2 to 12 inches (50mm to 300mm) and the thickness of material ranges from 0.035 to about 1/4 inches (0.90mm to 6.4mm).
Roof Deck

Floor decks, roof decks and wall systems are the prime applications for cold-formed steel in panel form. These are made in both simple, or single-component types, as well as more complex units made up of several elements.
Floor Deck

Permanent metal deck forms are fabricated from light weight steel in thicknesses that vary from 0.020 to 0.075 inches (0.50 to 1.9mm) and depths of 2, 3, and 4-1/2 inches (51, 76 and 115mm), depending on slab thickness and design span. Permanent metal deck forms are usually galvanized.

Permanent metal deck forms are designed to support the wet weight of concrete, a construction load, reinforcing steel and the weight of the form itself.

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Deflection is usually limited to L/180 or 1/2 inch for spans up to 10 feet (3m) and L/240 or 3/4 inch for spans greater than 10 feet (3m). The obvious benefit of permanent metal deck forms over the conventional wood form system is a significantly reduced construction cost and schedule since the metal forms remain in place as opposed to the wood forms which must be stripped. In addition, permanent forms provide a safe working platform for the subsequent operations of shear stud placement and re-bar installation.
MBMA Panel Profiles

Composite metal deck forms also provide the tension reinforcement for the slab. The embossments provide an interlock between the deck and the concrete. The ribs are generally trapezoidal in shape for roof and floor deck applications, although they may vary by manufacturer. The panels may be punched with a pattern of holes to absorb sound.
Multi-Function Deck
Some deck systems use cellular cold-formed steel shapes to permit lightweight floors that reduce deadweight. These floor systems can provide electrical power, communications and data cable distribution as well as heating and air conditioning ducts.
This eliminates separate space requirements in floors, walls and ceilings for ductwork or conduit systems. The modular construction possible with cold-formed steel sections permits access to many points in the deck, making it easy to rearrange wiring or ventilation outlets.
Standing Seam Metal Roof

The cold-formed steel standing seam roof was introduced in 1969 as a new concept in roofing. Today, there is over a billion square feet of standing seam roofing installed.

The system consists of factory of job-site roll-formed panels with elevated, field-secured seams and concealed clips which fasten the panels to the structure and permit the panels to accommodate thermal expansion and contraction.

There are two basic types of standing seam roof systems.
**Structural** standing seam roof panels provide a water tight barrier and are generally installed on low-slope applications, with a minimum slope of about 1/4 in 12. These panels provide their own support, usually spanning about five feet (1.5m) between purlins. The system can also be installed over existing flat roofs by using a sloped sub-assembly system made of light steel structures. The "attic" created by the sub-assembly affords a convenient area of adding insulation.
Leaving the old roof in place means avoiding the release of potentially hazardous materials into the environment and eliminating the cost of disposing of the existing roof. Most importantly, a new metal roof can be installed with little or no interruption to the building occupants. The preferred material for the roof panel is galvanized or aluminum-zinc coated sheet steel.
**Architectural** standing seam roof panels are generally used on roofs with slopes of 3 in 12 or greater, and provide water protection as well as aesthetic value. These panels usually require some form of decking for support. The preferred materials for architectural standing seam roof panels are prepainted galvanized and prepainted aluminum-zinc coated sheet steel. The architectural possibilities provided by the variety of colors and patterns is limitless.
Insulated Panel
Cold-formed steel panels are also used for enclosing the building to keep out the weather and keep in the heat. There are now available cold-formed steel panels with insulation already incorporated in the construction of the panel. Some of these configurations make use of foamed in place rigid urethanes sandwiched in between the steel. Others use different types of insulation, the more conventional being fiberglass installed in the panels.
Roll Coating

Virtually all panels come precoated from the manufacturer with galvanized paint over galvanized, or other protective coating. Some applications may employ aluminum coated steel sheet, which is an excellent reflecting surface, or vinyl coatings, which offer wide varieties of pattern and color. On the interior side of the panel, there may be more cold-formed steel or else dry wall or paneling, depending on the application.
Wall Panels

There are wide varieties of panel systems. The simple, single element is available primarily as a ribbed sheet; formed, coated and otherwise modified to fulfill special functions that may be required.

Panels for walls may be as straightforward as a painted ribbed panel or as interesting as a porcelain or metal and glass curtain wall system. In many metal buildings, the wall panel is similar to the ribbed roof panel, with either wide or narrow ribs, and is painted or aluminum coated for long service life. The same tongue and groove lap or standing seam joints are employed here.
Curtain Wall

More sophisticated systems are made from cold-formed steel for curtain wall systems of buildings. These may include varying amounts of glass, either tinted or clear, complex or simple trim work and clean expanses of sheet steel. The advantages of these cold-formed steel curtain walls are many. They include high strength and light weight, and modular installation for lower construction costs. They permit a beautiful surface, available in a wide variety of coatings, textures and colors to meet any architectural concept. Like other panels, these may have insulation pre-installed. The curtain wall module may span several window bays or several floors, to minimize installation time.
Building Interior

Cold-formed steel framing is also used for interior walls and partitions that provide flexibility in layout of interior spaces as well as the freedom to relocate and redesign.

The main advantages of these systems are strength, durability, noncombustibility, and a wide choice of coatings, including porcelain, vinyls and paints.
Residential Applications

Another area in construction where cold-formed steel is finding a wider application is in residential steel framing systems. Here, steel is used instead of lumber for joists, studs and other structural components of residential construction.

The steel components are usually of Cee, I or hat shape and galvanized or painted. They can be cut to the required length by the manufacturers, thereby minimizing construction labor.
PreFab Framing

Often, the steel studs are prefabricated into wall sections, sometimes on an assembly line located away from the actual building site. They are either welded or fastened with a wide variety of specialized screw-type fasteners. Then they are brought to the site where they are erected quickly and easily by carpenters. This simplifies work scheduling, takes advantage of job specialization and helps cut costs.
Framing With Joists

The high strength of steel joists often permits wider spacing than with wood joists. At the same time, cold-formed steel joist hangers permit fast and efficient joining of joists to beams. Steel studs are strong and available in lengths up to several stories high. Like joists, they are pre-punched for easy installation of gas, water and electric lines. They are usually mounted in a track - a U-shaped member that serves both as header and footer in steel framing. Specialized shapes are provided for bridging doors, windows and other openings.
The shapes used in framing systems are usually cold-rolled and then punched and cut to the required lengths. The high production rates make cold-formed steel framing systems the competitive building products in construction market.

The versatile structural properties of cold-formed steel allow designers to create structures in new ways.
**Hangar**

For instance, in designing this new hangar in California, Lev Zetin/Thornton-Tomasetti Engineers designed a roof built from standard steel deck sections joined to form hyperbolic paraboloids.
Deck
The 0.090-inch (2.3mm) thick steel deck comes to the site in flat sections with corrugations 7-1/2" deep...
Hypar

...which are then warped on the site into hyperbolic paraboloid shapes measuring 230 feet long, by 40 feet high at the core end, and 4 feet high at the tip of the cantilever.
These sections are lifted into place and supported as they are anchored to a structural steel frame and then the supports are removed.
Inside Hangar

This application of cold-formed steel decking resulted in a 40 percent reduction in hangar roof weight and a substantial reduction in structure cost, while producing an attractive design.
Space Frame

Another interesting area of construction in which cold-formed steel components are used is the space frame. A space frame is a three-dimensional structure of straight elements that is capable of resisting forces in any direction. It is often used as a roof structure. There are many geometric configurations possible and many connecting systems which usually vary with the manufacturer. Several systems, such as this one, use cold-formed steel components.
Rack Building

Cold-formed steel structural shapes are also used to a great extent in rack systems and rack supported buildings. In these applications, the cold-formed steel shapes are used as edge members and uprights for the rack structure.
Connections of Cold-Formed Steel Members

The main forms of connections of cold-formed steel in construction are mechanical fasteners, welding and seams of various designs.
Seam Types

Seams are used on roof decks and corrugated steel pipe are also in other products. Possible seam designs include the single lock seam, grooved single lock seam and the batten seam. Others include the double lock standing seams, the standing seam and double lock seam.
Bolts

With mechanical fasteners, and particularly bolted connections, the ratio of bolt diameter to plate thickness is usually much larger in cold-formed steel construction than in heavy construction. This means that larger numbers of smaller diameter mechanical fasteners should be used in joining cold-formed sheet steel sections, although the general rules governing their placement are not unlike those of hot rolled structural steel. These general rules, however, are strongly subject to modification for behavior in particular cases. Sometimes it is necessary to conduct tests to determine the best type and placement of fasteners, although for commercially available products, this information is supplied by the manufacturer. Bolts are usually hex head and used with washers.
Rivets

Rivets can be of the blind type, several examples of which are shown, or tubular. When tubular rivets are used to join together heavy and thin stock, the rivet head should be on the side of the thin sheet.

Self-tapping and self-drilling screws are also important fasteners for cold-formed steel. Self-tapping screws are the familiar sheet metal screw and are used with a pre-drilled hole. They come in a wide variety of lengths, diameters, strengths and coatings, and their use should be in accordance with the manufacturer's suggestions.
Screws

Self-drilling screws drill and tap their own hole and are used with mechanical drivers. Because these types of screws require no pre-drilled hole, they are useful where lineup of the parts being joined is accomplished through other means before joining.

These kinds of fasteners are used with steel framing systems for joining framing members to one another and for fastening sheathing material to the framing structure. For this latter job, there are many specialized types of screws, nails and staples. They are designed to anchor both into the framework and the sheathing. Special coatings such as cadmium, zinc and other metals provide longer fastener life.
Welding
Welding is widely used for joining cold-formed sheet steel parts. The types of welds used are fusion and resistance. Fusion welding includes a group of weld types such as fillet welds, butt welds, plug welds and puddle welds, in which sheets are welded together by bringing them to the molten state at the surface to be joined by means of deposition of weld metal. Fusion welds are often used for erection, joining one cold-formed steel member to another or to hot-rolled framing members.
Resistance welding includes spot and projection welding. In this type of welding, coalescence is produced by the heat obtained from resistance to an electric current passed through the work parts, which are held together under pressure by electrodes. Resistance welding is used mostly for in-shop fabrication of cold-formed steel components.
Types of Cold-Formed Structures
Pre-Engineered Buildings

When you put all the different types of cold-formed steel building and structural components together, you have enough to build an entire structure. That is just what can be done to produce what is known as a pre-engineered or system buildings. These buildings were originally developed during the 1940's and 50's primarily as storage spaces for agriculture and industry. They are now being used for all types of functions including commercial, institutional, and residential.
Pre-Engineered Building Under Construction

Cold-Formed steel is one of the most important elements of a pre-engineered building system. Purlins, girts, bracing, walls and roofs are made from cold-formed steel structural elements and panels. The frame may be fabricated from plates. In many cases, the cold-formed steel members and shear diaphragm help to brace the frame.
There are many reasons for what has turned out to be the rapid growth of the pre-engineered building industry. Chiefly, standardized components in buildings are economical just because of standardization. Also, they permit very rapid construction. Once a design is decided on that will fulfill the buyer needs, a computer generates a part list, and the parts are then manufactured, packaged and shipped to the site. There, the standardized connections, walls and ceilings are snapped into place by authorized contractors in a very fast pace.
Various Metal Buildings

Another reason for their popularity is that the designer is afforded the opportunity to create almost any type of exterior enclosure around the standard building structure, thereby having the design versatility of appearing custom designed while taking advantage of the cost and time savings of the pre-engineered building. In addition, architects can incorporate systems of building components and even parts of cold-formed structures into their own designs.
Various Metal Buildings
Cold-formed structural steel is non-combustible and is permitted for use by all building codes in all types of building construction.
Various Metal Buildings

When required, steel structures are typically protected with gypsum wallboard or other material to maintain their strength during severe fire exposure. Calculation procedures have been developed to predict the performance of protected cold-formed steel floor and wall structures.
Cold-Formed Steel Design Manual

Much of the research and engineering knowledge about cold-formed steel design is available to you in the form of the AISI Cold-Formed Steel Design Manuals. These publications, in allowable stress design and load and resistance factor design, include the Specification for the Design of Cold-Formed Steel Structural Members and its Commentary. The Commentary helps the designer understand how the criteria were developed and also gives references to the original sources. The Beam Design, Column Design and Connection Design parts provide various design examples, tables and charts for design use. The Design Manual also includes Supplementary Information and Test Procedures.

To order design related publications, please visit AISI Publications.