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presented in metal HOME DIGEST
Metal construction products for the residential market.

A FEW WORDS ABOUT STEEL

STEEL RECOGNIZED IN GREEN-BUILDING GUIDELINES

BY NADER ELHAJJ PE

FOR TODAY'S HOME-BUILDERS, GREEN BUILDING MEANS THE RESOURCE-EFFICIENT DESIGN, CONSTRUCTION, AND OPERATION OF HOMES. IT REPRESENTS AN APPROACH TO BOTH BUILDING AND MARKETING HOMES THAT HIGHLIGHTS ENVIRONMENTAL QUALITY-BOTH INSIDE AND OUTSIDE THE HOME.

Niche home builders have been constructing resource-efficient, environmentally sensitive homes since the early 1970s. The home building industry adopted the phrase "green building" in the late 1980s and early 1990s, turning a movement into a quiet revolution. The first official green home building program began in the city of Austin, Texas, in 1991. Green building continues to be a growing trend among home builders nationwide, with 31 successful green building programs now in existence.

NAHB recently responded to this growing trend by developing the document "Model Green Home Building Guidelines" that establishes voluntary minimum thresholds for resource-efficient, environmentally sensitive home building. Although developed for single-family homes, the guidelines can also be modified and applied to multifamily and custom homes, as well as remodeling projects for existing homes. In addition, local home builders associations can use the guidelines as a blueprint to create their own custom, voluntary green building programs, which would provide criteria, research, education and promotion to home builders in local markets.
The guidelines were developed under contract by the NAHB Research Center in a consensus process involving more than 60 stakeholders from the building industry, including Steel Framing Alliance, spearheaded by Maribeth Rizzuto, director of training and education. Other architects, manufacturers, home builders, environmentalists, government agencies, suppliers and trade associations also participated. The Green Building Initiative, a not-for-profit education program, is providing market research and promotional support for new green building programs.

The Voluntary Model Green Home Building Guidelines were introduced at the International Builders' Show in Orlando, Fla., in January with steel figuing prominently within the pages. Of particular significance, the guidelines replaced the term "lumber" with the more general and inclusive term "framing material."

The green attributes of steel were recognized and steel finally took its place in green construction for its optimized value engineering, recycled content, recyclability, termite resistance, and durability. The guidelines make a number of envi-

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> *"In addition to the advanced framing techniques described in the User Guide for wood, homes with steel framing can incorporate similar techniques using advanced framing techniques, including 24-inch-O.C. spacing for steel floors and walls, described in the HUDUSER's Prescriptive Method for Residential Cold-Formed Steel Framing."*
>
> — page 76, "Model Green Home Building Guidelines"

ronmentally friendly recommendations for builders, beginning at the planning stages of the home. Steel, especially floor joists, are mentioned in the section titled, "Resource Efficiency," which, according to the NAHB, "shows how certain framing techniques can effectively optimize the use of building materials and also discusses construction site waste management concepts."

The section also provides information on how a home's durability and maintenance are affected by how certain materials are used in its construction. Ray Tonjes, a home builder from Austin and chairman of the NAHB Green Building Subcommittee, said of them at the time of their release, "The guidelines are revolutionary because they will help all builders, not just niche builders, construct more energy-efficient, environmentally sensitive new homes in different price ranges and climate conditions."

The creation of the guidelines marks a significant milestone in the green building movement and the Steel Framing Alliance played an important role in the Guidelines' development.

Nader Elhajj is director, structure and materials, for the NAHB Research Center, based in Upper Marlboro, Md.

Hotline Hotter Than Ever

Expanded hours and tremendous base of technical and practical knowledge about steel framing are driving recent upgrades to the Steel Framing Hotline, a service provided to members and the marketplace by the Steel Framing Alliance, in partnership with the NAHB Research Center.

Supervised on site by Nader Elhajj PE, director, structure and materials, for the NAHB Research Center, the Hotline increases the number of hours when an expert can be reached—from two hours a day to eight hours. Elhajj, long a valuable resource to the steel framing industry, will also directly answer the more technical inquiries that come in on a daily basis.

Non-technical calls, for publications, SFA programs or SFA membership info, may be served by the Hotline, too. It will connect callers in a flash to staff members who can help.

The phone number for the hotline remains the same: (800) 79-STEEL. Steel Framing Alliance urges members to refer any inquiries that they or their customers may have to this number, and even include it on promotional literature, Web sites and seminar materials.

The Hotline is here for everyone interested in more information about steel!

GET YOUR STEEL INFO ON THE HOTLINE!

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RESEARCH

CORROSION OF GALVANIZED FASTENERS IN COASTAL ENVIRONMENTS

BY JAY LARSON

WIND, EXPOSURE AND VEGETATION WERE THREE OF SEVERAL FACTORS CITED THAT AFFECT THE PERFORMANCE OF GALVANIZED FASTENERS IN COASTAL ENVIRONMENTS.

These factors were identified in a significant research project recently completed by the Steel Framing Alliance and University of Hawaii. Funded primarily by the U.S. Department of Housing and Urban Development, "Corrosion of Galvanized Fasteners used in Cold-Formed Steel Framing" provides needed field and laboratory data, along with recommendations for the protection of cold-formed steel framing and fasteners in coastal climates.

The primary objective of this project was to study the effect of corrosion on the structural integrity of galvanized fasteners used in cold-formed steel construction. A number of specific tasks were developed to meet this objective, including a literature search, design and construction of field enclosures, determination of test sites and installation of field enclosures, test specimen design and fabrication, accelerated corrosion testing, structural tensile testing, data analysis and technology transfer.

TYPICAL CONDITIONS

UH personnel developed construction drawings of the field enclosures, based on suggestions received from an industry advisory group. Initially these enclosures were intended as simple structures housing corrosion test specimens. However, based on suggestions by the advisory committee and generous donations by the local steel suppliers and construction industry, the enclosure concept was expanded to represent typical cold-formed steel residential construction (**Figure 1**).

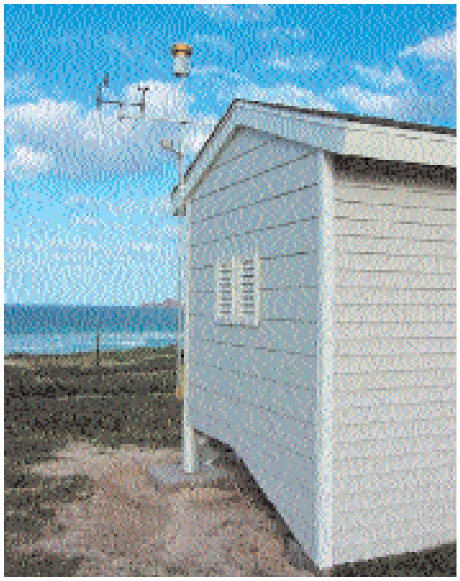

Figure 1 - Typical Field Enclosure with Weather Station

It was then possible to house corrosion test specimens in various exposure conditions within each field enclosure, such as wall cavities, vented attics, open and covered crawl spaces and permanent exterior exposures. This provided a better understanding of the likely corrosion in each of these locations. Various suppliers and contractors donated labor and materials for construction of the enclosures and all five enclosures were panelized during a carpenter-training workshop at Hawaii Steel Framing Alliance, Aiea, Hawaii.

UH personnel identified five sites on military bases on Oahu as locations for the field enclosures (**Figure 2**). Permission was obtained from the appropriate authorities at each base to permit installation of the field enclosures and monitoring through the duration of the project. Complete weather monitoring stations were installed at each of the five field sites and extensive meteorological data was collected to characterize each of the sites.

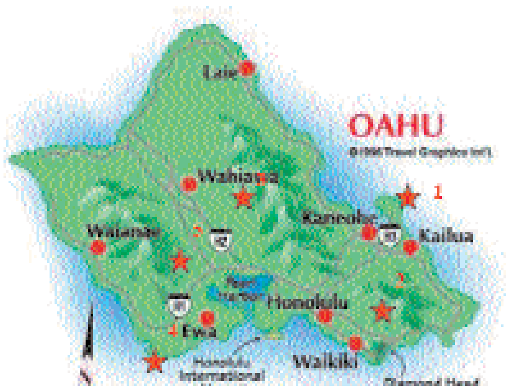

Figure 2 - Locations of Field Enclosures

REPRESENTATIVE SCREWS

In addition to monitoring the performance of the cold-formed steel-framing sections in each of the field enclosures, screwed connection specimens were located in various exposure conditions in each enclosure so as to study the structural condition of the connections over time. The connection specimen consists of a lap splice between two 1 ¼-inch wide, 54-mil (16-gauge) galvanized sheet-metal strips connected by means of two #10 hex-head galvanized screws positioned along the centerline of the strips. The configuration was chosen in order to ensure a shear failure in the screws rather than yielding of the strips. The #10 screws were chosen as being most representative of what is being used in the field.

Numerous connection specimens were located in each field enclosure and other identical specimens were subjected to accelerated corrosion in a chamber at UH (**Figure 3**). The corrosion chamber was used to apply a cyclic wetting and drying salt spray test routine to provide a simulation of

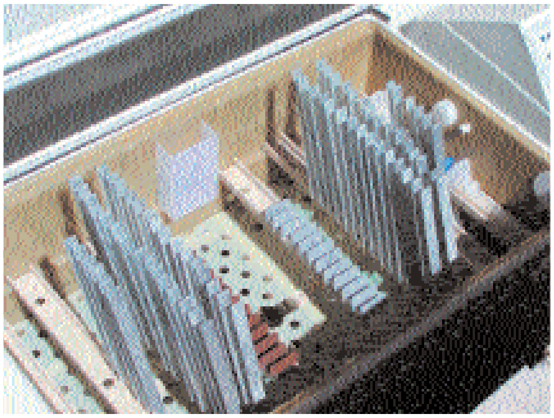

Figure 3 - Connection Specimens in Cyclic Corrosion Chamber

atmospheric conditions. A series of connection specimens were subjected to this corrosion routine with selected specimens removed at various intervals for testing. The corrosion condition of the screws was calibrated to the reduction in shear strength of the screwed lap splice connections.

Control specimens were tested to determine the base-line shear capacity of the screws (**Figure 4**). Specimens from the accelerated corrosion chamber were tested at various stages of corrosion for comparison with the control base line. Tests of connections from the field enclosures were compared with the base line tests and with the results from the corrosion chamber specimens to correlate the field performance to the corrosion chamber exposure.

Sets of three connection specimens were removed from the corrosion chamber at various stages and tested to failure. After 2,772 cycles in the corrosion chamber, the galvanized screws showed significant surface corrosion (**Figure 5**). Nevertheless, the average connection strength had not decreased. However, the average specimen elongation at the peak load had decreased to around 80 percent of that for the control specimen. It was concluded that this level of corrosion affects connection ductility, but not the strength. Microscopic images of the screw threads for control and 1,537 cycle test specimens before and after testing showed that although the surface corrosion appeared significant, it had not yet penetrated the shaft of the screw, and hence had not affected the screw failure strength.

In coastal environments with onshore winds carrying significant salt spray, exposed cold-formed steel framing and fasteners in crawl spaces, vented attics or exterior exposure may corrode very rapidly.

Vegetation or other obstructions between the coastline and the enclosure site can significantly reduce the salt content of the air, leading to less corrosion.

Coastal environments with predominantly offshore winds experience significantly lower levels of corrosion on framing and fasteners in crawl spaces, vented attics or exterior exposure.

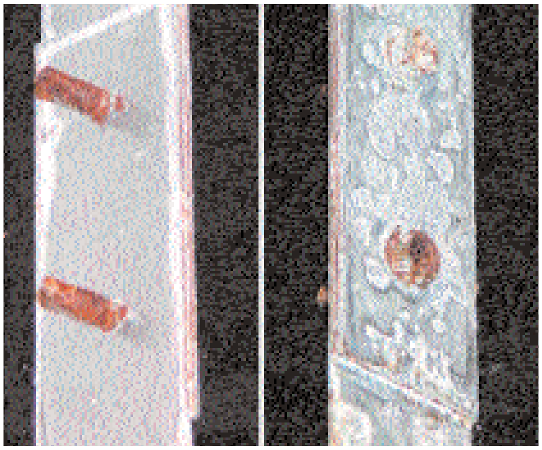

Figure 5 - Connection Specimen after Accelerated Corrosion

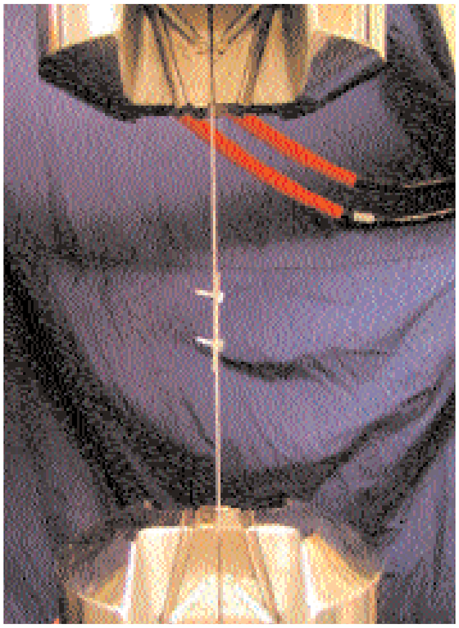

Figure 4 - Connection Specimen in Test Frame

Visual Inspections

The cold-formed steel framing and fasteners in each enclosure were inspected visually at regular intervals. The following conclusions are based on 28 months of visual inspection of the cold-formed steel framing and fasteners at the five field enclosure sites on the island of Oahu.

The predominant factors affecting the rate of corrosion are the level of chlorides in the atmosphere, the wind speed and direction, and the degree of exposure for the cold-formed steel framing and galvanized fasteners.

Framing and fasteners within enclosed wall and floor sections are protected from corrosive environments. Precautions must however be taken to prevent ingress of air-borne salts into these sections.

A number of presentations to the engineering, architectural and construction industries have been made based on the results of this research program. National and international dissemination of the project results is underway, as well as the integration of the project findings and recommendations (see page 28) into industry standards and design guidance.

For more information on this and other Steel Framing Alliance research projects, please refer to www.steelframingalliance.com.

Jay Larson is director, construction standards development, for American Iron and Steel Institute.

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RESEARCH

RECOMMENDATIONS FOR COLD-FORMED STEEL FRAMING AND FASTENERS IN COASTAL ENVIRONMENTS

BY DR. IAN ROBERTSON

Guidelines for protection of cold-formed steel framing and fasteners from atmospheric corrosion induced by air-borne chlorides are presented below for the following three exposure categories:

Category A: Extreme exposure.
Category B: Moderate exposure.
Category C: Mild exposure.

Table 1 – Exposure Category Assignment

Distance from Shoreline (m)	Site Characteristics			
	Onshore Wind		Offshore Wind	
	Unshielded	Shielded	Unshielded	Shielded
L ≤ 200	A	A	A	B
200 < L ≤ 500	A	B	B	B
500 < L ≤ 1000	B	B	C	C
L > 1000	C	C	C	C

Each building location should be assigned to one of these exposure categories based on geographical location, surrounding features and meteorological records. Table 1 gives preliminary suggestions for this assignment.

DEFINITIONS

Distance from shoreline is the straight-line distance measured perpendicular to the coast.

Onshore and **offshore** wind refers to the predominant wind direction for the building location. If winds are variable or unknown, onshore wind should be assumed.

Shielded refers to the presence of vegetation and/or structures, at least as tall as the proposed building, located between the coast and the proposed site. Sites that do not satisfy these conditions are considered to be unshielded. Shielded conditions are afforded by medium to dense vegetation covering at least 25 meters of the straight-line distance from the coast. **Shielded** conditions are also afforded by two or more rows of housing between the proposed site and the coast. A single barrier, such as a wall, fence, or hedge, should not be considered to provide shielded conditions. A small hill or rise with no vegetation should not be considered to provide shielded conditions.

The following recommendations are based on the results observed in this study and are detailed in the final report.

Category A Design:

- No cold-formed steel members or fasteners should be exposed to ambient atmospheric conditions.
- Exposure to atmospheric conditions during construction should be limited. If such exposure is expected to exceed two months, protective measures should be taken to prevent chloride accumulation on the cold-formed steel members.
- No cold-formed steel framing should be exposed in crawl spaces or the interior of garages, carports and other unfinished spaces. Plywood sheathing or gypsum board, with sealed joints, is effective for protection of cold-formed steel in these locations. The fastener heads on this sheathing remain exposed, but are not structural, and can be augmented in the future as necessary.
- Attic spaces require particular attention because of the need for venting to prevent moisture accumulation and potential mold development. However, venting in exposure Category A conditions permits the ingress of air-borne chlorides.

Two options are proposed for these conditions; however, neither of these options was evaluated in this study:

- The attic space can be designed as a sealed environment with insulation placed directly under the roof sheathing (a.k.a. cathedral ceiling, and the area underneath, designed as a conditioned space.
- Attic venting, particularly on the coastal elevation, can be kept to the minimum permitted by the applicable building code, which extra protection can be provided for the framing members and fasteners in the attic space through the increased galvanizing thickness and/or the addition of zinc-rich coatings after fabrication.

- Attic and crawl space framing should be inspected regularly for signs of corrosion. These inspections should be performed at least once every two years. The building occupants may choose to perform the inspection themselves, or hire an experienced contractor. Tarnishing of the galvanized framing members and minor ferrous oxide at cut ends and on screw threads is not of immediate concern. However, any spread of ferrous oxide from the cut ends or punch-outs, and signs of significant ferrous oxide on a majority of fasteners would indicate the need for additional protective measures.

- Protection for cold-formed steel framing and fasteners in exterior walls can be achieved by providing an enclosed wall cavity. The exterior of the wall should consist of plywood sheathing, or siding with vapor barrier. All openings, window and door framing, service penetrations, etc., must be sealed so as to prevent airflow into the wall cavity. The interior drywall joints should be taped and all openings sealed. The top of the wall must be sealed from any vented attic space above. Even a small amount of air circulation in an enclosed wall cavity will lead to corrosion in exposure category A.

- Protection of cold-formed steel framing and fasteners in interior walls and floor systems can be provided by gypsum board coverings on both sides of the wall cavity, and as a ceiling below elevated floor framing. The drywall joints should be taped and all openings sealed. The top of the wall should be sealed from any vented attic space above.

- Consideration should be given to increasing the thickness of galvanizing on cold-formed steel framing members, connection hardware and fasteners throughout buildings in exposure Category A. This increased zinc coating will provide additional protection in case of unintended exposure to air borne chlorides.

Category B Design:

- No cold-formed steel members or fasteners should be permanently exposed to ambient atmospheric conditions.

- Exposure to atmospheric conditions during construction should be limited. If such exposure is expected to exceed four months, protective measures should be taken to prevent chloride accumulation on the cold-formed steel members.

- No cold-formed steel framing should be permanently exposed in crawl spaces or the interior of garages, carports and other unfinished spaces. Plywood sheathing or gypsum board, with sealed joints, is effective for protection of cold-formed steel in these locations.

- Attics can be vented, but framing members and fasteners in the attic space should be provided with additional protection through the use of increased zinc coating thickness or the addition of zinc rich coatings after fabrication.

- Attic and crawl space framing should be inspected regularly for signs of corrosion. These inspections should be performed at least once every five years.

- Protection for cold-formed steel framing and fasteners in exterior walls can be achieved by providing an enclosed wall cavity. The exterior of the wall should consist of ply wood sheathing, or siding with vapor barrier, while drywall with taped joints is adequate for the interior face. The top of the wall should be sealed from any vented attic space above.

- Protection of cold-formed steel framing and fasteners in interior walls and floor systems is provided effectively by gypsum board coverings on both sides of the wall cavity, and as a ceiling below elevated floor framing. The top of the wall should be sealed from any vented attic space above.

Category C Design:

- Category C exposure is synonymous with normal inland exposure.

- Standard industry construction practices should be followed.

- Permanent exposure of cold-formed steel members or fasteners to ambient atmospheric conditions should be avoided.

- Exposure to atmospheric conditions during construction should be limited to six months.

- Attic and crawl space framing should be inspected regularly for signs of corrosion. These inspections should be performed at least once every five years.

DOWNLOAD THE ENTIRE REPORT AT

WWW.STEELFRAMINGALLIANCE.COM

Ian N. Robertson, Ph.D., S.E., is associate professor in the Department of Civil and Environmental Engineering at the University of Hawaii at Manoa.

MHD

FROM THE FORUM

VOCs, Maximum Content, Copper Pipes And Heat On Steel

American Iron and Steel Institute
www.steel.org

Steel Framing Alliance
www.steelframingalliance.com

I am currently bidding a job that is going to be LEED certified. They are requesting the VOC content of steel studs. Can you direct me to some information that would provide the VOC content of galvanized steel studs?

Interesting question! Websters Online Dictionary (not the real Merriam Webster) defines volatile organic compound (VOC) as, "Any organic compound that participates in atmospheric photochemical reactions except those designated by EPA as having negligible photochemical reactivity." It also defines volatile solids as, "Those solids in water or other liquids that are lost on ignition of the dry solids at 550 degrees centigrade."

Don't worry about VOCs with steel. Steel has no VOCs and emits no VOCs, therefore, "0" is the correct response to this question any LEED form. Wood, trees, forests, flowers, plants and animals emit VOCs. Oil-based paints emit VOCs while drying. Steel, however, does not emit VOCs. The answer is "0."

ERG says, "From an indoor air quality perspective, steel is quite inert and therefore a good material to use in structures designed for chemically sensitive clients.

It's easy to be green with steel!

What percentage of a building may be framed in steel?

Glad you asked! This may vary with the type and end use of the structure, but most can be built with 100 percent of the framing members made from steel.

I'm new to steel framing. What do I need to know about pairing steel with copper piping? And does steel conduct heat in a warm climate?

As you have heard, yes, steel must be isolated from copper piping, due to the galvanic action of the dissimilar metals, which will cause corrosion of the steel if the two metals are left in contact. Rubber or plastic grommets are made in standard sizes to fit the pre-punched holes in the steel, and provide isolation of the copper pipe. Guidance on the issue of piping and use with dissimilar metals is available from the American Iron and Steel Institute in its publication "Standard for Cold-Formed Steel Framing – General Provisions," and from the Steel Framing Alliance's "Durability Guide."

In answer to your second question, steel is an excellent conductor of heat. However, this is not helpful when one is trying to use steel in a thermal envelope. Placing a percentage of the insulation on the exterior of the structure reduces the impact of thermal bridging by framing members, even if they are wood, steel or some other material. One way this is often done is by using some type of insulating sheathing (foam board, R-board, polyisocyanurate sheets, etc.) on the outside of the studs but inside the final finish (brick, stucco, siding, etc.).

Thanks again for your questions!

Don Allen, P. E.
Steel Framing Alliance director of engineering development, and LEED 2.0 accredited professional

EDUCATION

The Three R's Of Steel Floors
Part 2

By Maribeth Rizzuto

Last issue we discussed the basics of floor framing. As promised, let's take a closer look at the details for floor bracing, blocking and openings this time around.

Function And Details of Bracing And Blocking

Bracing the floor joists prevents the joists from rolling over or twisting. The top flanges of the floor joists are braced with floor sheathing (plywood or OSB). When the joists are spaced 24 inches on center, the sheathing thickness must meet the span requirements in the applicable code. The IRC 2003 covers it in Section R503.

Take a look at **Figure A**. Note the location of the floor bracing in this detail. Floor bracing is required at a maximum distance of 12 feet from an interior or exterior support. If gypsum board, wood or other sheathing is applied to the bottom flange of the floor joist, then steel bracing is not required.

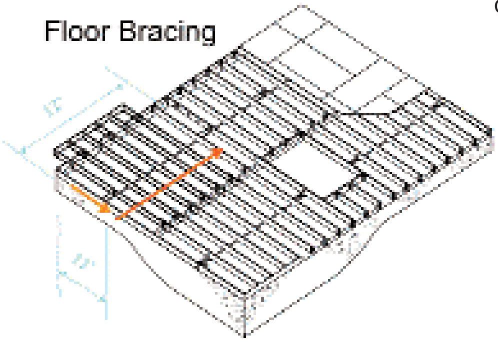


Figure A

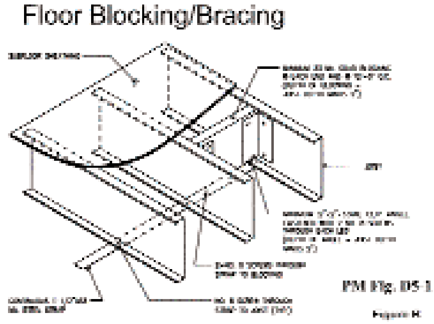
Blocking can be a solid piece of joist, stud or track material. Bridging is usually cross bracing consisting of strap or pre-manufactured bracing made by companies like Simpson Strong-Tie. Steel strap can be 33 mils thick and 1 ½ inches wide, and must be installed taut.

Blocking or bridging must be installed at a maximum spacing of 12 feet between block or bridge. Blocking or bridging must also be installed at each end of the steel strap.

The straps should be fastened to the blocking with a minimum of two No. 8 screws. Details for each method are contained in **Figures B and C**, respectively.

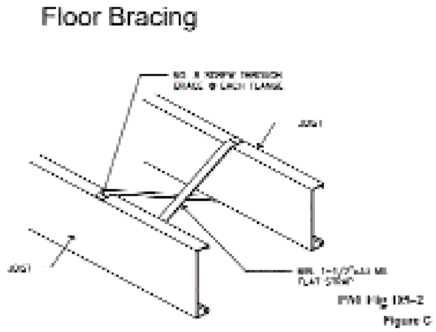
Floor Openings

Floor openings are locations where stairways or other access is allowed through the floor. The components of the floor system for openings are the trimmers, the headers, and the joists themselves. A check of **Figures D and E** give you the detail for a 6-foot opening. The maximum floor opening is 8 feet in both the Prescriptive Method and the International Residential Code, as shown in **Figures F and G**. The 6-foot opening requires the use of a joist nested in section of track. The larger 8-foot opening requires the use of two sections of joist, back- to-back, and



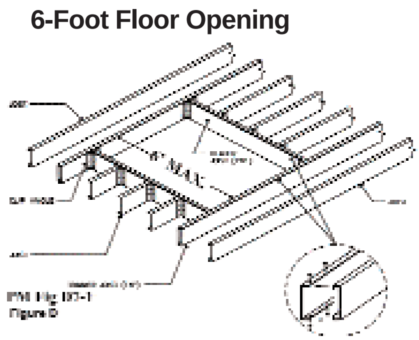
PM Fig. D5-1

Figure B



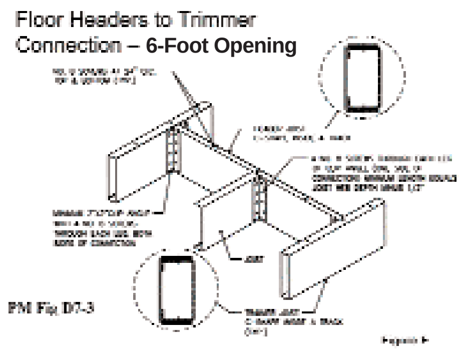
PM Fig D5-2

Figure C



PM Fig D7-1

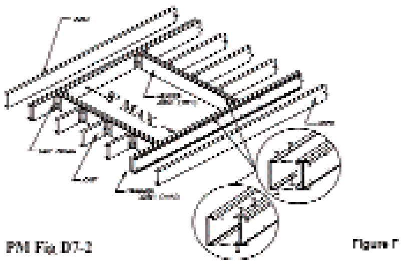
Figure D



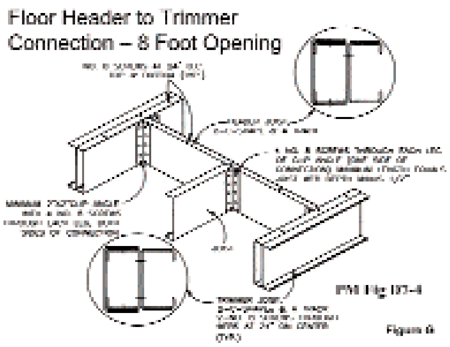
PM Fig D7-3

Figure F

8-Foot Floor Opening



PM Fig D7-2 Figure F



PM Fig D7-4 Figure 6

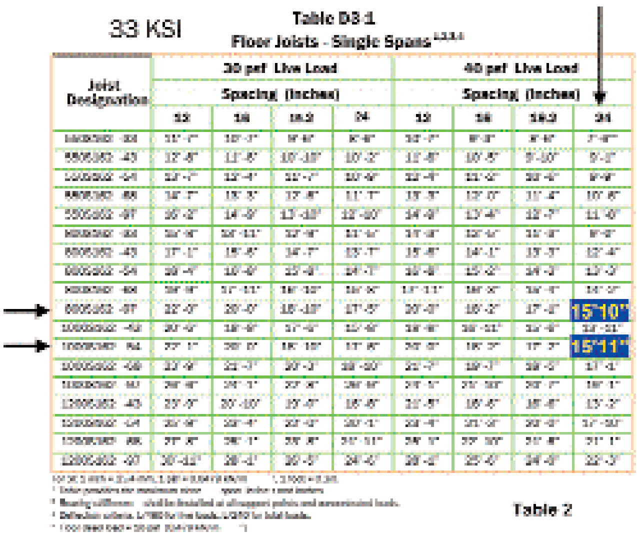
nested inside a section of track. In both instances, the track must be the same size and thickness as the joist being used for the floor. Tracks must be screwed to the header and trimmer joists at 24 inches on center using #8 screws through each flange, and attached using 2-inch-by-2-inch clip angles to fasten the headers to the trimmer joists. Framing of the openings is covered in Section R505.3.9, and figure R505.3 of the IRC 2003.

Now that we have covered all of the basics, let's run through a quick example.

We have a span of 15 feet 6 inches with joists spaced at 24 inches on center. The live load is 40 psf and the dead load is 10 psf. In the Prescriptive Method, we have three options: single span – 33 ksi, multiple span – 33 ksi, multiple span – 50 ksi, Table 1. It is important to note that under Section 301.1 of the International Residential Code, a builder may use the Standard for Cold-Formed Steel Framing—Prescriptive Method for One- and Two-Family Dwellings as an alternative provision. The use of the Prescriptive Method expands the options a builder has for floor spacing beyond the 16 inches and 24 inches on center, as listed in the IRC, to include 12 inches and 19.2 inches on center.

Single Span

Table D3-1, in the Prescriptive Method, is the correct table for single spans. The live load is 40 psf and the joist spacing is 24 inches on center. Under



33 KSI

Table D3-1
Floor Joists - Single Spans [1,2,3,4]

Joist Designation	30 psf Live Load Spacing (Inches) 12	16	19.2	24	40 psf Live Load Spacing (Inches) 12	16	19.2	24
550S162-33	11'-7"	10'-7"	9'-6"	8'-6"	10'-7"	9'-3"	8'-6"	7'-8"
550S162-43	12'-8"	11'-6"	10'-10"	10'-2"	11'-6"	10'-5"	9'-10"	9'-2"
550S162-54	13'-7"	12'-4"	11'-7"	10'-9"	12'-4"	11'-2"	10'-6"	9'-9"
550S162-68	14'-7"	13'-3"	12'-6"	11'-7"	13'-3"	12'-0"	11'-4"	10'-6"
550S162-97	16'-2"	14'-9"	13'-10"	12'-10"	14'-9"	13'-4"	12'-7"	11'-8"
800S162-33	15'-8"	13'-11"	12'-8"	11'-4"	13'-8"	12'-4"	11'-8"	9'-8"
800S162-43	17'-1"	15'-6"	14'-7"	13'-7"	15'-6"	14'-1"	13'-3"	12'-4"
800S162-54	18'-4"	16'-8"	15'-8"	14'-7"	16'-8"	15'-2"	14'-3"	13'-3"
800S162-68	19'-8"	17'-11"	16'-10"	15'-8"	17'-11"	16'-3"	15'-4"	14'-3"
800S162-97	22'-0"	20'-0"	18'-10"	17'-5"	20'-0"	18'-2"	17'-1"	15'10"
1000S162-43	20'-6"	18'-6"	17'-6"	15'-6"	18'-6"	16'-11"	15'-6"	13'-11"
1000S162-54	22'-1"	20'-0"	18'-10"	17'-6"	20'-0"	18'-2"	17'-2"	15'11"
1000S162-68	23'-9"	21'-7"	20'-3"	18'-10"	21'-7"	19'-7"	18'-5"	17'-1"
1000S162-97	26'-6"	24'-1"	22'-8"	20'-6"	24'-1"	21'-10"	20'-7"	18'-1"
1200S162-43	22'-9"	20'-10"	19'-4"	16'-8"	21'-9"	18'-6"	16'-8"	13'-3"
1200S162-54	25'-9"	23'-4"	22'-0"	20'-1"	23'-4"	21'-2"	20'-0"	17'-10"
1200S162-68	27'-8"	25'-1"	23'-8"	21'-11"	25'-1"	22'-10"	21'-6"	20'-1"
1200S162-97	30'-11"	28'-1"	26'-5"	24'-6"	28'-1"	25'-6"	24'-0"	22'-3"

[2] Bearing stiffeners shall be installed at all support points and concentrated loads.
[3] Deflection criteria: L/480 for live loads, L/240 for total loads.

Table 2

WHY USE THE RIGHT STUF

It has been five years since the industry made the formal move to changing the specifying nomenclature from gauge to mil. The move was made so that engineering calculations could be performed to create load and span tables for inclusion into the codes. However, it comes as no surprise that the construction industry is sometimes slow to embrace any new system—it can be costly!

Last month I had a call from a municipality in the heartland of America that had just gone through some renovations at a local community center. Steel was the material of choice. Using a local architect and in-house engineers, they specified the entire cut list using the old gauge nomenclature. A substantial amount of the material that was needed for the renovation was specified as 20 gauge.

As the bids for the material came, all were 20 gauge. But there was a difference. Unknown to the municipality, Company A had bid the material using a non-structural thickness, and Company B had responded with a price on structural thickness. In this instance, the municipality lost in excess of $3,000 because the use of the steel was for a non-structural application. It could have been sourced locally, by Company B, at a lower cost. Had the appropriate Universal Designator for mil been used in the specifications, everyone would have been on the same page.

S: Stud or joist sections with flange stiffeners (C-shapes).
T: Track sections.
U: Cold-rolled channel of channel studs (without flange stiffeners).
F: Furring channels (or hat shapes).

To avoid costly errors, know and use the Right Stuf!

—Maribeth Rizzuto

THE THREE R'S...
CONTINUED FROM PAGE 33

the 24-inch spacing, the first span that exceeds 15 feet 6 inches is 15 feet 10 inches. With this selection, the member designation is 800S162-97 or an 8-inch joist with 1 5/8-inch flanges, and 97 mils (12 gauge). Because 97-mil material is very difficult to work with, let's see if we have a better option. The next closest span would be 15 feet 11 inches. With this selection the joist designator is 1000S162-54 or a 10-inch joist with 1 5/8-inch flanges and 54 mils (16 gauge).

Multiple Span Tables

Remember we need to span 15 feet 6 inches, with joist spacing at 24 inches on center—a live load of 40 psf. We have two possibilities on this table, as well, either 800S162-68 or 1000S162-54. Once again, the 54-mil (16 gauge) material will be easier to work with than 68-mil (14 gauge) material.

When we checked the multiple span table for 50 ksi material we found two options, 550S162-97 and 800-162-54.

So let's compare and select our joist from the choices listed in Table 4. (It is important to note that steel is sold by the pound/foot.)

At first glance, we might select the 50ksi, 8-inch member. However, 50 ksi material may not be available in all markets. The next options would include the 1000S162-54 in either the single span or multiple span. You would have to calculate the additional cost of bracing and blocking required for each to determine which would be most cost-effective. As you can see, there are several options.

33 KSI

Table D8-2
Floor Joists - Multiple Spans 1,2,3,4,5,6
F_y = 33 ksi

Joist Designation	30 psf Live Load				40 psf Live Load			
	Spacing (inches)				Spacing (inches)			
	12	16	19.2	24	12	16	19.2	24
550S162-33	12'-2"	10'-5"	9'-6"	8'-6"	10'-9"	9'-3"	8'-6"3"	7'-6"
550S162-43	14'-5"	12'-5"	11'-4"	10'-2"	12'-9"	11'-11"	10'-5"	9'-0"
550S162-54	16'-3"	14'-1"	12'-10"	11'-6"	14'-5"	12'-6"	11'-5"	10'-2"
550S162-68	19'-7"	17'-9"	16'-9"	15'-6"	17'-9"	16'-2"	15'-2"	14'-1"
550S162-97	21'-9"	19'-9"	18'-7"	17'-3"	19'-9"	17'-11"	16'-10"	15'-4"
800S162-33	14'-6"	12'-10"	10'-4"	8'-6"	12'-4"	9'-11"	8'-3"	7'-2"
800S162-43	20'-0"	17'-4"	15'-8"	14'-1"	17'-9"	15'-4"	14'-0"	12'-6"
800S162-54	22'-7"	20'-5"	18'-5"	16'-5"	21'-0"	18'-2"	16'-7"	14'-10"
800S162-68	26'-5"	23'-1"	21'-0"	18'-10"	23'-9"	20'-6"	18'-9"	16'9"
800S162-97	28'-0"	26'-10"	25'-3"	22'-6"	25'-10"	24'-4"	22'-6"	20'-0"
1000S162-43	22'-9"	18'-3"	16'-0"	12'-7"	18'-11"	15'-5"	12'-6"	11'-2"
1000S162-54	26'-2"	22'-8"	20'-8"	18'-6"	23'-8"	20'-7"	18'-6"	16'5"
1000S162-68	31'-5"	27'-2"	24'-10"	22'-2"	27'-11"	24'-2"	22'-1"	19'-9"
1000S162-97	35'-8"	32'-3"	29'-11"	26'-9"	32'-3"	29'-2"	26'-7"	23'-9"
1200S162-43	21'-8"	17'-6"	15'-3"	12'-10"	18'-3"	14'-8"	12'-8"	10'-9"
1200S162-54	28'-6"	24'-8"	22'-6"	19'-6"	25'-0"	21'-11"	19'-4"	16'-9"
1200S162-68	33'-7"	29'-1"	26'-6"	23'-9"	29'-10"	25'-10"	23'-7"	21'-1"
1200S162-97	41'-5"	37'-5"	34'-6"	30'-10"	37'-6"	33'-6"	30'-7"	27'-5"

Table 3

One Final Note

While this series of articles has focused on the standard "C"-shaped floor joist, I would be remiss if I did not mention the progress of steel floor systems available today. They are known as Joist-RITE™ by Marino\Ware, SURE-SPAN™ by CEMCO, and TradeReady® by Dietrich Industries, and offer tremendous value and advantage to the construction industry. Because of the proprietary nature of these products, each manufacturer has developed load and span tables for its particular product.

Additional information on steel floors can be obtained by logging on to www.steelframingalliance.com and checking out the specific information for builders and design professionals. Information on the proprietary floor systems mentioned is available at www.marinoware.com, www.cemcosteel.com, and www.dietrichindustries.com.

Maribeth Rizzuto is director of training and education for the Steel Framing Alliance.

MHD

NEW Thickness Designation	Minimum Thickness (inch)	OLD Reference Gauge Number
18	0.018	25
27	0.027	22
30	0.030	20
33	0.033	20
43	0.043	18
54	0.054	16
68	0.068	14
97	0.097	12
118	0.118	10

Out With Gauge, In With Mils

Remember your Mils with this handy guide when referring to the thickness of cold-formed steel-framing members. Mils replace the outdated measurement term "gauge" in the new Universal Designator System, which is now being used in all technical manuals and building codes.