Steel Framing Alliance™

FRAMEWORK

YOUR GATEWAY TO THE STEEL FRAMING INDUSTRY

presented in metal HOME DIGEST

A FEW WORDS ABOUT STEEL

TECHNOLOGY ADVANCEMENTS IN COLD-FORMED STEEL

BY DON MOODY

ALL AROUND US WE SEE THE CONTINUED EVOLUTION OF TECHNOLOGY IN OUR EVERYDAY LIVES. EVERYDAY WE SEE SOMETHING THAT IS FASTER, BETTER OR HAS MORE FEATURES THAN WE HAD BEFORE AND AT SOME POINT WE MAY DECIDE THAT WE CAN'T DO WITHOUT IT. IF IT'S A NEW CELL PHONE OR COMPUTER SYSTEM, MOST OF THE DECISION-MAKING PROCESS CENTERS AROUND WHETHER WE CAN AFFORD IT.

This process takes on a whole new importance in the business world when words and phrases like "return on investment," "operating expense" and "productivity" are keys to the decision to use something new. Not only do we need to decide if it's affordable, but it also needs to create a sustainable improvement to the current system to be acceptable. Add to this the learning curve of incorporating a new machine or process into what already works and chances of improving the system become even more suspect.

Advancement in technology can take many shapes and be packaged in several different forms. For instance, new computers or a new software package in the office can increase designer productivity, or a new machine in the plant can move more material faster or easier than ever before. The holy grail of continuous improvement is developing a system where all the major systems and processes are essentially equivalent in capacity and are scaleable predictably. All too often we end up making a change in one location only to cause a major disruption somewhere else.

Perhaps one of the most rapidly changing technology environments today can be found in residential cold-formed steel framing. In recent years we have seen the advancements in design and engineering, prescriptive design methods, significant improvement in fasteners, cost effective framing techniques and more recently, highly sophisticated roll formers driven by powerful yet lightweight software.

Starting in the office, design software quickly generates a 3D model of the structure to be built. Feature based properties allow items that are used together to be linked together within the design. Doors and windows, for example, are dynamically linked to the wall in which they are installed so that changing the length of a wall still places the opening where it is needed. Design and engineering decisions can be made by using building-code-approved prescriptive tables and methods just like framing with wood. Intensive engineering requirements specific to the job are no longer necessary.

Once in the plant, servo technology coupled with a stable and consistent product has enabled cold-formed steel panels to be accurately assembled very quickly and without any cutting, measuring or even layout. Challenges found in the wood industry, including inconsistent lumber bundle size, don't exist with steel, allowing the development of material handling and production automation impossible or impractical with wood. Real-time roll forming means the steel is kept in coils until it is needed for assembly—no work-in-process inventory and virtually zero waste.

Advancements in steel manufacturing technology allow for high-quality, high-strength steel to be produced entirely out of recycled material using significantly less energy than previously needed. Galvanized coatings on the

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steel for corrosion resistance provide projected lifespan of hundreds of years.

Various acceptable design methods allow many options, including hybrid steel-wood construction that can enable the component manufacturer to supply the most cost-effective solution for any condition. Job site challenges are met with features such as specially located punch outs for the electrical and plumbing systems. Fastener manufacturers have even developed pneumatically driven pins that fit into air-powered tools currently used by the framer.

The cost of producing cold-formed steel panels has finally been able to be reduced to a point where they can compete with wood construction. The key has been the application of new technology to the entire process of designing, manufacturing and installing steel panels. In some cases sophistication has allowed simplification—and, therefore, removed manufacturing cost. In other cases, continued advancement has made what was impossible in the past reality today.

Future advancements will continue this trend. Current R&D efforts are sure to change the competitive landscape even more over the next few years. Costs will continue to go down, productivity will continue to improve and acceptance will continue to grow.

If cold-formed steel is already part of your operation, then you have been on this wave of growth and change. If you haven't studied the merits of adding cold-formed steel to your product mix then perhaps it's time to see just what technology can do for you and your bottom line.

Don Moody is president and general manager of Nucon Steel Corp. and chairman of the Steel Framing Alliance.

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HOUSING HEAD COMMENDS STEEL

The responsiveness of the steel-framing industry and declining quality of wood continue to present tremendous opportunities for market share growth for steel framing, according to Kent Conine, past president of the National Association of Homebuilders and president of Conine Residential Group, who was the keynote speaker at the 2004 Tex-Eco-Build Conference held in May.

Conine's keynote speech offered the group the challenge of meeting the housing needs of the "eco boomers," the children of baby boomers who he said "will create a huge impact on the housing market over the next 10 years." He pointed to projections of new household formation for 2 million new homes and apartments, including manufactured housing, that need to be built each year for the next 10 years to meet demand.

He went on to proclaim homes a stable investment, kept solid by the increasing cost of new construction, and growth and land-use restrictions that will continue to drive up prices.

Conine commended the steel-framing industry for producing a material of consistent dimensions and quality, remarking that "the quality of wood studs today isn't always what it used to be, and the consistent performance of steel is looking good by comparison." He also encouraged the steel-framing industry to keep addressing the concerns of residential builders, which he said in turn presented more opportunities to increase steel's market share.

"I want to congratulate the steel-framing industry for its high level of responsiveness to all of our builders' needs," he said. "We really appreciate the willingness of the steel-component manufacturers have shown in addressing the problems that residential builders encounter in the course of construction and the workplace. Other building material producers have not always been so responsive. You guys have done an excellent job with that."

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Steel And ICFs: A Smart Combination

By Joe Lyman & Ted Hartner

Joe Lyman

Ted Hartner

Did you ever wonder why the people who created such popular treats as cookies and ice cream or peanut butter and chocolate didn't do it sooner? These combinations seem like such a great idea that one would think they would have marketed them decades ago. Unfortunately, sometimes, good ideas just have to wait.

However, there are great ideas on the market today that are so good they don't have time to wait decades. One in particular is the marriage of insulating concrete forms and cold-formed steel framing in residential construction. For years, cutting-edge contractors have been using the combination of the two to build superior houses that withstand the forces of nature, save on energy bills, limit the risks associated with mold, mildew and fire and dramatically decrease the noise problems associated with busy neighborhoods.

Why ICFs and steel

Although steel framing has been around for quite some time, ICFs were known as a relatively obscure building system until a decade ago. They were first created in the mid-1960s by Werner Gregori as a lightweight alternative to the traditional concrete forming systems of the day. The lightweight form was an instant success on the jobsite for forming and pouring foundations. However, it continued to be relegated almost exclusively to the foundations market. That's until 1994, when ICFs began to surge as an above-grade building system. As such, they have experienced dramatic growth in the market place ever since. Currently, ICFs are now the third most popular building system used in residential construction, and the fastest growing building material in the U.S. market.

Despite their tremendous growth, ICFs can only get a contractor halfway to completing a home. ICFs are used

SMART COMBINATION...
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only as an envelope system and other options in framing the interior floors, partition walls and roof systems must be considered. Early adopters of ICFs were used to the built-in quality of ICFs, but not the inconsistency of traditional 2-by-4 lumber. Enter cold-formed steel framing, a building material whose quality can easily be controlled in the manufacturing process.

Marketable building materials

Although ICFs are still used for foundations, markets have expanded to the above-grade single-family home market, as well as military base housing

Steel floor joists that are set after the concrete has been poured into the ICF.

and multi-family residential projects. As first-cost building issues become less of a concern on projects, clients understand the long-term value and benefits of using ICFs.

This growth brings a wealth of opportunities for steel framers, as flooring, interior partitions and roofs of ICFs are now being captured by steel framing crews throughout the United States and Canada.

Thermal performance

Often, crews will argue that they don't want "half a job, they want the entire job." However, there are certain climates and conditions where ICFs make sense to use instead of traditional building systems. With its built in thermal mass performance and built-in insulation, ICFs are suited to extreme hot and cold climates where temperature swings can range 40 degrees from day to night. Also, user-friendly properties of ICFs allow experienced construction crews to become proficient in their installations without the added time and expense of learning a completely new building system.

The steel and ICF connection

Ledger framing is most common to ICFs construction and the Dietrich TradeReady rimtrack is frequently used within the ICF industry. C-shaped studs have an advantage over dimensional lumber and I-joists when framing into ICF. The rimtrack is significantly lighter compared to dimensional lumber and LVL beams and requires fewer connectors, making construction less laborious.

Bracing is set just under the rim track to ensure it is level around the perimeter of the wall.

Anchor bolts vs. clips

Anchor bolts and Simpson Strongtie connector clips (ICFLC) are the most common methods to attach ledger members in ICFs construction. Deciding which to use is simply a matter of comparing material costs vs. total labor savings. The question then becomes, which is more valuable to the builder? Anchor bolts are cheaper from a material standpoint, but require a hole drilled in the ledger member at every bolt location. Not only can this be time consuming, but it also allows for errors in determining exact hole locations. Once the ledger member is in place,

Top of the wall, which allows the builder to have a deck to pour, as well as acts as additional support when concrete is poured.

more time may be required if the ledger is not level.

The ICFLC clip is generally a more expensive alternative from a materials standpoint; however, it can be a valuable time saver. The 90-degree angle clip is simply inserted into the ICFs block and the cold-formed steel rimtrack is screwed into the clips. The clips do not have to be at an exact height on the wall to achieve a proper attachment. The framer can simply chalk a line to level the rimtrack and attach to each clip. It is recommended to attach the rimtrack with a few screws into the furring strips before the walls are poured to inhibit the clips from backing out during the pour.

Pour before or after

Traditionally, framing in ICFs construction is scheduled after the walls are poured. It seems to be a logical process. However, the light weight of a cold-formed steel floor system allows floor framing before pouring the walls.

There are multiple opportunities to reduce construction time and materials when using steel floor systems. The

The Portland Cement Association projects that by 2006, ICF systems will make up 8 percent of all single-family housing starts in the United States.

amount of complex bracing can be reduced significantly because diagonal bracing can generally be eliminated. The floor framing itself functions as diagonal bracing. Scaffolding can be eliminated entirely because the crew can now work on a framed deck, which is also a safety benefit. It should be noted that large loads (units of decking, for example) should not be placed on top of the deck before the walls are poured. Framing the deck first virtually eliminates the potential for waves in the wall that can occur during the concrete pour. Another way to ensure straighter walls is by installing a 2 ½-inch steel track member directly above the footing or concrete floor. The bottom ICF block can be nested inside the track member, preventing movement during construction.

Concrete subfloors

Cold-formed steel-framed floors with metal decking and poured concrete floors can also be used in combination. Poured concrete floors and radiant heating offer alternatives to traditional building methods. The metal decking can be attached using screws or by welding. The superior strength-to-weight ratio of steel allows for greater loads that concrete floors produce.

A learning curve can be expected with any new type of construction. However, it can also provide an opportunity to improve on traditional methods. With the combination of time and material savings, steel framing has proven to be a superior building method in ICFs construction. Working smart at the beginning of the process can save much more time in the end. As ICFs and steel products continue to evolve, so will the methods of the residential construction industry.

Joseph Lyman is executive director of the Insulating Concrete Form Association, and Ted Hartner is sales manager of residential products for Dietrich Metal Framing.

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From The Forum

Prognosis For Water-Damaged Steel Is Good

What is the best way to redo or repair steel framing that has been water-damaged due to a persistent undetected plumbing leak?

Water typically does not damage galvanized steel. Culverts and pipes made from galvanized steel have been used in in-ground placements with streams and stormwater running through them for decades. Although sometimes special coatings are required, steel and water work well together. In a plumbing wall or floor cavity, the problem is bigger than just damage to the steel. Leaky or broken pipes, or wetting due to improper insulation or placement of vapor barriers can create much bigger problems, such as the delamination and rot of plywood and oriented strand board finish materials, and the swelling and delamination of gypsum board or particle board. The worst problem can be a mold bloom, which occurs within just a few days of wetting.

For the steel, the biggest concern is some sort of corrosion. If the studs appear to be coated in a white powder, that is zinc oxide. This is evidence that the zinc coating is doing its job protecting the steel, and there is no need for any additional remedial action. This is usually the case, and the zinc oxide may be left in place and after the wallboard or wood material is replaced, the wall may be dried out and closed back up with no additional remedial action. If there is red rust, the building owner may have to take some additional steps.

Once the plumbing or other problem is fixed, the studs should be inspected, and cleaned off if possible. Moisture in the wall cavity can lead to the persistence of mold and other air quality problems, so sheathing may need to be removed, cleaned or replaced. When the sheathing is removed, it should be relatively easy to inspect the condition of the studs.

If the rust is light and spotty, the material can most likely be brushed off, and some type of cold-galvanizing compound (meeting ASTM A780) can be applied. In interior conditions, rust-resistive paint has been used successfully as well. Once the paint or cold-galvanizing compound is dry, no further remediation is required for the studs, and the wall cavity can be enclosed. If the rust is more severe, you may need to check the thickness of the remaining steel to see if it has the capacity to support the wall or, if in a load-bearing wall, the structure above.

In severe rusting in a load-bearing condition, which usually only occurs when persistent wetting has been taking place over the course of years, be cautious about removing material without providing additional shoring to support the structure above. Before checking thickness, use a wire brush or other suitable abrasive material or chemical to remove the red rust. Use a properly calibrated micrometer or similar device to check the thickness in a couple of spots, and then have an engineer run an analysis of the stud with the remaining thickness.

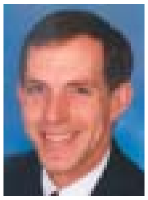
If the analysis shows that the stud can support the imposed loads, you can paint or galvanize the studs and close up the wall. If the analysis shows a structural problem, additional studs or other framing will be required. If this is the case, the rusted studs may be cleaned and treated and remain in place, or they may be removed.

The key to this sort of problem is to keep the moisture out of the wall cavity. Even if you take the steps above, if studs are exposed to persistent wetting the corrosion process will eventually begin again, even when properly coated. Mold growth on the sheathing is a major concern with moisture infiltration as well.

Tests on the long-term sustainability of zinc coated steel, including a report published in September 2003 by the National Association of Homebuilders Research Center, show that the estimated service life of galvanized material exposed in attic, wall and floor cavities ranged from 277 years to 1,004 years. The Durability Guide to Cold-Formed Steel Framing Members, which contains additional information about corrosion protection and the effects of zinc and other coatings, is available from the Steel Framing Alliance Web site.

Best wishes with your repair!

Don Allen, P. E.
Steel Framing Alliance
director of
engineering development



ASK YOUR QUESTION ON THE FORUM!

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www.steelframingalliance.com.

RESEARCH

LOOK TO STEEL DURING CONCRETE SHORTAGES

BY NADER ELHAJJ

CEMENT OR CONCRETE IS USED IN ALMOST EVERY BUILDING PROJECT, WHETHER NEW CONSTRUCTION OR REMODELING, ESPECIALLY IN FOUNDATIONS. HOWEVER, IN CERTAIN PARTS OF THE COUNTRY, THE AVAILABILITY OF CONCRETE HAS BEEN SIGNIFICANTLY DEPLETED, DRIVING PRICES UP AND LEAVING BUILDERS TO SEARCH FOR ALTERNATIVES. IN ADDRESSING CURRENT ISSUES ASSOCIATED WITH CONCRETE, THE NATIONAL ASSOCIATION HOME BUILDERS ASSOCIATION RESEARCH CENTER RECENTLY PROCLAIMED FOUNDATIONS OF STEEL AN EXCELLENT SOLUTION.

Nationwide, the United States imports about 22 percent (totaling about 23 million metric tons) of the 107.5 million metric tons Portland cement consumption each year. The top exporters of cement to the United States are Canada (about 25 percent), China (about 24 percent), Thailand (about 18 percent) and Greece (about 10 percent), according to the Portland Cement Association, a trade association based in Skokie, Ill. China's booming economy and its growing domestic demand for raw materials have forced it to curtail its cement exports in recent months. This, coupled with the current construction boom in the United States and overburdened shipping companies, is causing a worldwide shortage of cement, the key ingredient in the manufacture of concrete.

In parts of the country such as Florida, the home construction market is particularly vulnerable to price fluctuations and shortages because it imports about 40 percent of its cement annually. Beginning in the spring of 2004, South Florida home builders began reporting delays in getting concrete deliveries, according to Beth McGee, executive vice president of the Home Builders Association of Metro Orlando. These delays resulted from concrete rationing to builders in the state as concrete producers cut back production due to the cement shortages. The concrete shortage is likely to spread across the Southeast, said George Hossenlopp, president of Florida Concrete & Products Association and president of Jacksonville-based Florida Rock Industries' Southern Concrete Group.

With little indication of short-term relief in the cement prices and shortages, what can builders and contractors do to cope with this disruption and continue to run profitable businesses? Alternative materials and construction methods, including steel, may be the answer.

COLD-FORMED STEEL FOUNDATIONS

Cold-formed steel, or light-gauge steel, has been gaining wider market share because of its many advantages in high-hazard regions and insect infested areas. Its price stability, until recently, has attracted many builders and framers in the Southwest, West Coast and Hawaii. The Steel Framing Alliance reported that over 60 percent of new housing starts in Hawaii today are steel-framed.

The price of steel had gone down over the past three decades due to higher productivity, improvements in steel mills, and the start-up of minimills. However, the building boom in China has affected steel prices as it has for other materials. As the Chinese economy has grown, the construction market there has started to consume more steel creating a shortage worldwide. This had caused steel prices to increase by up to 100 percent since summer 2003. Despite these price fluctuations, there are still ways to use steel foundations economically.

While steel foundations are not recognized by the International Residential Code and there are no prescriptive tables for them, they can be used effectively if they are properly designed and installed. A below-grade steel stud is no different than an above-grade steel stud—the below-grade stud is subjected to lateral soil loads, just as the above-grade stud is subjected to lateral wind loads. The designer has to be careful though in selecting the exterior sheathing for steel foundations. Pressure treated wood containing copper is highly corrosive to steel and needs to be isolated from steel members.

INSULATED STEEL PANELS

Panelized steel systems are similar to structural insulated panels. They are fabricated from steel sheet skin (typically 22-gauge thick) and extruded or expanded foam sandwiched between the steel sheets. Other systems consist of steel studs embedded in extruded or expanded foam. The panels are either mechanically interlocked (with fasteners) or welded together. Whichever system is used, the panels can be successfully used as basement or foundations walls.

Cost savings for these foundations come from the ease of installation as work can be done by framing crews under a wide variety of weather conditions. These systems also eliminate the need for a concrete contractor, as poured concrete walls are not needed and footings can be poured without a concrete contractor. A recent time and motion study performed by the NAHB Research Center for the Mid-Atlantic Steel Framing Alliance documented construction time for a single-family

LOOK TO STEEL...
CONTINUED FROM PAGE 30

home using Premium Steel Building Systems panels. The labor cost for the foundations was 18 cents per square foot of living area. It took 19 labor hours to construct the foundation. The cost of these panels usually comes at a premium, therefore, a builder should look at the total cost rather than the labor cost alone.

Other wall panels

There are a variety of panelized systems that combine the strength of steel or other composites with concrete to form wall panels. Tridipanel, for example, produces a prefabricated polystyrene wire mesh panels that becomes a structural wall when concrete, gunnite, Portland cement, plaster, and stucco are shotcreted into place. Tridipanels have been tested to withstand extreme temperatures; they are earthquake tested and use recycled green products. These systems are not always available in all markets, nor do they provide a complete solution. However, when available, these alternative systems, as well as all systems of steel, can provide an economical alternative to concrete or block walls.

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

MHD

For more information on steel foundations from the NAHB Research Center, refer to the Technology Inventory Listing at:

www.toolbase.org

or visit the following company Web sites:

Premium Steel:
www.premiumsteel.com

The Hughes Group:
www.safebldg.com

Education

Foundations For Steel Framing

By Maribeth Rizzuto

The foundation of a steel-framed house has a distinct impact on the structure. The type and quality of foundation affects the steel frame design, anchor system, and straightness of the walls.

This two-part installment in our educational series addresses the types of foundations commonly used and the impacts they have on steel-framed houses, the details available to anchor a steel-framed house and the factors framers should consider when choosing foundations are also examined.

Foundations not only support the weight of the structure above with all the superimposed loads, they also provide a level surface to support the framing.

Types

Three basic types of house foundations are commonly used today:

Slab-on-grade: Concrete slab at ground level.

- Eliminates the need to build a floor out of joists and beams.
- Can be the least expensive foundation to build.

Crawl space: Stem walls typically 2 feet to 4 feet in height that elevate and support the first floor.

- Stem walls are typically made from reinforced concrete, concrete block, or post and beams.
- Help provide air circulation underneath the house.
- Commonly used in warm climates (they keep houses cooler) or where basement foundations are not practical.

Basement: Floor 6 feet to 8 feet below ground with walls that hold back the soil.

- Often occupy a full story below ground with uses ranging from laundry to recreational rooms.
- Usually are more expensive to build because of additional material and excavation costs.
- Usually constructed in colder climates where an underground floor can help to keep the house warm and provide more living or storage space (especially beneficial during winter months).
- Hard rocky ground or high water tables often make basements impractical.

Foundation importance

Regardless of the type of foundation selected for a steel-framed house, all foundations:

- Act as an anchor for the house, preventing damage during wind, weather or seismic events.
- Serve as a platform for framing.
- When well-constructed, will help to produce a level, straight-walled steel-framed home.

Anchoring

Steel framing must be firmly anchored to the foundation, regardless of the type. Because most foundations are made from concrete, the steel frame anchors must be designed for embedment in, or attachment to, concrete.

Following are some of the most common anchoring methods.

Anchor bolts

The Standard for Cold-Formed Steel Framing – Prescriptive Method for One and Two Family Dwellings 2001 Edition provides several details for anchoring

Figure A: Sill Anchor

steel-framed houses. **Figure A** depicts a steel-frame floor system anchored to a wood sill on top of a concrete foundation. The wood sill is tied to the foundation with anchor bolts, similar to wood construction. The rim joist of the steel floor system is fastened to the wood sill with a steel plate.

Figure B shows a detail of a steel floorsystem attached directly to the concrete foundation using clip angles and anchor bolts.

Anchor bolt sizes are provided in **Table D2** (above right) of the *Prescriptive Method*.

Where there are no floor joists in a slab-on-grade house, anchor bolts may also be used to anchor walls to the slab.

Table D2.1
Floor to Foundation or Structural Wall Connection Requirements[1,2]

Framing Condition	Basic Wind Speed (mph), Exposure, and Seismic Design Category	
	85 MPH Exposure C or less than 110MPH Exposure A/B – Seismic Design Categories A, B & C	Less than 110 MPH Exposure C
Floor joist to wall track of exterior wall per FigureD2-1	2 No. 8 screws	3 No. 8 screws
Rim track or end joist to structural wall top track per Figure D2-1	1 No. 8 screw at 24" o.c.	1 No. 8 screw at 24" o.c.
Rim track or end joist to wood sill per Figure D2-4	Steel plate spaced at 4' o.c. with 4 No. 8 screws and 4 10d or 6 8d common nails	Steel plate spaced at 2' o.c. with 4 No. 8 screws and 4 10d or 6 8d common nails
Rim track or end joist to foundation per Figure D2-3	1/2" minimum diameter anchor bolt and clip angle spaced at 6' o.c. with 8 No. 8 screws	1/2" minimum diameter anchor bolt and clip angle spaced at 4' o.c. with 8 No. 8 screws
Cantilevered joist to foundation per Figure D2-4	1/2" minimum diameter anchor bolt and clip angle spaced at 6' o.c. with 8 No. 8 screws	1/2" minimum diameter anchor bolt and clip angle spaced at 4' o.c. with 8 No. 8 screws
Cantilevered joist to wood sill per Figure D2-5	Steel plate spaced at 4' o.c. with 4 No. 8 screws and 4 10d or 6 8d common nails	Steel plate spaced at 2' o.c. with 4 No. 8 screws and 4 10d or 6 8d common nails
Cantilevered joist to wall track per Figure D2-6	2-No. 8 screws	3- No. 8 screws

For SI: 1 inch = 25.4 mm, 1 psf = 0.0479 kN/m², 1mph = 1.61 km/hr, 1 foot = 0.3m
[1] Use the highest of the wind speed and exposure or the seismic requirements for a given site.
[2] Anchor bolts shall be located not more than 12 inches (305 mm) from corners or the termination of bottom tracks (e.g. at door openings or corners).

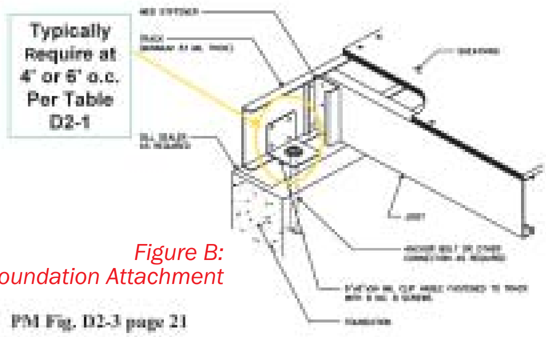


Figure B: Foundation Attachment

PM Fig. D2-3 page 21

Embedded bolts

Embedded anchor bolts are available in different forms:

J-bolt: a bolt bent into a "J" shape. It is cast in concrete with the bottom part of the "J" serving as an anchor. This type of attachment is covered in the Prescriptive Method for One and Two Family Dwellings on page 43, Figure E2-1, as shown here in **Figure C**.

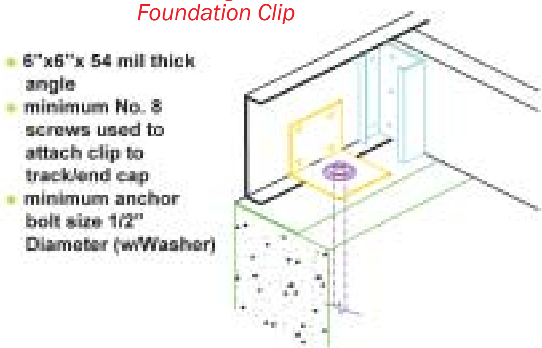
Threaded rod: a steel rod that is threaded on both ends with a washer and nut screwed on one end that is cast in concrete. The washer improves the resistance to pullout.

Embedded bolts need to be set in place before the concrete is poured. This is usually accomplished using brackets that:

- Hold the bolts in position during concrete placement.
- Can be made from steel angle or studs with holes drilled in them to position the bolts.
- May be attached to the formwork to keep the bolt in position.

Figure C: Foundation Clip

PM Fig. D2-3 page 21



We will continue the subject in the next issue, when we will cover epoxied bolts, concrete tolerances, and girders and interi or foundations.

MHD

METALCON's SFA-Sponsored Seminars & Events

Tuesday, Oct. 19, 2004

8:00 a.m. – 4:00 p.m.

Steel Framing in Wall Systems*

Presented by Don Allen P.E., director of engineering development Steel Framing Alliance, and Roger LaBoube Ph.D., P.E., director of the Wei-Wen Yu Center for Cold-Formed Steel Research, University of Missouri-Rolla

Wednesday, Oct. 20, 2004

8:30 a.m. – 10:00 a.m.

Corrosion or Lack Thereof*

Presented by Nader Elhajj, director of structures and materials, National Association of Home Builders Research Center

Low and Mid-Rise Construction—Beyond the Curtain Wall*

Presented by Patrick W. Ford P.E., principal and owner, Matsen Ford Design Professionals

10:15 a.m. – 11:45 a.m.

Packing the Right Equipment?*

Presented by Maribeth Rizzuto, director of training and education, Steel Framing Alliance

Special Issues in Roof and Truss Construction

Presented by John Carpenter, special projects, Alpine Engineered Products Inc., andBill Babich PE, chief engineer, Alpine Engineered Products Inc.

Thursday, Oct. 21

8:30 a.m. – 10:00 a.m.

Details, Details, Details—The New Details Manual*

Presented by Don Allen

Steel—Past, Present and Future*

Presented by Don Moody P.E., president and general manager, Nucon Steel Corp.

10:15 a.m. – 11:45 a.m.

Is Builder's Risk Insurance Causing You Heartburn?*

Presented by Bill Kraft, director, U.S. West Region and Canada, Steel Framing Alliance

Market Opportunities for Cold-Formed *Steel Framing—Through the New Codes**

Presented by Jay Larson P.E., F.A.S.C.E., director, construction standards development, American Iron and Steel Institute, and Robert Wills, regional director, American Iron and Steel Institute

5:00 p.m.

Steel Framing Alliance Fall Forum

Hosted by Steel Framing Alliance. Registration required.

Friday, Oct. 22, 2004

9:30 a.m. – 11:30 a.m.

Code Official? Plan Examiner? Building Inspector? Be Our Guest!

*Hosted by Steel Framing Alliance. Registration required. *Earns 1.5 learning units*

Steel Framing Alliance is also presenting another STUD University...

Sunday, Oct. 17
1:00 p.m. – 4:00 p.m. (classroom)
5:00 p.m. Welcome Barbecue

Monday, Oct. 18
9:00 a.m. – 4:00 p.m. (lunch included)

Tuesday, Oct. 19
9:00 a.m. – 5:00 p.m. (lunch included)

Instructed by Danny Feazell, president, Premium Steel Building Systems Inc., Maribeth Rizzuto, Nader Elhajj, and Matt Macarewich, principal, Matt Macarewich & Associates

For more information about the above programs or to register, visit metalcon.com or steelframingalliance.com, or phone (617) 965-0055.

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