Versatility helps spur interest in this product

The dimensions of steel framing grow

Versatility of light gage steel framing—that’s the phrase contractors and architects are increasingly using these days. In fact, according to Durward Humes, managing director of the Metal Lath/Steel Framing Association (ML/SFA) based in Chicago, these remarkable systems could very well displace wood framing as builders’ first choice in the coming decade.

“For fast-truck construction, you’ll find nothing better than the benefits offered by steel framing systems,” he says. “In addition to savings in weight, cost, time and energy, there’s the high strength of steel to consider. More and more solutions to construction problems are being provided by steel framing systems, and that includes load-bearing situations.”

For example, Dick Wescott, president of Versatile Panels, Inc., Lansing, MI, points out that as far as load-bearing curtainwall applications of steel framing are concerned, there is virtually no height limitation involved. In fact, for the Warren Plaza, a 10-story high-rise for the elderly under construction in Detroit, MI, Wescott’s company chose steel framing over precast and saved an estimated half-million dollars!

According to Wescott, who began Versatile Panels, Inc. in anticipation of the trend towards the increased use of these systems, the typical 25-ft. x 9-ft., 8-in. panels were prefabricated at his warehouse and trucked 85 miles to the construction site in Detroit.

“It took only 60 days to fabricate, panelize and erect the 45,000 sq. ft. of panels on this project,” Wescott explains. “Only five men were needed to erect 3600-sq. ft. of panel per day. In fact, 41 percent of all the panels were erected in just six days.” Inryco’s 14-ga. light gage studs were used on floors one through five, while 16-ga. were employed on floors six through ten.

Wescott also points out that savings in weight over precast were significant. The panels came to approximately 4.66-lbs/sq. ft. and also contained 4-in. rigid polystyrene glued to gypsum and a weatherproof exterior finish.

The panels were shipped with specially designed trailers to the site with the windows already installed.

“It’s going to cost less to heat and cool this building because of the insular properties of the panels,” Wescott adds. “Steel Framing is the future trend in the construction industry, especially with the way costs for lumber have been going these past few years.

Retirement Home

Besides load-bearing situations like Warren Plaza, steel framing has numerous other applications, having established itself as the preferred

40 panels per day were fabricated on the job site at Olathe, KS.
A typical example of this application is the Good Samaritan Towers in Olathe, KS, a nine-story, 80,000 sq. ft. high-rise for the elderly, designed by BWB Associates, Memphis, TN. The subcontractors, E & E Plastering, Kansas City, MO, cut off an estimated two months of scheduled time allowed for enclosure of exterior walls because of the panelization and prefinishing processes inherent in steel framing systems.

“It also used to be where contractors had to go see the architect on a specific project,” says Everett Belt, co-owner of E & E Plastering. “Now, however, we’ve got architects coming over to see us, seeking out information about this great system.”

According to Belt and his partner, Elmer Tanking, the first floor used 16-gage, wide flange CEE studs manufactured by Ceco Corp., Broadview, IL. Floors two through nine used 20-gage. Exterior walls had ½-in. gypsum sheathing on the studs, 1-in. Styrofoam, and “dryvit” on the face of the Styrofoam.

“We’ve achieved an ‘R’ value of 17.5 with an additional 3½-in. insulation in this wind-loaded bearing situation,” Belt adds.

Four to five men put up 12-15 panels per day, while an average of 40 panels per day were fabricated on site. “The normal process of doing interior partitions after exterior walls was speeded up by this prefabricating process,” Belt says, “and you just can’t do that with wood.”

**Racquetball Courts**

While such load-bearing and wind-load bearing situations are typical of the increasing number of applications for steel framing systems within the construction industry, there are also new market areas in the decade of the 80s opening up for these systems.

“One of these is racquetball courts,” Humes says. Tom Finnegang, vice president of Cassidy Brothers, Inc., Rosemont, IL, says that it was the overall economy of steel framing that led to its selection for the construction of Continental Tower Courts in Rolling Meadows, IL.

“Steel framing was lighter in weight than concrete block,” Fin-
negan explains. “For the walls, USG 7½-in. 20-ga. studs spaced 16-in. o.c. were used. In addition, the interior angles within the courts-wall/ceiling, wall/wall, wall/floor-received casing beads in order to achieve five independent planes. Consequently, cracking from building settlement or impact stress or play was minimized.”

Finnegan also points out that the studs were easier to stock on the job. “Other systems simply don’t hold up to the constant pounding like steel framing,” he adds, “and there’s a consistency in the quality and end-result of the system that you don’t find elsewhere.”

Humes sums up the trend towards steel framing systems by saying that they are slowly making inroads into the residential market of construction.

“Over 10,000 steel-frame houses have already been built in the U.S.” he explains. “There are many advantages residential builders are seeing in steel framing. Though wood may be cheaper per foot, for example, steel framing uses only about half as much material. Steel is also more stable in price, and unlike lumber, there is historically no shortage during peak building.”

Practically everyone involved in construction—both commercial and residential—finds these systems extremely easy to work with once they’ve come into contact with them, according to Humes.

“And when you combine the benefits of steel over other traditional systems there’s just no question in my mind that steel framing is going to expand its construction dimensions during this decade,” Humes adds.
With much fanfare and high expectations, weathering steel first arrived on the construction scene in the 1960s. Its initial architectural application was the now-famed Deere & Company headquarters building in Moline, Ill., completed in 1964 and so successful that the same material was chosen for Deere West, a recent 200,000-square-foot addition.

Since then, steel producers, engineers, architects and contractors have amassed extensive experience in specifying, fabricating and handling weathering steel. The material has found its niche in a number of well-suited applications—from bridges and buildings to water tanks and transmission towers, from open-deck parking and high-mast light poles to elevated transit and coal handling systems. It has settled into steady although not spectacular growth.

Now, according to the Committees of Structural Steel and Steel Plate Producers of American Iron and Steel Institute, the material is poised for what may be its true growth phase, for its attributes coincide with a number of current needs and construction industry opportunities.

1. Substantial rises in maintenance costs, for both labor and paint, have renewed interest in two major advantages of weathering steel. First, in the bare condition, its corrosion resistance eliminates the need for any coating protection of surfaces boldly exposed to the atmosphere, and therefore may greatly decrease subsequent maintenance. Second, when paint systems are required, tests indicate they gain up to twice the service life on a weathering steel surface as on structural carbon steel.

2. Increasingly, the material’s aesthetics are finally being recognized, accepted and sought. When exposed to the atmosphere, the surface weathers to a rich, dark, earthy color. The oxide that forms during the early years of bare exposure—about the same thickness as a heavy coat of paint—becomes dense, adherent and inhibits further atmospheric corrosion. If scratched or marred, the oxide reforms.

3. Its properties as a high strength/low alloy steel are also gaining economic importance. Specifiers now capitalize on the fact that it is up to 40 percent stronger than structural carbon steel and can permit the substitution of thinner plate or smaller shapes to partially offset its higher cost.

4. The serious deterioration of older bridges throughout the U.S. and Canada leads many to anticipate...
an upsurge in new or replacement construction. A large bridge now costs several million dollars just to paint initially or repaint periodically. Replacement with bare weathering steel, along with painted weathering steel in trouble-spot sections, has a significant cost-cutting potential.

5. With the know-how derived from more than 15 years of diversified applications, design and installation guides have been developed to help the designer solve the problems encountered with weathering steel. (This article presents some of the guidelines, for those not fully experienced in working with the material.)

Today weathering steel is available as structural shapes and plates for welded or bolted construction, in ASTM specifications A242 and A588. The former, usually employed as relatively thin plate, has enhanced atmospheric corrosion resistance several times that of carbon structural steels without copper (0.2 percent maximum copper content). The latter grade, normally used for structural shapes and thicker plate, embodies about 54 times carbon steel’s atmospheric corrosion resistance. Both grades have about twice the corrosion resistance of copper-bearing steel (0.20 percent minimum copper).

The materials attain their properties through a combination of alloying elements, not copper alone, but which could also include chromium, nickel and silicon. In fact, A588 will differ by supplier in both alloying ingredients and their percentages.

Weathering steel plate is made primarily in widths up to 144", and in lengths to about 720", with the upper range of width and length dependent upon gage; the thinner the plate the longer and wider it can be. Yield strength is 50,000 psi, compared to 36,000 psi for structural carbon steel, with the yield diminishing slightly for A588 steel over 4" thick.

Structural shapes are available as angles, American Standard shapes, channels, tees, wide-flange beams and zees. They’re produced mainly to the A588 spec. Exposed structural shapes for bridges and buildings are among the growing applications for weathering steel.

Do’s and Don’ts
To achieve all the benefits of weathering steels, especially in the bare condition, it is important that proper design, fabrication, and handling practices be observed. A few of the key rules are presented in the following paragraphs.

LOCATIONS
Use of bare weathering steel is suited to most atmospheric environments-urban, suburban, rural, moderate industrial and moderate marine. There are areas, however, where usage in an uncoated condition isn’t recommended because the protective oxide will not form properly. These are: atmospheres containing concentrated, corrosive industrial fumes; marine locations subject to salt-water spray or salt-laden fog; and applications where the steel is
continuously submerged in water (salt or fresh) or buried in soil.

DRYING
A constantly-wet weathering steel surface will corrode at an unacceptably-rapid rate. Therefore, the detailing of beams, columns, sunscreens, exterior wall systems, etc., should avoid creating sources of water retention—pockets, crevices and faying surfaces. Where such collection spots cannot be avoided, there must be allowance for drainage and ventilation to permit the steel to dry.

STAIN PREVENTION
Moisture dripping from the steel, especially during its early years of exposure, will contain particles of insoluble iron oxide, which can stain or streak adjacent materials. Permanent provisions should be made through design, detailing and the selection of proper adjoining materials and colors to accommodate this run-off water or divert it from vulnerable surfaces. Successful solutions include sealants, gutter and downspout systems, overhangs, drop plates and special flashings.

ADJACENT MATERIAL
Compatible construction materials subject to minimal staining and which can generally be cleaned include: aluminum, ceramic tile, extruded neoprene, glass, glazed brick, organic coatings (washable, air-drying and thermosetting), porcelain enamel coatings (semi-gloss and glossy) and stainless steels. Some materials that may undergo severe staining and are difficult or impossible to clean are concrete and stucco, galvanized steel (unpainted), matte porcelain enamels, stone, wood and unglazed brick.

GLASS
Windows in weathering steel structures require frequent cleaning during the period when the oxide coating is forming. Cleaning frequency will decrease once the oxide has matured, but will be higher than that in structures of other architectural material. Glass is not affected by the corrosive drainage products, but staining will become apparent once the surface has dried. The resulting film—airborne dirt in addition to the iron oxide—is generally difficult to remove by rinsing and may require a mild abrasive cleaner.

INTERIORS
All interior and other unexposed weathering steel surfaces, including faying surfaces that are not held tightly together, where weathering and proper oxide formation is prevented, must be protected as if the material were carbon steel. Flat, horizontal surfaces are particularly vulnerable to moisture or condensation, as are those covered by structural or curtain wall gaskets, and the interiors of window frames, door frames and wall panels. A good rust-inhibitive primer, applied on cleaned material, is usually adequate.

FABRICATING
Weathering steels can be cold formed using conventional equipment and good shop practices. Slightly-greater forming pressures as well as more liberal bending radii are needed than for carbon steel. Hot forming is recommended for bending of plate over 1/2" thick.

FASTENERS
For structural joints where high-strength bolts are required, ASTM A-325, Type 3 bolts must be used. Lower strength fasteners—standard machine bolts, self-drilling/self tapping screws, nuts and hardened washers are all available in weathering steel. Galvanized steel fasteners are not suitable for use in weathering steel structures; when the zinc coating erodes, it leaves an exposed plain carbon steel unit that is not resistant to atmospheric corrosion.

WELDING
While any of the low-hydrogen welding processes used to join car-
bon steel plate can ordinarily be used, the alloy content of weathering steels requires that welding procedures be tailored to the thicknesses and the types of joints being made. The low-hydrogen, arc-welding processes are commonly used to minimize the need for pre-heating and to permit use of lower preheating and interpass temperatures. Where the weld metal must exhibit corrosion resistance, weathered color and texture comparable to the base metal, certain alloying elements should be present in the weld metal.

**CUTTING**

Weathering steel plate can be oxygen or plasma-arc cut in accordance with practices suggested in the American Welding Society Handbook. Generally, this steel does not require pre-heating.

**BAR**

Steel bar is also produced in specifications A242 and A588, and is frequently employed as a reinforcing component to plate in heavy construction. For these purposes, only shearing and bending to shape are usually necessary to utilize the bar.

**SURFACE PREPARATION**

For most architectural applications, a uniform weathering process is desirable, necessitating a uniform surface for the even formation of the protective oxide. Therefore, all exposed plate and structural shapes to be left unpainted should be blast-cleaned or pickled to remove mill scale. When blast cleaning is required, it should be performed in accordance with the Steel Structures Painting Council surface preparation specification SSPC—SP6-63 “No.6, Commercial Cleaning,” which is usually adequate for most exposed applications. Specify that any necessary markings be made in chalk or water-soluble ink, and not in paint or crayon, and that they do not appear on surfaces which will be exposed.

**AVAILABILITY**

Although a wider size variety of weathering steels is available from the producing mills, steel service centers do stock weathering steel plate, angles and wide-flange shapes in the most popular sizes. To overcome any problem of small quantity availability, design details should aim at consolidation of sizes and thicknesses so that mill quantities can be ordered.

For complete information on weathering steel, contact these member companies of the Committees of Structural Steel and Steel Plate Producers, AISI: Algoma Steel, Armco, Bethlehem Steel, Inland Steel, Kaiser Steel, Lukens Steel, Northwestern Steel and Wire, Republic Steel and United States Steel.