

## STEEL FRAMING INDUSTRY ASSOCIATION



## **CASE STUDY**

# STRENGTH TAKES SUSTAINABLE BUILDING TO A NEW LEVEL

CONVENT HILL MILWAUKEE, WISCONSIN

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## **OVERVIEW**

## **PROJECT**

Senior apartments, street-level retail

Size

10 stories, 120 units

**Total construction cost** 

\$9.9 million

**Start Date** June 2006

**Completion date** 

January 2008

Recognition

2008 Milwaukee Mayor's **Urban Design Award** 

## **PEOPLE**

Developer

Housing Authority of the City of Milwaukee

Architect

Zimmerman Architectural Studios

**General Contractor** 

Gilbane Building Company

**Structural Engineers** 

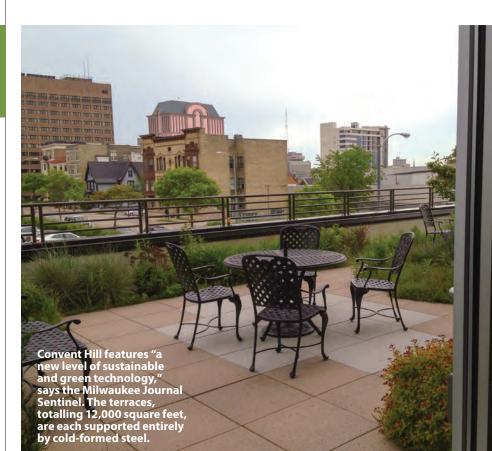
Norris & Associates, Matsen Ford Design Associates

**Cold-Formed Framing Contractor Worthington Building Systems** 

### STEEL

Pre-fabricated cold-formed steel studs, joists and rim track

43-68 mils (interior), 43-68 mils (exterior), 97 mils joists at longer spans





## **Cold-Formed Steel Supports Green Terraces**

Around 1900, the School Sis- are probably not aware that coldters of Notre Dame settled on a formed steel framing can support wooded hill in Milwaukee. Ac- green roofs." cording to the Milwaukee Journal Sentinel, the nuns built "a NEW LEVEL OF SUSTAINABILITY little pioneer home hidden under The City of Milwaukee had the mighty trees."

greenery crowns another home built on the same hill: Convent Hill, a 10-story senior residence with roof terraces filled with day lilies, spirea, phlox, shrubs and grass.

They hold lightweight soil filled to a depth of three inches, ground cover plants and wild flowers, and irrigation systems," says John Matsen, P.E., Principal, Matsen Ford Design. "Most architects

Convent Hill complex built in More than a century later, 1959. For the present redevelopment, the city wanted to take advantage of the latest environmentally friendly building designs. The structure represents "a new level of sustainable and green technology," states the Milwau-"The terraces are extensive. kee Journal Sentinel, which features 12,000 square feet of green

But how could the structure support the green roofs without a large and significant use of structural steel?

Matsen Ford Design Associates, Waukesha, Wis., engineered the project's cold-formed steel system, which comprises the majority of the structure's support system.

port of the load bearing walls,"

lower slab and shallow footings. The main lateral resisting system is cast-in-place reinforced concrete stair and elevator cores.

The combination of concrete "Structural steel beams were and some structural steel with used at the second level for sup- cold-formed steel supports 120 senior apartments and five roof-

plumbing and sprinkler runs. The perimeter of the holes are also rolled to add stiffness over the entire span of the joist.

Made using 54 mil cold-formed steel joists with a 12-inch web depth, the roof structures at Convent Hill are sturdy enough to sup-

## Structural steel beams were used at the second level for support of the load bearing walls...But the top eight floors of Convent Hill are cold-formed steel all the way.

Matsen says. "But the top eight floors of Convent Hill are coldformed steel all the way."

### **FIVE GARDEN TERRACES**

Indeed, cold-formed steel framing is the primary load-carrying structure for the upper residential stories. Cast-in-place concrete was used for the foundation walls, top garden terraces.

From the second floor upward, the structure features cold-formed steel joists that are prefabricated into panels to shorten construction times and eliminate on-site labor. These joists leverage the strength and formability of cold-formed steel with punched holes to accommodate HVAC, mechanical,

port five terraces each filled with a variety of greenery.

The School Sisters of Notre Dame would be proud. The little hill in Milwaukee where they had built their home remains verdant, filled with life. The owner, too, is proud of the green contribution Convent Hill makes to Milwaukee's Park East corridor.

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## **STRUCTURE**

## **SUMMARY**

Cast-in-place concrete foundation walls, lower slab and shallow footings

Cast-in-place reinforced concrete stair and elevator cores

Second floor and below: hot-rolled steel framed with post-and-beam and cold-formed steel joists

Upper eight stories: cold-formed steel framed bearing walls and joists

## **WALL FRAMING**

Cold-formed steel — 362S162-43 to 362S200-68 (interior), 600S162-43 to 600S200-68 (exterior)

**Bridging:** Cold-rolled channel with clip angle

Stud panels compressed for tight seating in top and bottom track

Prefabricated on site

## **FLOOR JOISTS**

Cold-formed steel — 1000S200-54 — at 24" o.c., 925S162-54 at corridors, fastened to prepunched tabs on rim track

Rim track used in many locations to eliminate load-bearing headers in the stud walls

Track fastened to the sides of the wall studs with screws or welds

S162 C-deck run up to bearing walls

Bridging at 6' to 7' o.c. with typical solid blocking — RC furring substituted for continuous bottom flange bridging in some locations.

## **ROOF JOISTS**

Cold-formed steel — 1200S200-54 at 24" o.c., 2x 1200S200-97 at long-spans, 925S165-43 at corridors

Screw-fastened S150 B-deck with tapered insulation and ballasted EPDM roofing

Bridging at 6' to 7' o.c. with typical solid blocking — RC furring substituted for continuous bottom flange bridging in some locations.

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