

# PRODUCT HIGHLIGHTS

## Steel Joist Products

### CANAM STEEL CORPORATION

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Canam Steel, the second-largest joist fabricator in the United States, has been producing open-web steel joists for 40 years. In addition to the standard SJI products, Canam designs and manufactures composite joists, extra-long joists and specialty trusses such as barrel, bowstring, gable, and scissor trusses. Canam also produces various types of steel deck profiles.

Canam Steel has 14 plants in North America and a total production capacity of 732,000 tons. Canam's welders, inspectors and quality assurance technicians are all AWS or CWB certified. To locate the nearest Canam office, call or visit our web site to download Canam's new joist catalog, which includes a summary of the latest OSHA regulation.

### NICHOLAS J. BOURAS, INC.

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Nicholas J. Bouras, Inc. is the sales, engineering and detailing subsidiary of Bouras Industries Inc., an integrated manufacturer of steel construction products, with plants and sales offices in 17 states. United Steel Deck, Inc., Bouras' roll-forming subsidiary, manufactures Steel Deck Institute-specified steel floor, roof decking and related accessories, as well as metal siding and roofing products. The New Columbia Joist Co., Bouras' joist-manufacturing subsidiary, manufactures Steel Joist Institute-specified K, LH & DLH series joists, joist girders and specialty trusses.

### NUCOR VULCRAFT GROUP

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Nucor's Vulcraft Group is the nation's largest producer of steel joists, joist girders and steel deck. Vulcraft also produces highly engineered products, such as composite floor joist. Vulcraft's seven facilities across the United States produce roughly 800,000 tons to 1 million tons of joist and deck each year.

Vulcraft supplies products for a range of structures: from high-rise office buildings and large industrial complexes, to pumphouse buildings and schools. A variety of joist and joist-

girder configurations are available for architectural consideration, including arched chord, bowstring, scissor and single- and double-pitched designs. Vulcraft's engineers are experienced with customized applications.

Vulcraft products, made from more than 90% recycled materials, have been essential elements in green buildings. They also support famous venues such as the Olympic Speed Skating Oval in Utah, home of "The Fastest Ice on Earth," and the second-largest skylight in the nation at the Opryland Hotel in Nashville, TN.

### QUINCY JOIST COMPANY

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Quincy Joist Company manufactures open-web steel joists, long spans, and joist girders, and is a member of S.J.I. Quincy services the U.S. from coast to coast, and close proximity to major ports permits convenient shipments overseas. Production capabilities permit the timely fabrication and delivery of projects of all sizes, and complex engineering challenges.

One example is St. Timothy's Catholic Church in Hillsborough County, FL. The unique design required two domes, one spanning 64' with a radius of 45', and the other spanning 124' with a radius of 105'. The steel fabricator contacted Quincy Joist Company for ideas on how to meet cost and schedule requirements. Quincy Joist recommended arched, open-web steel joist girders and open-web steel joists for the project. Quincy Joist met with the architect, structural engineer, and the general contractor to discuss these alternatives and the design parameters. The use of joists saved the project almost \$200,000 and cut four weeks out of the schedule.

# PRODUCT HIGHLIGHTS

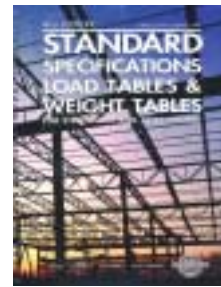
## Steel Joist Products

### STEEL JOIST INSTITUTE

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The Steel Joist Institute, a non-profit organization of active joist manufacturers, was founded in 1928, five years after the first open-web steel joist was manufactured. SJI's publications

give specifications, provide load and weight tables, and recommend a code of standard practice in the steel joist industry. The Institute now presents its 41st edition *Catalog of Standard Specifications and Load Tables for Steel Joists and Joist Girders*. Originally published in August 2002, the 41st edition is the first revision since 1994. It's now available for \$20.00. It has been revised for conformance to new OSHA steel-erection standards, and is ANSI-certified for consensus approval.



Another new publication is SJI's *Joist Substitutes*, which includes the OSHA *Steel Erection Standard §1926.757—open web steel joists*, and an appendix that defines SJI bay lengths.

## PRODUCT CASE STUDY

## The Chapel at Green



Photo courtesy of Jack Baumann, Braun & Steidl Architects

The Chapel at Green project is a new, 144,000-sq.-ft facility in Green, OH that serves as a second campus for The Chapel, a non-denominational church based in Akron, OH. It consists of two primary facilities: one facility with classroom and administrative wings, and the second a 21,000-sq.-ft worship center with a sanctuary, narthex and feature entry. The classroom and administrative wings are two-story conventional structures with 14'-8" floor-to-floor, and a flat roof. The worship center sanctuary and lobby are complex vaulted spaces with heights to 60', incorporating multiple steps in a roof of various geometrics with a significant tower element extending 75' above grade.

Structural steel was the only system considered to achieve the long clear spans and complex vaults required for the worship center sanctuary and lobby. The vaulted areas above 20'-0" clear did not require a fire rating, making joists and joist girders a suitable choice. Joist girders enabled the long spans to be achieved at a relatively economical cost. **Canam Steel Corporation**, the joist supplier, was receptive to the framing and detail requirements and worked closely with the engineers through the shop-drawing phase.

The worship center roof was constructed of conventional K-Series steel joists spaced 6' o.c., spanning to joist girders and supporting 1½" type B wide-rib galvanized roof deck. Seven primary girders fan out from a central tower, which forms the sanctuary's signature feature. The geometry of the primary girders creates complex framing conditions where jack girders frame to the primary girders. Roof pitch and 5' roof steps are located at the girder lines. Girder members spanned up to 114'.

The primary girder trusses were designed and detailed using standard construction details modified to meet the various geometric con-



straints. Joist-girder loads, geometry, deflection requirements and connections were detailed on the structural drawings.

The joist-girder depth was selected to allow joists on opposing sides of the roof steps to frame to the upper- and lower-girder chords. This allowed for the efficient use of a single long-span joist girder at each major roof step.

The interior finish requirements of the project conceal the steel joist members. However, the ability to frame joist to girder web members provided the required roof steps, and achieved the desired architectural form while promoting efficiency of design. The ability to incorporate sloped joist seats in the design contributed to the roof aesthetics.

Lateral-load resistance in the worship center was accomplished with a variety of x-bracing configurations located in the worship-center building perimeter.

The project required lighting and sounds systems to be suspended from the Worship Center roof, including more than 400 linear feet of theatrical lighting catwalk. Other items suspended from the roof framing include a speaker cluster, an acoustic cloud and retractable curtains with equipment.

The use of joists and joist girders on this project economically accommodated the clear spans, and also simplified shop fabrication and field erection of compound connections. The total cost of the steel joist and joist girders for the roof was approximately \$280,000 for labor and material. Total tonnage for joist and joist girders is 92.5 tons.

For this project, structural engineer Thorson Baker & Associates, Inc. received Honorable Mention in the "Non-Industrial" Category of the Steel Joist Institute 2002 Design Awards, one of six awards given nationally. ★



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### SMI JOISTS

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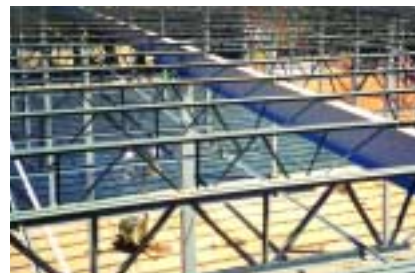
SMI Joist division produces long-span steel joists, deep long-span steel joists and joist girders, with coast-to-coast production facilities and nationwide service. SMI's goal is to deliver products that exceed customers' expectations on time, every time. An in-house joist test lab

demonstrates SMI's commitment to improved production practices through research and development projects. SMI Joist's customers use technical centers for engineering, detailing, and construction solutions, what SMI calls value engineering. SMI Joist is part of the CMC Steel Group of Commercial Metals Company (NYSE:CMC) headquartered in Irving, TX. Since 1915, CMC has been recycling and manufacturing all types of metals, from aluminum to zinc.

### VALLEY JOIST, INC.

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Valley Joist is a manufacturer of steel joists (K Series, LH, DLH and joist girders) and steel deck (roof deck, composite deck and form deck). Valley Joist also fabricates a wide range of non-standard joists and joist girders including



bow strings, rainbow joists, single pitch, double pitched, scissor joists and gable joists.

Valley offers customers one-stop shopping and provides quick service. Valley offers full customer service, beginning with a computerized detailing department. Complete AutoCAD placement drawings are produced for each customer's building. Valley's fleet of trailers and modern tractors delivers products the morning construction begins. Valley Joist has delivered buildings as far north as Alaska, as far south as Puerto Rico and as far west as the Marshall Islands.

## PRODUCT CASE STUDY

Paul A. Zilio, P.E.

**D**olphin Mall is a \$1.6-million retail shopping complex. The project team used structural steel and open-web steel joists as creative solutions to address complexities resulting from sheer size, architectural goals, a fast-track schedule, wind-region requirements, and the flexibility needs of a major retail center.

Architect Beame Architectural Partnership and Structural Engineer Bliss & Nyitray took advantage of a variety of standard and non-standard joist types to provide form, function and style while maintaining the required speed and economy. Nucor Vulcraft supplied the joists, and AISC-member E & H Steel Corporation of Midland City, AL supplied the structural steel. Each entrance and thoroughfare of the racetrack-style mall has an exposed roof structure. LH-type joists were used in shapes such as scissor, bow string and sloping chords. They were placed upright, inverted or sloping, and left exposed and painted to create dramatic spaces. Joist spacing was adjusted to coordinate with the size and location of skylights.

The most striking element of Dolphin Mall is a 92'-wide vaulted roof located over the main entrance. This space frame is supported with lacy steel framework, including open-web steel joists. The vault is punctuated with skylights and sits above a level of clerestory windows. This visual separation provides a roof that seems to float above the building.

Steel joists are economical, lightweight and quickly fabricated and erected using lightweight equipment. Although a small roof-supported equipment-load allowance was specified for the long-span roof joists, it represented a large, con-

centrated load-carrying capacity, adequate to support most of the tenant's mechanical units. The roof-joist system was designed to support rooftop air-conditioning and mechanical units weighing more than 30,000 lb, and anchored for hurricane winds. The joist system accommodated changes to the mechanical and plumbing systems with its open-web feature that provides a convenient



## Dolphin Mall, Miami

avenue for MEP lines. Tenants also took advantage of easy connectability to the bottom chord.

Dolphin Mall was designed for more than 275 retail spaces, and many were not on board until after the shell's completion. Structural steel's flexibility facilitated large spans, maximized column-free space, and provided flexibility to accommodate changes. Leasing space was easily increased outside of the building envelope to accommodate tenant needs. Large signs and logos, which act as sails in hurricane winds, were added through the mall without penalizing the architectural design.

Joist and joist girders were a fast method of construction for this project. The erector pre-assembled approximately 80% of the more than 6400, typically 40'-by-40' bays on the ground. The joists, joist girders and bridging were welded together, stacked vertically and then lifted onto columns by crane. This quick erection contributed to the timely delivery of the project.

Open-web steel joists are traditionally subjected to predominantly gravity loads, with little or no uplift. With Dolphin Mall located in the heart of South Florida, which has the highest design wind loads in the country, the joist seats, webs, bottom chords and bridging were strengthened to resist the resultant reversal (compression) forces due to roof-net uplift pressure.

This project won first place in the "Non-Industrial" Category of the Steel Joist Institute 2002 Design Awards. ★

Paul A. Zilio, P.E. is Vice President of Bliss & Nyitray, Inc. in Miami.