

# STEEL JOISTS & JOIST GIRDERS



**NEW MILLENNIUM**

*A Steel Dynamics Company*



# OVERVIEW

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Steel joists are key components to your roofing and flooring system. New Millennium engineers and manufactures a full range of standard steel joists (K-Series, LH-Series and DLH-Series) plus composite joists (CJ-Series) and joist girders. Our team can provide early design assistance for total-project cost optimization, including optimal joist spacing, member depth and load specification for maximum efficiency. All joists are locally available and manufactured in accordance with the specifications of the Steel Joist Institute.

# CERTIFICATIONS

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A Steel Joist Institute (SJI) member company, New Millennium is fully certified to manufacture K-, LH- and DLH-Series steel joists, and joist girders.

- New Millennium products meet FM, UL and ULC requirements
- The Indiana, Virginia, Florida, Tennessee, Arkansas, Nevada and Arizona facilities are ICC certified
- F, B, N, NW32® and Versa-Dek® 2.0 LS ES, 2.0 LS ESA, 3.5 LS, and 3.5 LSA deck are Factory Mutual approved for use as a component in Class 1-60, 1-75 and 1-90 wind uplift metal roof decking construction
- Steel deck products are approved by Underwriters Laboratory and listed in the UL Fire Resistance Directory
- All acoustical deck has been tested in accordance with ANSI ASTM C423 and E795 to determine the noise reduction coefficient (NRC) rating
- Welders are certified in accordance with AWS D1.1 and D1.3
- The Indiana, Virginia and Nevada facilities meet CSA Standard W47.1 in Division 2 for open-web joists
- The Florida facility has Miami-Dade County approval.
- The Arkansas and Florida facilities are certified in accordance with the Houston, Texas Building Code, section 1704.2.2
- The Nevada and Mexico facilities are certified in accordance with the requirements of Los Angeles
- The Nevada facility is certified in accordance with the requirements of Clark County

# ICC REPORTS

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ICC-ES, a nonprofit organization, evaluates building products and publishes reports that verify they comply with building codes. For complete reports for New Millennium products verified by ICC-ES, visit [www.newmill.com/certifications/certifications.html](http://www.newmill.com/certifications/certifications.html).



## **STANDARD STEEL JOISTS . . . . .3-4**

Steel joist products include K-, LH- and DLH-Series joists, designed and manufactured in accordance with the specifications of the Steel Joist Institute. Joists are available in parallel chord, double-pitched top chord or single-pitched top chord configurations with either underslung or square ends.



## **COMPOSITE JOISTS . . . . . 5-6**

A composite joist (CJ-Series) is a steel joist designed for shear connection to the overlying concrete slab using field-applied shear studs, such that when the decking is filled with concrete, the shear studs become embedded in the hardened concrete, creating a unified load-bearing system that deflects as a single unit.



## **JOIST GIRDERS . . . . .7-8**

Joist girders are open-web steel trusses that serve as primary framing members. They are designed as simple spans to support concentrated loads for a floor or roof system. These concentrated loads are normally considered to act at the top chord panel points of the joist girders.



## **FLUSH FRAME CONNECTIONS . . . .9-10**

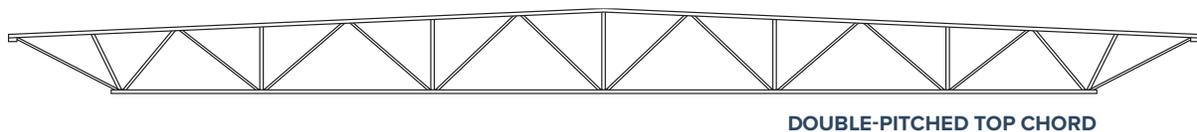
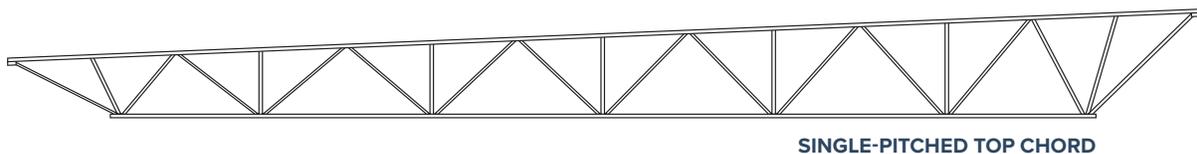
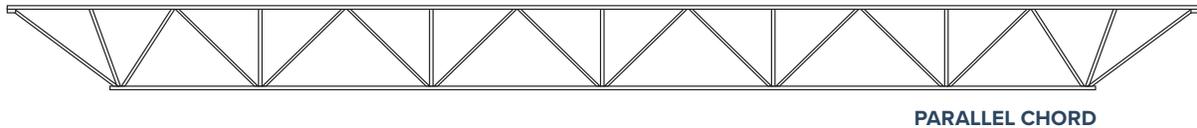
Flush-frame connections are a versatile and efficient method for connecting open-web steel joists to wide-flange girders. In flush-frame connections, the top chord of the joist is flush with the top of the supporting girder. These connections are particularly useful in composite floor systems, including composite joists (CJ-Series).



## STANDARD STEEL JOISTS

Steel joist products include K-, LH- and DLH-Series joists, designed and manufactured in accordance with the specifications of the Steel Joist Institute. Single-piece joists can be produced up to 90' long, with field splices used to increase lengths and depths. Contact your local New Millennium facility.

- LH- and DLH-Series joists available with single-pitched or double-pitched top chords
- Standard SJI camber per table 4.6-1, unless specified otherwise



All standard profile joists are available with either underslung or square ends. The depth indicated in joist designation is determined by the depth of single-pitched joists at the center of span and at the ridgeline of double-pitched joists. When top chord slope exceeds  $\frac{1}{2}:12$ , total and live top chord uniform loads must be provided. All standard profile joists with top chord pitch greater than  $\frac{1}{2}:12$  will be provided with no camber unless otherwise specified in contract documents.

## NEWBAY™ BRIDGING SYSTEM

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NewBay™ steel joist bridging system reduces construction time, giving you a competitive advantage over clamp-and-weld bridging.

- Rapid, single-pass tap screw assembly of bridging members
- Standard hand-tool fastening for speed, convenience and economy
- Joist spans up to 60 feet reduce bridging counts
- Enhanced safety, using fewer parts—no bolting or welding

Bridging goes in more quickly, safely and economically using a single-pass tap screw instead of drilling and bolting or welding. It adapts to the design for all manner of loading conditions, rooftop loading and construction needs. In addition, it alleviates the need for welded termination bridging. The NewBay™ bridging system is available nationwide with the ease of a single point of contact for design, pricing and project management to accommodate even the tightest time frames.

Our economic joist design not only reduces bridging, but it also enhances safety at the job site. Fewer parts are needed, with no welding required. NewBay™ is the non-weld option that owners are looking for to provide flexibility of joists, ease of erection and nationwide availability and pricing.





## COMPOSITE JOISTS (CJ-SERIES)

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A composite joist is a steel joist designed for shear connection to the overlying concrete slab using field-applied shear studs. When the decking is filled with concrete, the shear studs become embedded in the hardened concrete, creating a unified load-bearing system that deflects as a single unit. Composite steel joist design is an example of load and resistance factor design (LRFD). It achieves a higher-density floor structure compared to more conventional methods because structural elements are integrated into one compact joist-and-deck system.

Advantages can include a stronger, stiffer, lighter and less expensive steel structure compared to other structural steel frame approaches. This integrated approach to steel joist and deck design can save time and money on a building project and possibly improve the design of the building. The design also contributes to earlier erection, a potentially shorter construction timeline and earlier building occupancy.

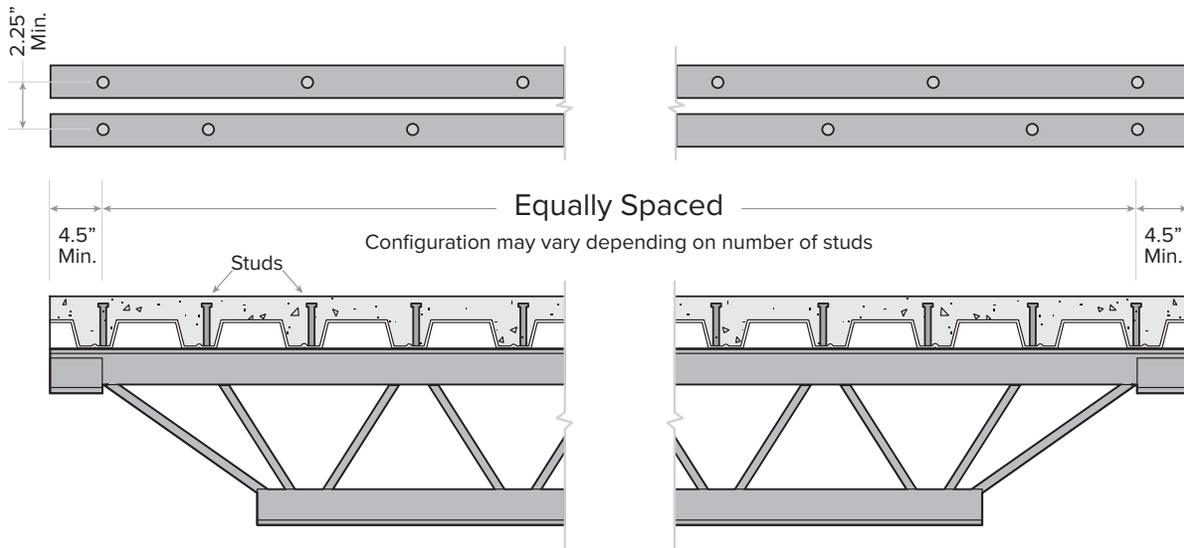
### OTHER ADVANTAGES

- Reductions in steel material and related costs
- Open-web joists allow routing of MEP for lower floor-to-floor height
- Wider-spaced and fewer columns for more open bays
- Stiffer floors for reduced live load deflections
- Shortened construction timeline



Because the concrete slab adds extra strength and the joist alone does not have to support full design loads, top chords can be smaller, thereby reducing material costs. Joists can also be spaced farther apart, translating to cost reductions in steel, manufacturing, shipping and erection.

Using a composite joist narrows the floor, creating more headroom, often with adequate MEP routing options through the joist. Also, shear studs increase joist strength, thereby expanding the span-to-depth ratio limit to 30 times the joist depth, compared to 24 times the joist depth for non-composite joists.



**NEW MILLENNIUM WILL PROVIDE THE PROJECT-SPECIFIC STUD LAYOUT, BASED ON THE COMPOSITE JOIST DESIGN REQUIREMENTS, ON THE PLACEMENT PLANS FOR USE BY THE STEEL ERECTOR.**



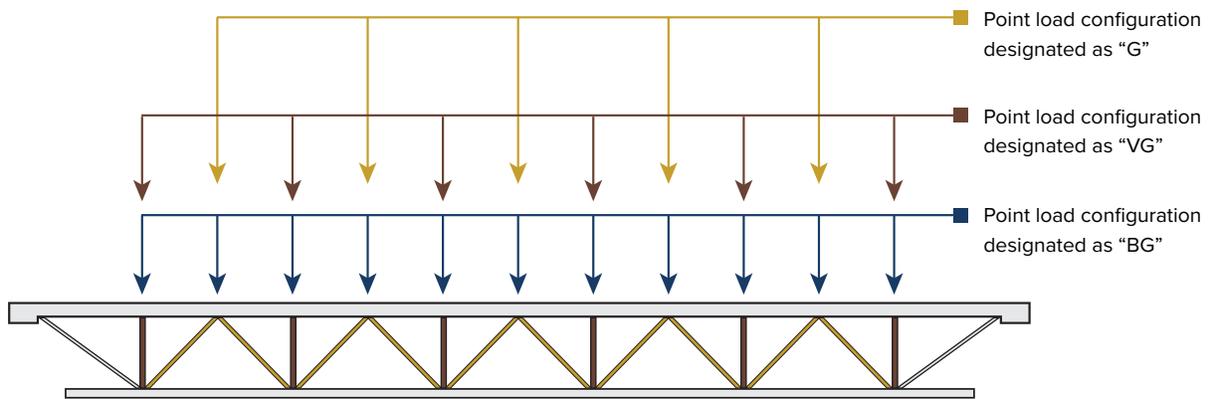


## STEEL JOIST GIRDERS

Joist girders are open-web steel trusses that serve as primary framing members. They are designed as simple spans to support secondary framing members of a floor or roof system. These secondary members are normally located at the top chord panel points of the joist girders.

### OTHER ADVANTAGES

- Often more cost-effective than wide-flange steel beams
- Comparably easier and faster erection
- Open-web design allows for MEP integration
- Standard depths from 20" to 120"
- Standard spans from 20' to 120'
- Available with single-pitched or double-pitched top chords up to 1/2":12"

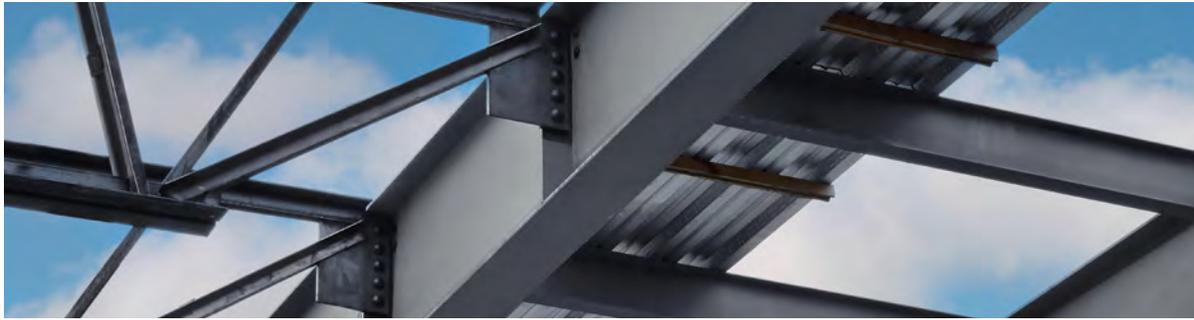


JOIST GIRDERS POINT LOAD CONFIGURATIONS

The design of rigid moment frames using joist girders is very similar to that of wide-flange beams. End fixity is achieved by restraining the rotation at the ends of the joist girders. As with wide-flange beams, there are several methods of achieving this fixity, and for each approach, specific design, fabrication and erection concerns must be considered. With close coordination between the specifying professional and New Millennium, material savings may be achieved without increasing fabrication or erection cost. In some cases, it is possible to attain savings in several phases of the project.

Advantages of using joist girders as part of a lateral load resistant frame include material efficiencies, a more evenly distributed diaphragm load path and decreased erection cost. Material efficiencies may be achieved utilizing joist girder chords in continuity moments as well as lateral frame moments. By collecting the diaphragm loads at each frame line, the diaphragm shear requirements and attachment may be reduced as compared to using braced frames or shear walls at only a few locations.





## FLUSH-FRAME CONNECTIONS

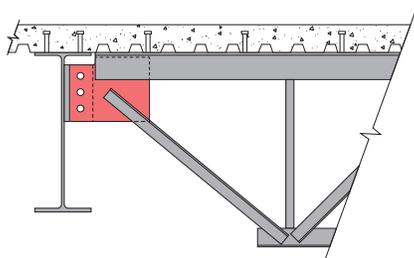
Flush-frame connections are versatile and efficient when connecting open-web steel joists to wide-flange girders. In flush-frame connections, the top chord of the joist is flush with the top of the supporting girder. These connections are particularly useful in composite floor systems, including CJ-Series joists.

Steel joists with flush-frame end connections offer significant weight savings compared to wide-flange beams while providing equivalent floor stiffness and vibration performance. An innovative flush-frame design from the engineers at New Millennium features a joist reaction point designed to occur at the center line of the wide-flange girder. This enhanced design mitigates girder torsion concerns, whether in a perimeter wide-flange girder or due to unequal bay loading on an interior wide-flange girder.

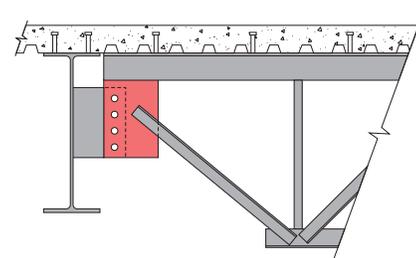
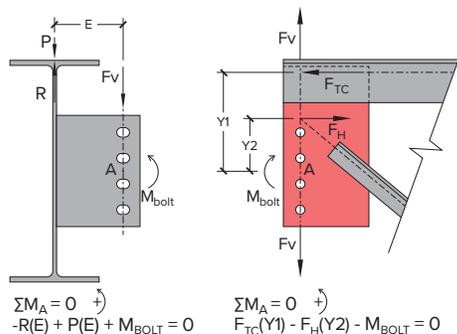
### OTHER ADVANTAGES

- Published set of standards simplify specification
- Eliminates blocking between joist seats for diaphragm shear transfer
- Up to 35% reduction in weight lowers material and construction costs
- Reduced floor-to-floor height with steel joist MEP integration
- Joist camber built into the manufacturing process with no additional time or cost

### STANDARD BOLTED SHEAR CONNECTIONS FOR FLUSH-FRAME JOISTS



UNDER-FLANGE FLUSH-FRAME CONNECTION



EXTENDED-TAB FLUSH-FRAME CONNECTION

- P = Resultant of uniform load which is tributary to the end of the joist ( $\frac{1}{2}$  of the top chord end panel loading, which is not carried by the end web)
- R = Joist end reaction
- E = Distance from the girder  $\zeta$  to bolt  $\zeta$
- $M_{BOLT}$  = Design moment of bolt group ( $R \cdot E$ )
- $F_V$  = Vertical component of end web ( $=R-P$ )
- $F_H$  = Horizontal component of end web ( $=F_{TC}$ )
- $F_{TC}$  = Top chord force ( $=F_H$ )
- Y1 = Distance from top chord centroid to bolt centroid
- Y2 = Distance from intersection of end web centroid and bolt  $\zeta$  to bolt centroid

## UNDER-FLANGE CONNECTIONS

The under-flange connection is designed so the steel joist nests within the wide-flange girder. In this connection, the joist end plate is typically coped to maintain clearance around the flange of the wide-flange girder.

Connection Number	Max Girder Flange Width (in)	Max Joist Vertical LRFD Reaction (kips)	Number of Bolts	Bolt Diameter (in)	Bolt Grade ASTM	Hole Diameter in Joist End Plate (in)	Slot Width in Shear Tab (in)	Slot Length in Shear Tab (in)	Connection Drawing on Website
NMUFC-1	11.50	62	3	1.00	A490-N	1.125	1.125	1.3125	NMUFC-1.pdf
NMUFC-1A	17.50	62	3	1.00	A490-N	1.125	1.125	1.3125	NMUFC-1A.pdf
NMUFC-2	11.50	97	4	1.00	A490-N	1.125	1.125	1.3125	NMUFC-2.pdf
NMUFC-2A	17.50	97	4	1.00	A490-N	1.125	1.125	1.3125	NMUFC-2A.pdf
NMUFC-3	11.50	124	4	1.25	A490-N	1.375	1.375	1.625	NMUFC-3.pdf
NMUFC-3A	17.50	124	4	1.25	A490-N	1.375	1.375	1.625	NMUFC-3A.pdf

## EXTENDED TAB CONNECTIONS

Extended-tab connections are designed to facilitate quicker, easier erection of steel joists and eliminate the coping necessary to the under-flange connection. In this connection, the shear tab on the wide-flange beam extends beyond the flange of the beam, allowing the joist to be placed without needing to rotate it into position. This is beneficial when multiple joists are panelized on the ground and lifted into place as a unit.

Connection Number	Max Girder Flange Width (in)	Max Joist Vertical LRFD Reaction (kips)	Number of Bolts	Bolt Diameter (in)	Bolt Grade ASTM	Hole Diameter in Joist End Plate (in)	Slot Width in Shear Tab (in)	Slot Length in Shear Tab (in)	Connection Drawing on Website
NMETC-1	11.50	26	3	1.00	A490-N	1.125	1.125	1.3125	NMETC-1.pdf
NMETC-2	11.50	47	4	1.00	A490-N	1.125	1.125	1.3125	NMETC-2.pdf
NMETC-2A	17.50	35	4	1.00	A490-N	1.125	1.125	1.3125	NMETC-2A.pdf
NMETC-3	11.50	74	4	1.25	A490-N	1.375	1.375	1.625	NMETC-3.pdf
NMETC-3A	17.50	55	4	1.25	A490-N	1.375	1.375	1.625	NMETC-3A.pdf
NMETC-4	11.50	109	5	1.25	A490-N	1.375	1.375	1.625	NMETC-4.pdf
NMETC-4A	17.50	82	5	1.25	A490-N	1.375	1.375	1.625	NMETC-4A.pdf
NMETC-5	11.50	136	6	1.25	A490-N	1.375	1.375	1.625	NMETC-5.pdf
NMETC-5A	17.50	113	6	1.25	A490-N	1.375	1.375	1.625	NMETC-5A.pdf



# YOUR NATIONWIDE PARTNER FOR STEEL JOISTS AND DECK SUPPLY

New Millennium steel fabrication plants serve commercial and multistory residential construction projects across the United States.

Our state-of-the-art facilities and national operating footprint enable us to supply the entire domestic construction market with steel joists, joist girders, and a broad selection of steel roof and composite floor deck panels.



## LOCATIONS

### Headquarters

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Fort Wayne, IN 46802  
Phone: 260.321.8080

### Indiana

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Butler, IN 46721  
Phone: 260.868.6000  
Fax: 260.868.6001

### Nevada

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Fallon, NV 89406  
Phone: 775.867.2130  
Fax: 775.867.2169

### Arkansas

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Phone: 870.722.4100  
Fax: 870.722.4245

### Mexico

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Colonia Puente Alto 32695  
Cd. Juarez, Chihuahua  
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Fax: 915.298.4040

### Florida

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### Tennessee

4900 Hungerford Road  
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Phone: 901.969.3033  
Fax: 901.375.1547

### Virginia

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Phone: 540.389.0211  
Fax: 540.389.0378



**NEW MILLENNIUM**

*A Steel Dynamics Company*

BUILDING SUCCESS TOGETHER  
newmill.com

A division of Steel Dynamics Inc., we engineer and manufacture a full range of steel joist and deck for commercial construction projects. We work with you right from the start, resulting in the efficient selection, engineering and supply of the optimal system for your project.