Steel Joists, Joist Girders and Steel Deck

Design Tools

Presented by NUCOR/Vulcraft
with
Contributions by the Steel Joist Institute

Topics

- Vulcraft Design Tools
- Steel Joist Institute Design Tools
- Design Examples using Tools

Vulcraft Design Tools

Joist Design Tools

- Joist Depth Selection Aid
- Joist Tie-Plate Connection Design
- Composite Joist Floor System Aid
- Vibration Analysis – Walking
- Joist Analysis Aid
- **2018 IBC Deck Diaphragm (Will be demonstrated)**
- Steel Deck Uniform Load
- Steel Deck Roving Load
- Web Crippling Loads
- 2015 IBC Deck Diaphragm
- Expansion Joints in Buildings

Floor Deck Design Tools

- Unshored Span Calculator
- Deck-Slab Diaphragm Strength
- Composite Deck-Slab Strength

Vulcraft Joist Design Tools

Tool	Use
Joist Depth Selection Aid	To determine the most economical depth for joists for given span, spacing and loading (ASD).
Joist Tie-Plate Connection Design	Tool provides calculations and information to specify ties to transfer axial forces between joists (LRFD or ASD).
Composite Joist Floor System Aid	Tool provides specification guidance, estimated dead loads, stud quantities, bridging, and maximum sizes for ductwork (LRFD)
Vibration Analysis – Walking	Analyses of floor systems for Vibration based on Walking criteria using SJI TD5 and AISC DG11.
Joist Analysis Aid	Provides shear and moment diagrams for uniform loads and point loads.
2018 IBC Deck Diaphragm	Calculates unfilled deck diaphragm shear and stiffness for your exact condition based on the American Iron and Steel Institute AISI S310-16.

Vulcraft Joist Design Tools

Tool	Use
Steel Deck Uniform Load	Determines uniform gravity and wind-uplift load for steel deck based on strength, deflection, and attachments.
Steel Deck Roving Load	Calculates the concentrated roving load that may be applied to any rib of the selected roof deck.
Web Crippling Loads	Calculates one flange and two flange web crippling loads based on AISI S100-16.
2015 IBC Deck Diaphragm	Calculates unfilled deck diaphragm shear and stiffness for your exact condition based on the "Steel Deck Institute Diaphragm Design Manual, Third Edition" (DDM03).
Expansion Joints in Buildings	Provides expansion joint design information
Unshored Span Calculator	Calculates maximum unshored span for thick slabs based on your design criteria.
Deck-Slab Diaphragm Strength	Calculates deck-slab diaphragm strength and stiffness for selected deck profiles based on AISI S310-16.
Composite Deck-Slab Strength	Creates custom composite deck-slab strength and maximum unshored span tables for selected composite deck profiles.

SJI Design Tools

Joist Design Tools

- Historical Load Tables
- Joist and Joist Girder Reinforcement
- **Roof Bay Analysis (Will be demonstrated)**
- **Floor Bay Analysis (Will be demonstrated)**
- Joist Girder Moment Connections
- Virtual Joists
- Virtual Joist Girders
- Joist Investigation Form
- Floor Vibration Analysis

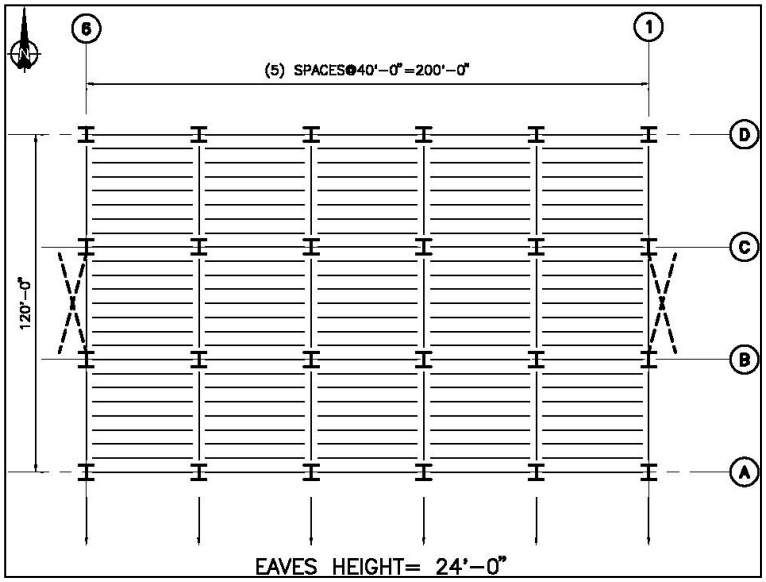
SJI Joist Design Tools

Tool	Use
Historical Load Tables	Provides historical information on joists and Joist Girders
Joist and JG Reinforcement	Spreadsheets are provided to assist the Design Professional in reinforcing joists and Joist Girders
Roof Bay Analysis	Assists the structural engineer in determining optimum bay sizes and in performing ponding analysis.
Floor Bay Analysis	Assists the structural engineer in determining optimum floor bay size.
JG Moment Connections	Spreadsheets are provided to assist the with the design of connections between Joist Girders and columns. The tool can be utilized for wide flange and HSS columns.
Virtual Joists	A table provides the approximate section properties for Virtual Joists in preparing the building structural models.
Virtual Joist Girders	A table provides the approximate section properties for Virtual Joist Girders in preparing structural models.
Joist Investigation Form	Using the form SJI will help you make a proper match of your joist information with historical files.

Demonstrated Examples

1. 2018 IBC Deck Diaphragm Calculator
2. Roof Bay Analysis Tool
3. Floor Bay Analysis Tool

Example 1: Deck-Slab Diaphragm Calculator



Results and input from the previous presentation on diaphragms

Steel deck:	1.5B22 (0.0295 in. thickness)
Support fasteners:	5/8 in. puddle weld, 36/4 pattern
Side-laps:	(1) #10 Tek screw side-lap connection
Deck support:	Joists spaced at 5 ft center-to-center
Uplift	30 psf

Maximum Shear on Grid Lines 1 and 6 = **200** plf

Demonstration of the Vulcraft Tools

To access the Vulcraft tools, go to the Vulcraft Website.

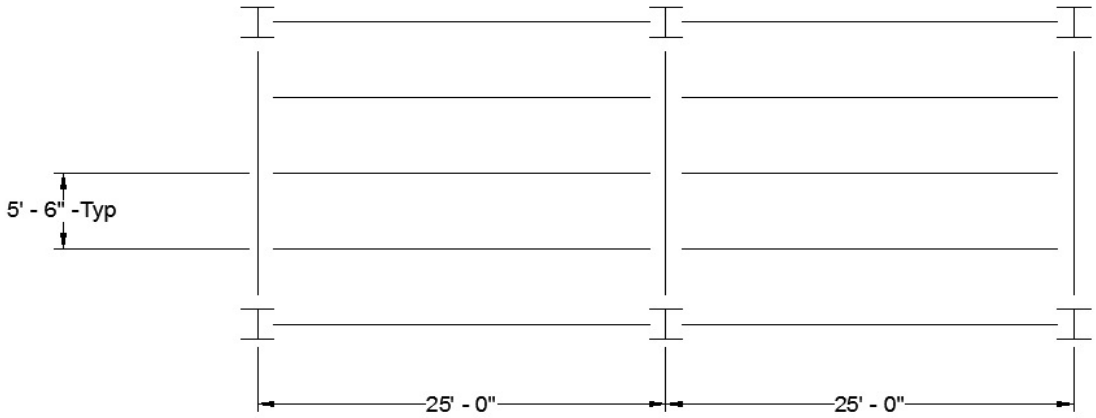
If it is the first time you have gone to the Website, you will have to register on the site by providing your email and providing a password.

Example 1: 2018 IBC Deck Diaphragm Tool

Load the 2018 IBC Deck Diaphragm Tool

Vulcraft Design Tools

Example 2: SJI Roof Bay Analysis Tool



Selection of a K-Series Joist

Given:

Roof Dead Load = 30 psf

Roof Live Loads = 20 psf (Unreducible)

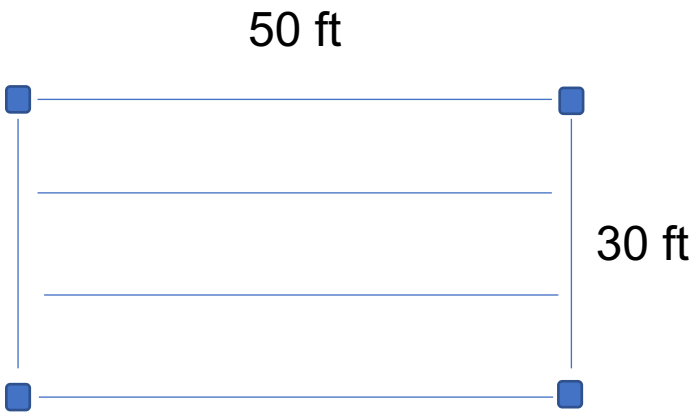
Snow Load = 35 psf

Snow Load Deflection Limit L/240

Download the SJI Roof Bay Analysis Tool

SJI Roof Bay Analysis

Example 3: SJI Floor Bay Analysis Tool



Compare an LH-Series joist to a Composite Joist

Given:

Try 3 VLI 20 composite deck

Use 5.5 in. (total depth), normal weight concrete

Loads:

Dead Load = 15 psf

Live Load = 80 psf

Download the SJI Floor Bay Analysis Tool

SJI Floor Bay Design

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