

Steel Joists, Joist Girders and Steel Deck

Design Hints and Design References

**Presented by NUCOR/Vulcraft
with contributions by the Steel Joist Institute**



Topics

- Design Hints
- Quips to Remember
- Design References and Publications

See Chapter 4



Steel Joists and Joist Girders

Design Hints – Steel Joists and Joist Girders



Design Hints

- Determine bay size and dimensions
 - Bay proportions and roof diaphragm considerations
 - Short spans (HSS, Channels)
 - Direction of main members vs. secondary members
 - Roof Drainage
- Select the serviceability criteria for the framing members (typically span/240)
- Determine any loss prevention requirements from the owner or architect such as Factory Mutual (FM Global) requirements for deck span
- Determine the loads on the structure
- Select the roof deck, joists and joist girders based on their required strength and serviceability requirements



A few design quips to guide you...

- ***Keep it Simple, Stupid (KISS)***: Some poor soul is going to erect your design in the blazing heat of the day or in the freezing cold. Complexity is the last thing the worker needs to worry about
- ***Be a ksi***: Imagine your self a “ksi” (unit of stress) on a journey from one part of the structure down to the earth. You must be able to find your way through every member, every connection, every weld, every bolt, every screw, without being overstressed. We now call this ***load path***



A few design quips to guide you...

- ***The Trickle Theory.*** The trickle theory is the opposite of tracking loads through the structure. The trickle theory presumes that the “ksi” will go somewhere and find its way to the earth without engineering analysis. Don't practice the trickle theory
- ***If it works don't mess with it.*** There is great wisdom and judgment in this statement. A proven design will work any multitude of times so long as the scale of the structure does not change
- ***You cannot do just one stupid thing in the design.*** Once you use bad judgment in a design, additional bad decisions will have to be made



A few design quips to guide you...

- ***Learn from your failures.*** It's the best way to learn good judgment
- ***Less is more.*** (Mies van der Rohe, Illinois Institute of Technology) Similar to KISS, but more eloquent
- ***God is in the details.*** (Mies van der Rohe, Illinois Institute of Technology) The details are the design
- ***If it looks good, it probably is good.*** A part of judgment. Proportions often indicate if a structure or structural component is designed correctly



A few design quips to guide you...

- ***Don't worship the "weight god."*** Least weight is rarely least cost
- ***If you can't rough it out on an envelope, you shouldn't design it.*** (Bill Lemessurier, Lemessurier Consultants) Again, this is judgment. You should know the answer to the problem before you start with a sophisticated analysis
- ***Strive for structural simplicity.*** (Fazlur Khan, SOM)
- ***Don't get lost in your own technology.*** (Fazlur Khan, SOM)



Get to the Jobsite

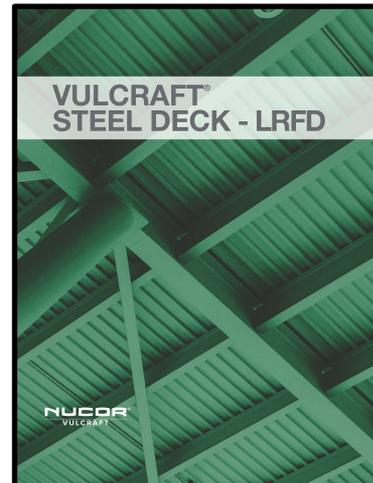
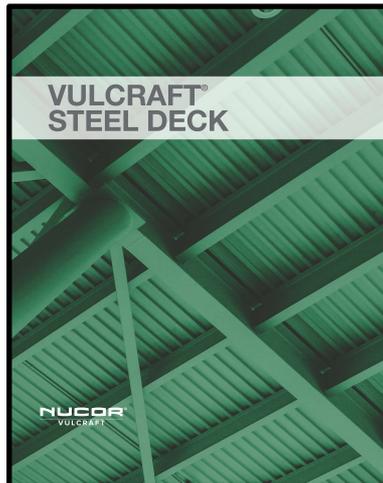
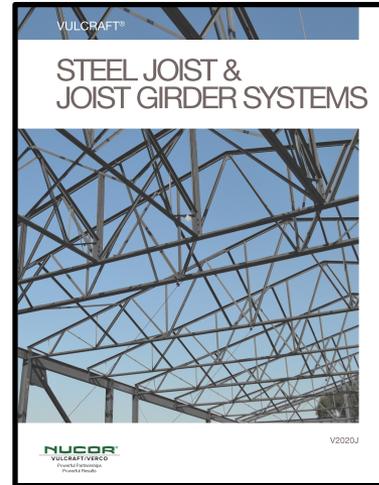
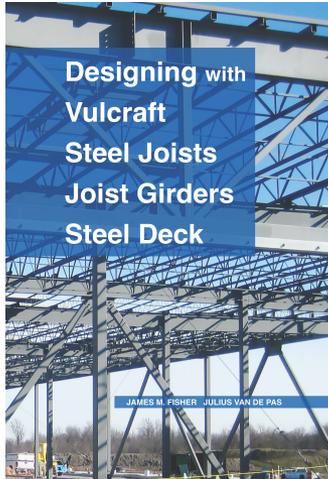


Design References



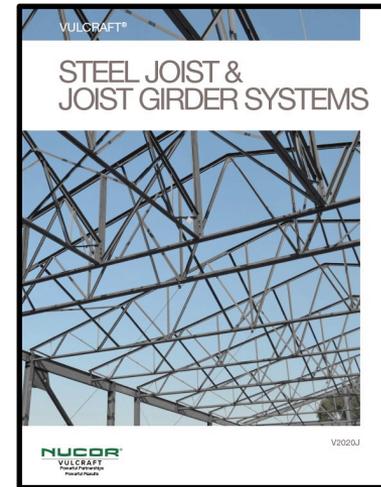
Nucor/Vulcraft Publications

Vulcraft Literature



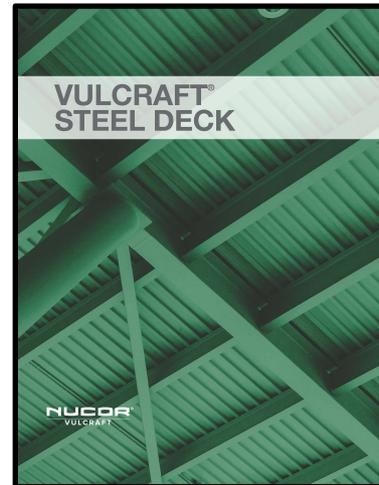
Steel Joist and Joist Girder Systems

- Joist Design Information (Joist Schedules)
 - Uplift Design
 - Serviceability
 - Floor Vibration Bridging Information
 - Floor Joists
 - Economical Joist Guide
 - Code of Standard Practice
 - Standard Specification
 - Load Tables for K, KCS, TCX, Joist Substitutes, LH, DLH-Series, and Joist Girders
 - Appendix A Fire Resistance
 - Appendix B OSHA Standards
- Plus, Many additional topics



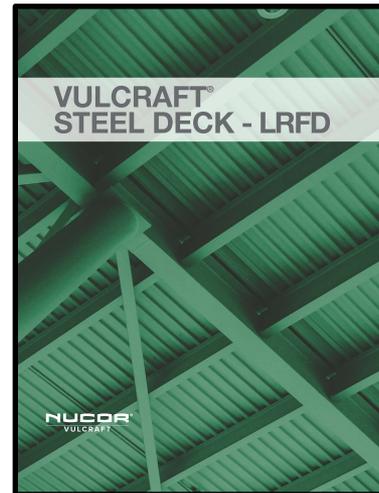
Vulcraft Steel Deck

- Roof Deck (Properties and Vertical Load Tables)
- Composite Deck (Properties and Superimposed Load Tables)
- Non-Composite Deck (Properties and Vertical Load Tables)
- Cellular Deck (Properties Tables)



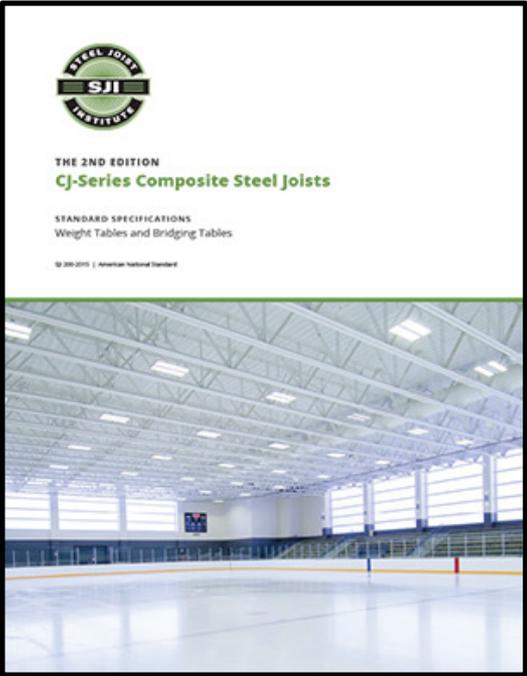
Vulcraft Steel Deck - LRFD

- LRFD Roof Deck (Properties and Vertical Load Tables)
- LRFD Composite Deck (Properties and Superimposed Load Tables)
- LRFD Non-Composite Deck (Properties and Vertical Load Tables)
- LRFD Cellular Deck (Properties Tables)



SJI Catalogs

SJI Publications



Second Edition CJ-Series Composite Steel Joists



45th Edition Standard Specifications Load Tables and Weight Tables for Steel Joists and Joist Girders



SJI Publications –Technical Digests

- TD No. 3 Structural Design of Steel Joist Roofs to Resist Ponding Loads (February 2018)
- TD No. 5 Vibration of Steel Joist – Concrete Slab Floors (January 2015)
- TD No. 6 Structural Design of Steel Joist Roofs to Resist Uplift Loads (April 2012)
- TD No. 8 Welding of Open Web Steel Joists (July 2020)
- TD No. 9 Handling and Erection of Steel Joists and Joist Girders (March 2008)



SJI Publications –Technical Digests

- TD No. 10 Design of Fire Resistive Assemblies with Steel Joists (2003)
- TD No. 11 Design of Lateral Load Resisting Frames Using Steel Joists and Joist Girders (November 2020)
- TD No. 12 Evaluation and Modification of Existing Steel Joists and Joist Girders (July 2020)



NUCOR®

VULCRAFT/VERCO

