Delegated Design and the Role of the Designer of Record

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Presented by:

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Nucor-Vulcraft

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Webinar Description

It is common for the engineer of record (EOR) to delegate design responsibility for aspects of the project to a specialty engineer or for specific products to the product manufacturer's engineer. This presentation will discuss the roles and responsibilities between the EOR and specialty engineer or a specific product engineer. This session will discuss the overlapping areas of responsibilities and the areas where gaps often occur. The IBC gives general direction and key aspects to follow. This presentation will discuss ways to clearly establish roles and responsibilities of each and how to denote these roles and responsibilities.

Learning Objectives

- The EOR's responsibility
- Reasons and materials that could be delegated
- Methods to communicate roles, including direct communication, clarifying gray areas, and resolving concerns and conflicts
- Examples
- What works and learning from each other; capturing, validating and implementing methods that work

Who is attending this webinar

What is the primary role that you normally fill in the construction process:

A. Structural Engineer

B. Delegated Design Engineer

C. General Contractor

D. Steel Erector

E. Steel Fabricator

Delegated Design and the role of the Designer of Record

- 1967 all day lift ticket price at Park City, Utah - $5.00
- Other resorts in the area were about 50% of Park City.
- 2022 all day lift ticket price at Park City, Utah - $213.00

Delegated Design and the role of the Designer of Record

- Park City ski resort opened in 1963 for skiing
- Longest Gondola in North America
- This Gondola was a delegated design.

Delegated Design and the role of the Designer of Record

This presentation will be different than most

- No absolutes
- Negotiated solutions
- No one expert
- Learn from each other

Solicit information from audience by answering questions and showing the results

Ask for comments in the chat box – reference slide

Delegated Design and the role of the Designer of Record

Learning Objectives:

- Discuss EOR's responsibility
- Discuss reasons and materials that could be delegated
- Discuss methods to communicate roles
  - Direct communication
  - Clarify gray areas
  - Resolve concerns and conflicts
- Examples
- Discuss what works – Learn from each other
  - How to capture, validate and implement new ideas?

Avoid the surprise

- Whereas a “surprise”, bearing good fortune is greatly appreciated, surprises in the process of construction almost never bear good fortune and are not appreciated.
- One way to eliminate surprises is to pay close attention to items where the Design Professional of Record delegates the design of both structural and non-structural products or services.

EOR has full responsibility for the structure

Always required:

- Building Use Building Permit
- Defining the structural system
- Materials Used – Wood, Steel, Concrete
- Define the loads based on building code requirements
  - Environmental - Snow and Rain
  - Specific for materials - Dead loads
  - System – Seismic & Wind
- Foundation Requirements
- Drawings, Notes and Specs
- Submittals and Approvals
- Manufacturing Certifications

Advantages to delegate aspects of the design

- EOR can expand the **Knowledge Base** for the project, for knowledge the EOR may not have.
- Efficiencies and costs from component suppliers
- Expertise of component engineers
- Value engineering
- Proprietary Software

EOR conducts the band

Specialty Structural Products where delegated design is common:

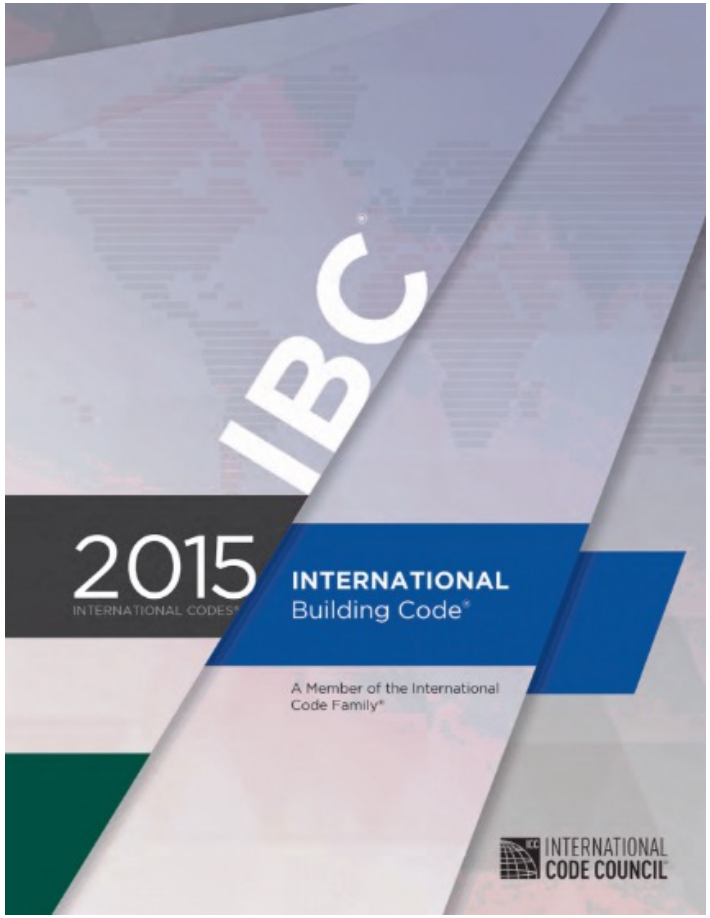
- Precast concrete
- Open web steel joist and deck
- Metal-plate-connected wood trusses
- BRB braces and connections
- Connections
- Some piers and Caissons

EOR conducts the band

Specialty Non-Structural Products where delegated design is common:

- Structural Steel Stairs
- Metal studs
- Insulated metal panels
- Fire Suppression
- Seismic Braces
  - Arch, Mech, Plumbing and Electrical items

Building codes - IBC



The *registered design professional in responsible charge* shall be responsible for reviewing and coordinating submittal documents prepared by others, including phased and deferred submittal items, for compatibility with the design of the building.

[A] 107.3.4.1 Deferred submittals. Deferral of any submittal items shall have the prior approval of the *building official*. The *registered design professional in responsible charge* shall list the deferred submittals on the *construction documents* for review by the *building official*.

Building codes – IBC Joist requirements

STEEL JOISTS

2207.1 General. The design, manufacture and use of open-web steel joists and joist girders shall be in accordance with one of the following Steel Joist Institute (SJI) specifications:

1. SJI CJ
2. SJI K
3. SJI LH/DLH
4. SJI JG

2207.1.1 Seismic design. Where required, the seismic design of buildings shall be in accordance with the additional provisions of Section 2205.2 or 2211.6.

2207.2 Design. The *registered design professional* shall indicate on the *construction documents* the steel joist and steel joist girder designations from the specifications listed in Section 2207.1; and shall indicate the requirements for joist and joist girder design, layout, end supports, anchorage, bridging design that differs from the SJI specifications listed in Section 2207.1, bridging termination connections and bearing connection design to resist uplift and lateral loads. These documents shall indicate special requirements as follows:

1. Special loads including:
    1.1. Concentrated loads.
    1.2. Nonuniform loads.

1705.2.3 Open-web steel joists and joist girders. *Special inspections* of open-web steel joists and joist girders in buildings, structures and portions thereof shall be in accordance with Table 1705.2.3.

TABLE 1705.2.3
REQUIRED SPECIAL INSPECTIONS OF OPEN-WEB STEEL JOISTS AND JOIST GIRDERS

TYPE	CONTINUOUS SPECIAL INSPECTION	PERIODIC SPECIAL INSPECTION	REFERENCED STANDARD[a]
1. Installation of open-web steel joists and joist girders.			
a. End connections – welding or bolted.	—	X	SJI specifications listed in Section 2207.1.
b. Bridging – horizontal or diagonal.	—		
1. Standard bridging.	—	X	SJI specifications listed in Section 2207.1.
2. Bridging that differs from the SJI specifications listed in Section 2207.1.		X	

For SI: 1 inch = 25.4 mm.
a. Where applicable, see also Section 1705.12, Special inspections for seismic resistance.

The structure can be the easy part

- HVAC
- Fire suppression
- Fire codes
- Fueling station requirements
- Mechanical systems

Structural Engineers – Drawing Notes

S. STRUCTURAL DELEGATED DESIGNS AND DEFERRED SUBMITTALS

1. STRUCTURAL DELEGATED DESIGNS AND SUBSEQUENT DEFERRED SUBMITTALS ARE FOR ELEMENTS, PARTS, OR PORTIONS OF THE OVERALL STRUCTURAL SYSTEM THAT ARE INDICATED OR REFERRED TO ON THESE DRAWINGS AND THAT ARE CRITICAL TO THE PERFORMANCE OF THE OVERALL STRUCTURAL SYSTEM. DESIGN CRITERIA HAS BEEN PROVIDED FOR THESE ITEMS IN THE STRUCTURAL NOTES, PLANS, AND DETAILS.
2. STRUCTURAL DEFERRED SUBMITTALS ARE COMPLETE PACKAGES TO BE SUBMITTED FOR REVIEW THAT INCLUDE DRAWINGS AND CALCULATIONS FOR ALL DELEGATED DESIGN ITEMS AND THEIR CONNECTIONS. DEFERRED SUBMITTALS SHALL BEAR THE STAMP AND SIGNATURE OF THE DESIGN PROFESSIONAL RESPONSIBLE FOR THEIR DESIGN.
3. ARW ENGINEERS WILL REVIEW STRUCTURAL DEFERRED SUBMITTALS TO VERIFY DESIGN CRITERIA IS COMPLIANT WITH THE APPROVED CONSTRUCTION DOCUMENTS.
4. STRUCTURAL DELEGATED DESIGN COMPONENTS SHALL NOT BE INSTALLED UNTIL APPROVED BY THE BUILDING OFFICIAL.
5. STRUCTURAL DELEGATED DESIGN ITEMS REQUIRING DEFERRED SUBMITTALS INCLUDE, BUT ARE NOT LIMITED TO :
   a. OPEN WEB JOISTS & GIRDERS, BRIDGING, BRACING, CONNECTIONS, AND RELATED COMPONENTS.
   b. METAL-PLATE-CONNECTED WOOD TRUSSES, BLOCKING, BRIDGING, BRIDGING CONNECTIONS, TRUSS HANGERS, AND RELATED COMPONENTS.
   c. TILT-UP CONCRETE WALL PANELS THAT ARE PART OF THE PRIMARY STRUCTURAL SYSTEM.
   d. PRE-CAST CONCRETE ELEMENTS AND THEIR CONNECTIONS.
   e. CASTELLATED OR CELLULAR BEAMS.
   f. BRB BRACES, GUSSET PLATES, AND CONNECTIONS. THESE DESIGNS SHALL BE BASED UPON QUALIFIED CYCLIC TESTS IN ACCORDANCE WITH SECTION K3 OF AISC 341-16.
   g. HELICAL PIERS / MICRO PILES (SHALL INCLUDE, BUT NOT BE LIMITED TO, PIER LAY-OUT, QUANTITIES, SHAFT AND HELIX SIZES, FOUNDATION CONNECTION REQUIREMENTS, TEST PIER REQUIREMENTS, APPLIED SAFETY FACTORS, ETC.).
   h. DISPLACEMENT RAMMED AGGREGATE PIERS.
   i. CAST-IN-PLACE CONCRETE CAISSONS (SHALL INCLUDE CAISSON LAY-OUT, QUANTITIES, SHAFT SIZES, TEST REQUIREMENTS, DETAILS SHOWING ATTACHMENT OF CAISSONS TO GRADE BEAMS, PILE CAPS, AND FOUNDATIONS, ETC.).
   j. CARBON/GLASS FIBER REINFORCING

Question for Structural Deferred Submittals

Which products typically seem to be the most difficult to manage:

A. Steel joists

B. Wood trusses

C. Tilt up concrete

D. Precast concrete

E. BRB and associated connections

Structural Engineers – Drawing Notes

T. NON-STRUCTURAL DELEGATED DESIGNS AND DEFERRED SUBMITTALS

1. NON-STRUCTURAL DELEGATED DESIGNS AND SUBSEQUENT DEFERRED SUBMITTALS ARE FOR ITEMS NOT INCLUDED IN THE STRUCTURAL DELEGATED DESIGN SECTION. THESE ARE ITEMS THAT ARE NOT CRITICAL TO THE OVERALL PERFORMANCE OF THE STRUCTURAL SYSTEM BUT THAT IMPART LOADS AND FORCES TO THE STRUCTURAL SYSTEM.
2. NON-STRUCTURAL DEFERRED SUBMITTALS SHALL BEAR THE STAMP AND SIGNATURE OF THE DESIGN PROFESSIONAL RESPONSIBLE FOR THE DESIGN.
3. ARW ENGINEERS WILL REVIEW NON-STRUCTURAL DEFERRED SUBMITTALS TO VERIFY DESIGN CRITERIA IS COMPLIANT WITH THE APPROVED CONSTRUCTION DOCUMENTS.
4. IF THE STRUCTURAL DRAWINGS INCLUDE LOADS TO ACCOMMODATE NON-STRUCTURAL ELEMENTS, THE CONTRACTOR SHALL SUBMIT DOCUMENTATION INDICATING THAT THE NON-STRUCTURAL ELEMENTS COMPLY WITH THE LOADING CRITERIA PROVIDED HEREIN. SUCH DOCUMENTATION SHALL BEAR THE STAMP AND SIGNATURE OF THE DESIGN PROFESSIONAL RESPONSIBLE FOR THE DESIGN.
5. WHEN THE NON-STRUCTURAL DEFERRED SUBMITTAL INDICATES THAT THE ELEMENT WILL IMPART FORCES IN EXCESS OF LOADS THAT ARE INDICATED ON THE STRUCTURAL DRAWINGS, THE CONTRACTOR SHALL SUBMIT A DETAILED GRAPHICAL REPRESENTATION OF THOSE DESIGN LOADS, INCLUDING MAGNITUDE, AND LOCATION. THE GRAPHIC SHALL BE ACCOMPANIED BY DOCUMENTATION INDICATING THAT THE NON-STRUCTURAL ELEMENT DESIGN COMPLIES WITH THE LOADING CRITERIA PROVIDED HEREIN. THE LETTER SHALL BEAR THE STAMP AND SIGNATURE OF THE DESIGN PROFESSIONAL RESPONSIBLE FOR THE DESIGN.
6. NON-STRUCTURAL DELEGATED DESIGN ITEMS REQUIRING DEFERRED SUBMITTALS SHALL INCLUDE, BUT ARE NOT LIMITED TO :
   a. COLD FORMED STEEL STUDS / JOISTS / HEADERS / JAMBS / TRUSSES.
   b. SEISMIC BRACING OF ALL ARCHITECTURAL, MECHANICAL, PLUMBING, AND ELECTRICAL ITEMS WHERE REQUIRED BY THE MOST RECENT VERSION OF ASCE 7 AND THE PROJECT CONTRACT DOCUMENTS.
   c. STRUCTURAL STEEL STAIRS.
   d. INSULATED METAL PANELS.

Question for Non-Structural Deferred Submittals

Which products typically seem to be the most difficult to manage:

A. Cold form steel products

B. Seismic bracing for the trades

C. Structural steel stairs

D. Insulated metal panels

E. All of the above

What are the biggest problems?

What seems to be the biggest problems with delegated design?

A. Complete submittal documents

B. Delegated design products meeting your requirements

C. Completing the review on time

D. Changing scope of product

E. All of the above

Sub-Contractor surprise

- What is allowed?
- Where are the boundaries?

Defining the gray

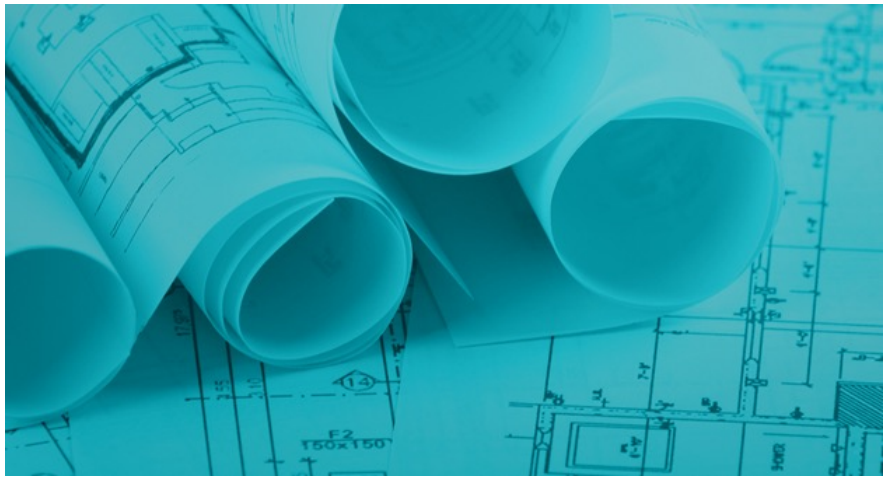
Drawings, notes and specifications to define scope and requirements.

- Reference Industry Specs
- Reference Manufacture Requirements.
- Submittal requirements.
- Oversight requirements.
- Building code requirements.
  - Deferred submittal
- Schedule
- Codes of Standard Practice

Following rules versus breaking the rules

Define the gray areas

- Contract drawings – notes
- Specifications
- Approval documents
- Final documents
- Communication protocols
- Common breakdowns



What are your best practices

What practices have you found to be effective for communication:

A. Tailoring notes to individual projects

B. Preconstruction meetings

C. Developing relationships with deferred submittal engineers

D. Ask about the concerns of the delegated design engineer

E. Call the DD Engineer about approval drawings questions

Effective communication

- Consider making improvements
- Drawings
- Specifications
- Drawings notes
- Protocols

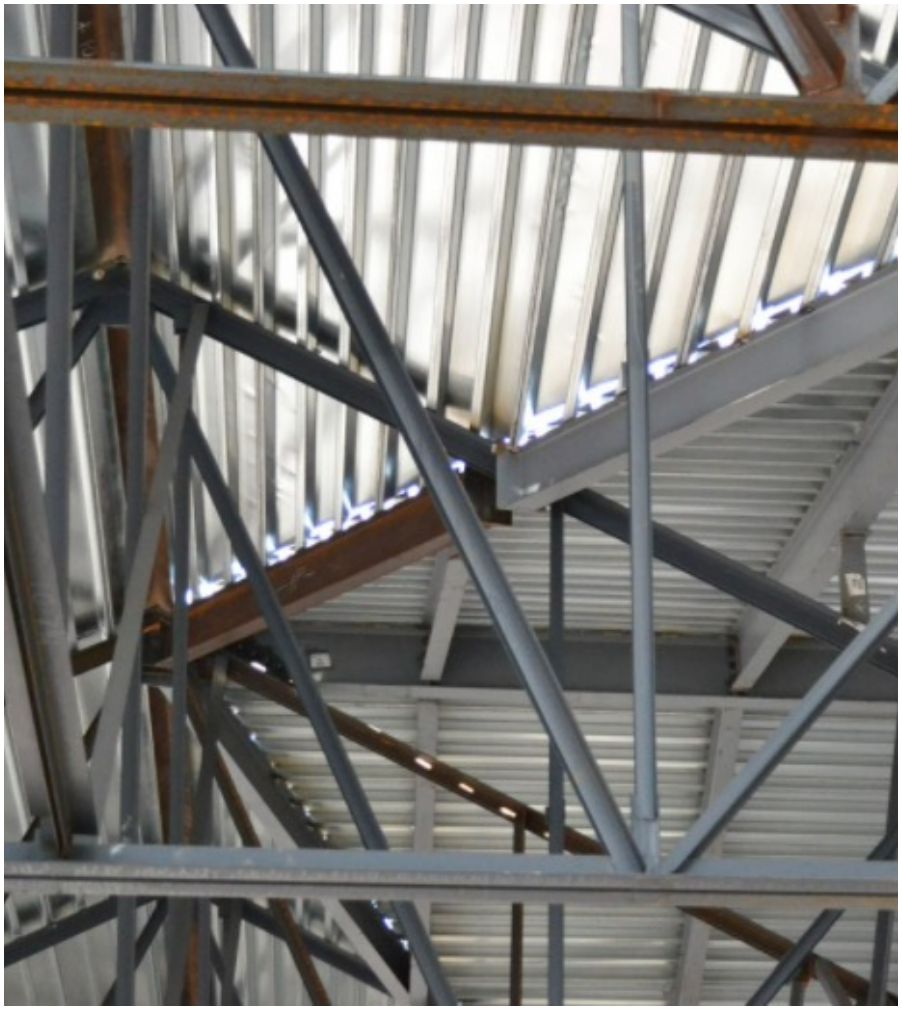
– "Communication skills — such as business writing, technical writing, public speaking, and presentation preparation — are ***crucial*** for success as engineers work in and among more varied groups.

Schedule – ally versus enemy or both

- Communication
  - Meetings
  - RFI's
  - Emails
  - Phone calls
  - Before or at approval
- Approval
  - Return times
  - Response to information requests
- Intertrade Communication

Perspective of the component supplier

- Define the general and specialty loads
- Define deflection
- Define any special load cases
- Use Code of Standard Practices
- Define the geometry (depth, span etc.)
- Define how trades are to communicate
- Clearly define where supplier is free to operate
- Connections



Perspective of the component supplier

- Use Code of Standard Practices

CODE OF STANDARD PRACTICE
FOR STEEL JOISTS AND JOIST GIRDERS

Adopted by the Steel Joist Institute April 7, 1931
Revised to Nov. 10, 2014 - Effective Jan.1, 2015

SECTION 1.
GENERAL

1.1 SCOPE

The practices and customs set forth herein are in accordance with good engineering practice, tend to ensure safety in steel joist and Joist Girder construction, and are standard within the industry. There shall be no conflict between this code and any legal building regulation. This code shall only supplement and amplify such laws. Unless specific provisions to the contrary are made in a contract for the purchase of steel joists or Joist Girders, this code is understood to govern the interpretation of such a contract.

1.2 APPLICATION

This Code of Standard Practice is to govern as a standard unless otherwise covered in the architects' and engineers' plans and specifications.

1.3 DEFINITIONS

Add-Load. A single vertical concentrated load that occurs at any one panel point along the joist chord. This load is in addition to any other gravity loads specified.

Bend-Check Load. A vertical concentrated load used to design the joist chord for the additional bending stresses resulting from this load being applied at any location between the joist panel points. This load shall already be accounted for in the specified joist designation load, uniform load, or Add-Load and is used only for the additional bending check in the chord and does not contribute to the overall axial forces within the joist. An ideal use of this is for incidental loads which have already been accounted for in the design loading but may induce additional bending stress due to this load occurring at any location along the chord.

Buyer. The entity that has agreed to purchase Material from the manufacturer and has also agreed to the terms of sale.

Erector. The entity that is responsible for the safe and proper erection of the materials in accordance with all applicable codes and regulations.

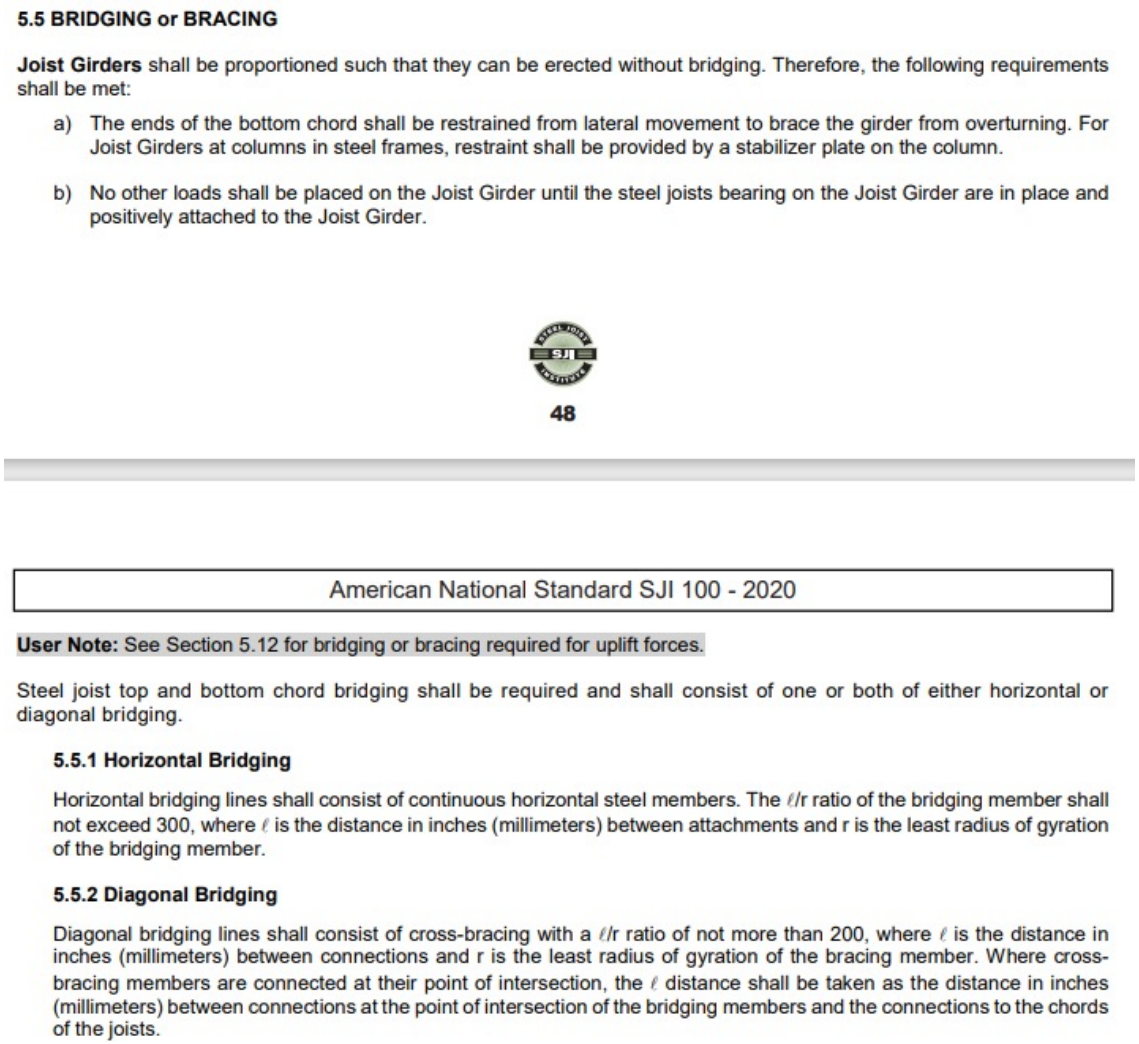
Material. Steel joists, Joist Girders and accessories as provided by the seller.

Owner. The entity that is identified as such in the contract documents.

Perspective of the component supplier

- Clearly define where supplier is free to operate

  Example is Bridging: Provide bridging in accordance with the latest SJI specification.



5.5 BRIDGING or BRACING

Joist Girders shall be proportioned such that they can be erected without bridging. Therefore, the following requirements shall be met:

a) The ends of the bottom chord shall be restrained from lateral movement to brace the girder from overturning. For Joist Girders at columns in steel frames, restraint shall be provided by a stabilizer plate on the column.

b) No other loads shall be placed on the Joist Girder until the steel joists bearing on the Joist Girder are in place and positively attached to the Joist Girder.

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American National Standard SJI 100 - 2020

User Note: See Section 5.12 for bridging or bracing required for uplift forces.

Steel joist top and bottom chord bridging shall be required and shall consist of one or both of either horizontal or diagonal bridging.

5.5.1 Horizontal Bridging

Horizontal bridging lines shall consist of continuous horizontal steel members. The ℓ/r ratio of the bridging member shall not exceed 300, where ℓ is the distance in inches (millimeters) between attachments and r is the least radius of gyration of the bridging member.

5.5.2 Diagonal Bridging

Diagonal bridging lines shall consist of cross-bracing with a ℓ/r ratio of not more than 200, where ℓ is the distance in inches (millimeters) between connections and r is the least radius of gyration of the bracing member. Where cross-bracing members are connected at their point of intersection, the ℓ distance shall be taken as the distance in inches (millimeters) between connections at the point of intersection of the bridging members and the connections to the chords of the joists.

Joist example - non typical joist connection

Advantages for floor design:

- Top of beam and top of joist at same elevation
- Deck attached directly to joist and WF girder
- Reduced vibration characteristics from standard joist seat connection

Joist example - non typical joist connection

- What are the forces on the WF girder that the EOR designs?
  - vertical?
  - eccentricities?
- What are the forces that the Joist manufacturer designs for?
  - vertical?
  - eccentricities?

Joist example - non typical joist connection

Who and How are material sizes specified?

- EOR or Joist manufacturer?
- Preferred Bolt Diameter? 1”
- Preferred Plate Size? 1”
- Preferred Bolt Type – EOR and Erector.

Joist example - non typical joist connection

- When do eccentricities need to be considered?
- How is this communicated?

Let’s learn from each other. What works?

How can design teams communicate?

Through chain of command?

Directly?

Let’s learn from each other. What works?

How do we clarify the gray areas?

Let’s learn from each other. What works?

How to resolve concerns and conflicts?

Let’s learn from each other. What works?

What is Value?

- Money
- Time
- Sustainability
- Relationships

Which of these are of the most value to you?

Which of these are of the most value to you?

A. Money

B. Time

C. Relationship

D. Sustainability

E. All of the above

Improving on what works

- Capture
- Validate
- Implement

Let’s learn from each other. What works?

How do <u>you</u> capture improvement ideas?

Capture improvement ideas

How to you capture improvement ideas?

A. Conversations with direct customers

B. Keep notes

C. Conversations with indirect customers

D. Conversations with office or peers

E. Project completion review

Let’s learn from each other. What works?

How do <u>you</u> validate improvement ideas?

Validate Improvement

How to you capture improvement ideas?

A. Vet ideas with direct customers

B. Vet ideas with indirect customers

C. Discuss with peers

D. Project completion review

E. Collaborate with others

Let’s learn from each other. What works?

How do <u>you</u> implement improvement ideas?

Implement Improvement

How do you implement improvement ideas?

A. Revise notes

B. Discuss with peers and change office practices

C. Preconstruction meeting to explain changes to project team

D. Offer different cost structure

E. Collaborate with others

Avoid the surprise

- Whereas a “surprise”, bearing good fortune is greatly appreciated, surprises in the process of construction almost never bear good fortune and are not appreciated.
- One way to eliminate surprises is to pay close attention to items where the Design Professional of Record delegates the design of structural and non-structural products or services.

Assessment Question

The following are advantages to delegated design:

A. Utilize proprietary software

B. Value engineering

C. Expertise of a specified product

D. Speed up building design

E. All of the above

Check Out Our Resources

SJI offers a number of resources including:

- Design tools
- Publications
- Live webinars
  - **Next webinar: August 17th | Designing With The 2022 SDI Standard For Steel Deck – What's New?**
- Webinars on demand
  - Our Webinars on Demand section offers 40+ pre-recorded webinars. Earn PDHs today.

Q&A SESSION

THANK YOU

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