Night School 26: Developing an Eye for Connection Design

Thank you for joining our live webinar. We will begin shortly. Please standby.

Session 8 – Potluck
August 31, 2021 | Larry Muir

Smarter. Stronger. Steel.

AISC Live Webinars

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AISC Live Webinars

Course Description

Potluck
August 31, 2021

You don't need to bring a casserole or Jell-o salad to attend this session but bring us your questions and suggestions for topics. In advance of the session participants will decide the topics and questions for this session. Anything related to connection design is fair game. This session will address a variety of connection related topics and frequently asked questions.

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Learning Objectives

1. Explain when the "Option 2" option should be used for connections (CoSP 3.1.1).
2. Explain the importance of investigating the connection design of HSS members during the design of HSS members.
3. Describe how any admissible distribution can produce a safe design for vertical bracing, and how the Uniform Force Method is one such method.
4. List suggestions on how to develop an eye for connection design.

Night School 26: Developing an Eye for Connection Design

Session 8: Potluck
August 31, 2021

Larry Muir, PE, Consultant

Smarter. Stronger. Steel.

THE END

Juggling chainsaws on a tightrope

Potluck

Session 8

A Free For All

The Denouement in which the loose threads are drawn together and matters are explained and resolved.

An opportunity to crash and burn

8

Attendee-based Content

We received quite a few questions and comments up to this point. Thank you for participating in our experiment.

The discussion that follows addresses attendee questions related to delegated connection design.

There are not definitive answer for many of the questions submitted. I will express my opinions. Some of my opinions may be controversial.

The intent is to provide my perspective in hopes that it will be useful at least to the extent that the issues are brought to light and considered.

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Delegated Design

Based on attendee questions and comments.

10

Option 2

Question: When should the experienced steel detailer option be utilized?

Answer : Option 2 should be utilized for “simple” and common connections that do not require significant calculation. It can allow the fabricator to choose connections that optimize their equipment and labor.

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Who pays?

Question: Who pays the delegated connection engineer?

Answer: The CoSP addresses the most common situation - the delegated connection engineer works for the fabricator. Of course the fabricator will include this cost in the bid.

Other arrangements are possible. EoRs sometimes hire connection engineers.

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Licensing

Question: Is the "licensed engineer working for the fabricator" implicitly required to be licensed in the State of the project?

Answer: I am not a lawyer.

I am not sure of the legality of implicit requirements.

Where delegated design is not explicitly addressed, I often perceive the implicit condition to be that it is prohibited. My perception is not consistent with practice.

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Licensing

Question: Is the "licensed engineer working for the fabricator" implicitly required to be licensed in the State of the project?

Answer (cont.): The CoSP does not state this.

As indicated in Session 2 few states explicitly address delegated design. I think those states that do require the delegatee to be licensed in the state. In my experience it is common for contract documents to require the "licensed engineer working for the fabricator" to be licensed in the State of the project.

I was licensed in 24 states when I was employed by a fabricator.

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Missing Information

Question: What information do you find is difficult to receive from the EOR in delegated design?

Answer: **Transfer forces**

In my experience transfer forces are rarely indicated.

One of the first RFIs is always, “Transfer forces are not shown. Please confirm there are not transfer forces.”

99% of the time the response is, “Confirmed”.

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Missing Information

Question: What information do you find is difficult to receive from the EOR in delegated design?

Answer (cont.): In a significant number of cases a condition will later be discovered for which there is almost certainly a transfer force, and this will be pointed out to the EoR.

The EoR will then often find dozens or even hundreds of other cases where transfer forces occur.

This can be very detrimental to the project.

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Missing Information

Question: What information do you find is difficult to receive from the EOR in delegated design?

Answer (cont.): Loads in general.

Contract documents often provide written instructions about loads that are not as complete or clear as the EoR assumes.

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Missing Information

Question: What information do you find is difficult to receive from the EOR in delegated design?

Answer (cont.): A wide range of information that is vital but not obviously missing.

CoSP 3.1.4. “When the structural steel frame… requires interaction with non-structural steel elements… for strength and/or stability, those non-structural steel elements shall be identified in the contract documents…”

Description of this lateral force-resisting system.

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Calculations

Question: Does the fabricator's engineer submit complete calculations to the EOR?

Answer: In my opinion the fabricator's engineer should submit complete calculations for each type of connection as part of the substantiating connection information.

In my experience it is not common to submit complete calculations for every connection on the project.

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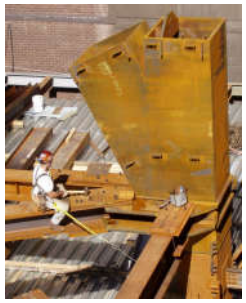
Standard Connections

Question: Can you provide few examples of complicated connections which are not specified in AISC as standard connections?



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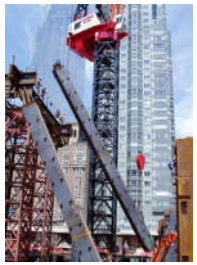
Standard Connections

Question: Can you provide few examples of complicated connections which are not specified in AISC as standard connections?



21

Standard Connections

Question: Can you provide examples of AISC standard connections?

Answer: No.

AISC does not define "standard connections". I believe the 5th Edition of the *Manual* (1962) was the last edition to refer to specific connections as "standard", and some of these connections are not even in common use today.

There are not "standard connections" for lateral force resisting systems and all steel buildings will include a lateral force resisting system.

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Standard Connections

Question: Can you provide examples of AISC standard connections?

Contracts sometimes limit connections to "standard connections". It is not clear what this intends. Whatever EoRs think they are accomplishing by specifying "standard" likely is not being accomplished.

In my experience this practice only leads to controversies and disputes.

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Standard Connections

Question: Can you provide examples of AISC standard connections?

If only certain beam end connection types are to be permitted, the permitted connections should be named using the nomenclature in Part 10 of the *Manual*.

I think it is theoretically possible to "select" or "complete" connections for uncoped beams to facilitate "Option 2" using nothing but the Tables in the *Manual*. I have never tried to do this, but I suspect it would be difficult.

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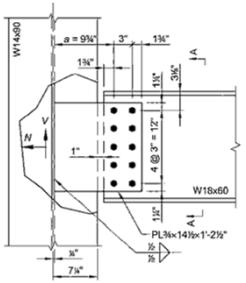
Standard Connections

Question: Can you provide examples of AISC standard connections?

During Session 6 a question was asked about extended shear tabs.

Extended shear tabs are included in Part 10 of the *Manual* and have been for more than a decade and a half.

They have a long history of use.

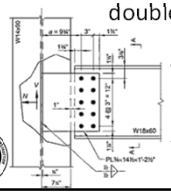


25

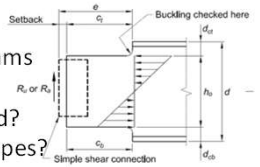
Standard Connections

An extended tab will almost always be torsionally stronger and stiffer than a corresponding double coped beam. It will often be torsionally stronger and stiffer than a single coped beam.

If as the EoR you have concerns about extended tabs, then you should never use framing that requires a cope – especially not a double cope.



The strength of coped beams are not tabulated.
Are coped beams standard?
Is the intent to prohibit copes?



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Standard Connections

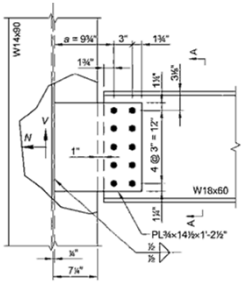
I was using extended tabs long before a design procedure was included in in the *Manual*.

A lot of work and expense went into the formal *Manual* design procedure.

Extended tabs have a lot of benefits.

Don't misuse them. Don't abuse them. It makes me sad.

I sort of regret sharing them.



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Calculations

Question: If Option 3 is selected, what is the connection engineer required to supply under his or her professional seal?

Answer: As indicated in the NY state requirements and the CoSP the contract documents must clearly define the scope of delegated work.

The fabricator and therefore the fabricator's engineer are required to perform to the contract.

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Calculations

Question: If Option 3 is selected, what is the connection engineer required to supply under his or her professional seal?

Answer (cont.): Contracts are agreed to by the parties and both parties should take the process seriously.

My practice was that a structural steel connection was a connection that connected structural steel elements. Once a structural steel element touched a non-structural-steel element, this was outside the scope of our contract and not part of the delegated design.

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Calculations

Question: If Option 3 is selected, what is the connection engineer required to supply under his or her professional seal?

Answer (cont.): For example, I did not design:

- embed plates or base plates
- façade connections

There were times we treated some of these items as Option 2 meaning we performed calculations based on design procedures provided by the EoR, but we did not make design decisions.

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Calculations

Question: Can we ask for the fabricator to provide connection design including calculation for EOR to review and approve?

Answer: Yes.

A licensed engineer working for the fabricator will provide connection design when Option 3 is indicated by the EoR.

If the EoR wants calculations, then the required substantiating connection information should be defined accordingly.

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Sealing of Shop Drawings

Question: What is your opinion of requiring the connection engineer to seal the shop drawings?

Answer: My opinion is that this should not be required.

The Commentary to the CoSP states, “A requirement to sign and seal each sheet of the shop and erection drawings is discouraged as it may serve to confuse the design responsibility between the owner’s designated representative for design and the licensed engineer’s work in performing the connection design.”

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10 lb. of sausage in a 5 lb. bag.

Question: Please elaborate on the tire photos of Slides 96 & 97

Answer: This is apparently an actual tire on an actual car that was used to drive children to school in England.

My intent was to illustrate the perceived "amount of work and responsibility" as the original volume of the tire and the actual or lower limit on the "amount of work and responsibility" as the bulging tire.

10 lb. of sausage in a 5 lb. bag.

Question: Please elaborate on the tire photos of Slides 96 & 97

Answer: The "amount of work and responsibility" required to complete a structural project must exist somewhere.

Pretending it ceases to exist because it has been shifted out of one's immediate view could lead to dire consequences … as could this tire.

HSS Connections

Based on attendee questions and comments.

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HSS Member Design

Part 13 of the *Manual* states:

- "HSS member sizes are often critical in connection design. Connection design… should be investigated during main member selection as the connection limit states may force an increase in the member wall thickness over the main member design thickness."

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HSS Member Design

Part 13 of the *Manual* states:

- "Compression chords should be sized such that the demand-to-capacity ratio is considerably less than one"
- "… chords should have thick walls rather than thin walls; web members should have thin walls rather than thick walls; web members should be wide relative to the chord members, but still able to sit on the "flat" face of the chord section if possible."

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HSS Member Design

From Design Guide 24:

- "Moreover, note that reinforcing the connections of HSS assemblies often is not an available option, for either architectural or fabrication reasons."
- "Usually the goal is to achieve a hollow section steel structure without any stiffeners or reinforcement."
- "Whenever possible, HSS connections should be designed to be unreinforced, for reasons of both economy and aesthetics."

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HSS Member Design

The whole world is talking about it:

From CIDECT

- "The trend in fabrication techniques with hollow sections… is increasingly towards simple types of joints… without gussets, stiffeners or other means of reinforcement…"
- "Stiffeners and other reinforcement.. should always be kept to a minimum and used only when truly needed (e. g. for repair)."
- "Apparent economies from minimum-mass member selection will quickly vanish at the connections if a designer does not have a knowledge of the critical considerations which influence connection efficiency."

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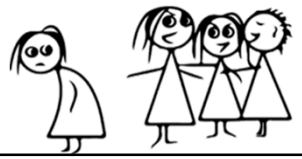
HSS Member Design

If your HSS members have to be reinforced:

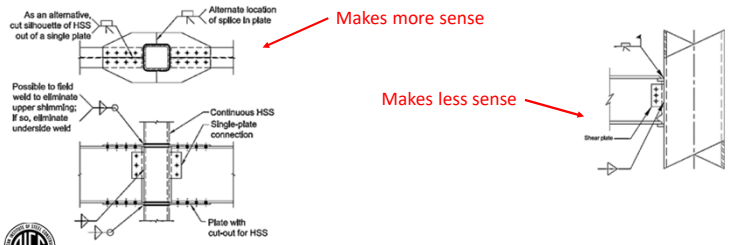
- It will be expensive
- It will be ugly
- You will find no design examples
- You will be uncomfortable with the suitability of the final design
- It will be disruptive to the project and the relationships among the project team
- No one will be happy – with you.



40

HSS Moment Connections

Q: Please address HSS moment connections.



41

Stiffness & HSS Connections

Q: For HSS how is the assumed stiffness of the connection typically compared to the designed stiffness?

A: Like all other conditions in my experience this is generally done by inspection. However, in my experience many of the connections I see used in practice are NOT okay by inspection.

Many engineers must know things I do not.

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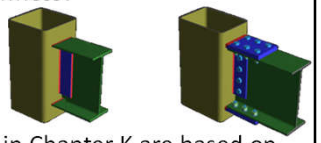
Stiffness & HSS Connections

Q: For HSS how is the assumed stiffness of the connection typically compared to the designed stiffness?

A (cont.): From Commentary:



"The connection capacities calculated in Chapter K are based on strength limit states only. There is no connection deformation limit state considered in these provisions."

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Stiffness & HSS Connections

A (cont.): From Commentary

- "Sub-commission XV-E of IIW… have now adopted a limit of 0.03*D* for round and 0.03*B* for rectangular HSS as the maximum acceptable connection displacement, perpendicular to the main member face at the ultimate load capacity."
- "This limit state equates to approximately 1% of connection deformation at service loads." In other words 1/3 the ultimate deformation.

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Stiffness & HSS Connections

A (cont.): From Commentary

Why does AISC not just adopt the international standard?

1. Is 3% at ultimate or 1% at service okay?
   a. Relative to the design model?
   b. Column bracing?
   c. When might it not be okay?
   d. Shouldn't the limit relate to the branch stiffness and not the chord dimensions?

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Stiffness & HSS Connections

A (cont.): From Commentary

Why does AISC not just adopt the international standard?

2. Is 3% at ultimate or 1% true?
   a. Can this relationship hold for all load combinations?
   b. How do we know?
3. Is it useful?
4. If all of your friends jumped off a bridge…

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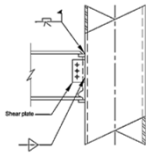
Stiffness & HSS Connections

Q: How is the assumed stiffness of the connection typically compared to the designed stiffness? For example, can a moment connection to an unstiffened HSS wall be ever considered stiff enough?

A: Yes. The connection shown here could be made stiff enough to serve as a fully-restrained moment connection and satisfy the criteria presented in the Commentary to *Specification* Section B3.4.



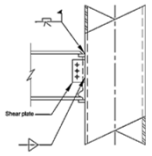
47

Stiffness & HSS Connections

Q: How is the assumed stiffness of the connection typically compared to the designed stiffness? For example, can a moment connection to an unstiffened HSS wall be ever considered stiff enough?

A (cont.): However, it is not obvious (to me) that such a connection will be stiff enough.

My inclination is to believe that such a connection will not be stiff enough.



48

Stiffness & HSS Connections

Q: How is the assumed stiffness of the connection typically compared to the designed stiffness? For example, can a moment connection to an unstiffened HSS wall be ever considered stiff enough?

A (cont.): I would have to convince myself that it was stiff enough to "be consistent with the intended behavior" "and the assumptions made in the structural analysis". The process would be similar to what was done in the attendee-based portion of Session 4.

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Stiffness & HSS Connections

A (cont.): Models like the one to the right are discussed in some of the research and are even included in some codes.

As always knowledge, experience, and judgment are required to get useful results.

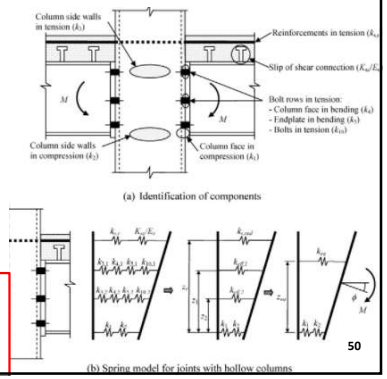

Figure from: "Rotational stiffness and moment resistance of bolted endplate joints with hollow or CFST columns" (Huu-Tai Thai & Brian Uy 2016)

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Vertical Brace Connections and Uniform Force Method

Vertical Brace Connections

Q: Can you walk through a vertical bracing connection with an upper and lower brace?

A: No. If you need to walk through the bay you might be better off with a moment frame.

I am a dad, and this is a dad joke.

Vertical Brace Connections

Q: Can you walk through a vertical bracing connection with an upper and lower brace?

A: But seriously folks… Hopefully after participating in Sessions 6 and 7 you will better understand why I am not working through design examples in the more traditional manner as part of this presentation.

AISC Design Guide 29 contains many examples – though not one with upper and lower braces. Superposition can be applied.

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Vertical Brace Connections

Q: ~~Can you walk through a vertical bracing connection with a upper and lower brace?~~ Can they both be in tension or compression?

A: This is possible, though unusual. Where this occurs (in my opinion) it should be highlighted in the contract (design) documents.

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Vertical Brace Connections

Q: Can they both be in tension or compression?

A (cont.): For Special Concentrically Braced Frames: “Braces shall be determined to be in compression or tension neglecting the effects of gravity loads. Analyses shall consider both directions of frame loading.”

There is no such requirement for other systems, though this is the practice I generally assume is used much of the time.

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Vertical Brace Connections

Q: Can they both be in tension or compression?

A (cont.): Unless indicated otherwise in the design documents, I produce substantiating connection design information assuming one brace is in tension and the other is in compression.

If this is incorrect, then the EoR should tell me.

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Vertical Brace Connections

Q: Appendix A of DG29 seems much more approachable than the actual UFM as it doesn't have restrictions about the interface lengths. Why is it not the #1 method recommended?

A: I have never proposed that the generalized UFM be adopted by the *Manual*. Approachability is subjective. The equations associated with the generalized UFM are messier than those that have been included in the *Manual* for a long time.

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Vertical Brace Connections

Q: Why is it not the generalized UFM the #1 method recommended?

A: The point of Chapter 1 of the Design Guide is that any admissible distribution can produce a safe design. There is nothing wrong with the more specific UFM. If it ain't broke, don't fix it.

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Vertical Brace Connections

Q: Why is it not the generalized UFM the #1 method recommended?

A (cont.): Also, replacing simpler equations with more complex equations, might imply to users that the more complex equations are more accurate and precise due to their complexity, which is something users are prone to assume any way. I do not want to promote this sort of thinking.

Either approach is fine.

"It's your thing, do what you wanna do."
~~~ Isley, Isley, & Isley

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UFM & Other Connection Types

Q: Is there a set of Standard or Typical application of UFM to the more common moment and shear connections?

A: The Uniform Force Method is a means of determining a statically admissible force distribution for corner vertical brace connections.

There are established force distributions used to design shear connections. These are implicitly or indirectly described in Part 10 of the *Manual*.

60
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UFM & Other Connection Types

Q: Is there a set of Standard or Typical application of UFM to the more common moment and shear connections?

A: There are established force distributions used to design moment connections. These are described in Part 12 of the *Manual* and in Design Guides 4 & 16 for end plate moment connections.

Generally it is assumed moments are transferred through the flanges alone. *Modern Steel Construction* May 2012 Dowswell and Muir.

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UFM & Seismic Design

Q: Regarding UFM, what additional considerations might be needed for seismic design ?

A: The Uniform Force Method can be used to determine a statically admissible force distribution for corner vertical brace connections where the demand is based on the expected strength of the brace.

But there is more going on…

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UFM & Seismic Design

A: Section D3 of the *Seismic Provisions* state: "Where deformation compatibility of members and connections that are not part of the seismic force-resisting system (SFRS) is required… these elements shall be designed to resist the combination of gravity load effects and the effects of deformations occurring at the design story drift…"

Isn't this always a requirement? Isn't it at least always a consideration? What about *Specification* Section B1?

What about "deformation compatibility of members and connections that ARE part of the SFRS"?

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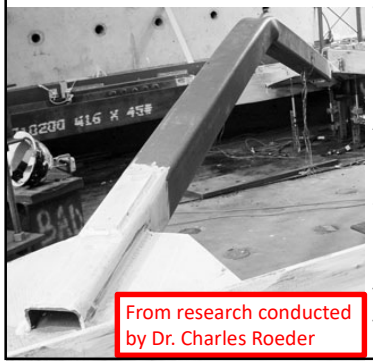
UFM & Seismic Design



From research conducted by Dr. Charles Roeder

What sorts of demands are created by "good" seismic behavior?

And how do we address them?

Section 4.2.6 of Design Guide 29 discusses the effects of frame distortion. Such effects are addressed through prescriptive requirements in the *Seismic Provisions*.

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UFM & Seismic Design

From research conducted by Dr. Charles Roeder

Deformation compatibility for compression "consistent with the intended behavior":

1. "Brace connections designed to withstand the flexural forces imposed by brace buckling…"
2. "Brace connections… to withstand the rotations imposed by brace buckling…"

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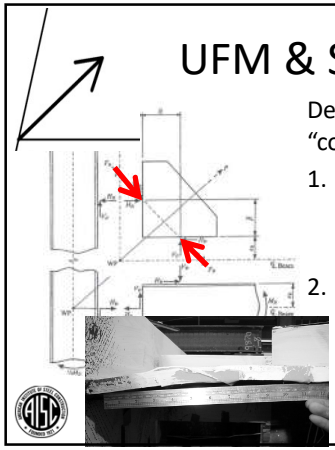
UFM & Seismic Design



Deformation compatibility for tension "consistent with the intended behavior":

1. The connection assembly shall be a simple connection…
2. The connection… shall be designed [for] the lesser of… the expected beam flexural strength […or…] the expected column flexural strength…

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UFM & Seismic Design

When you think about what you are asking the steel to do, what the codes are asking you to do makes more sense.

Design is easy if you understand the behavior.

Understanding the behavior is not always easy.

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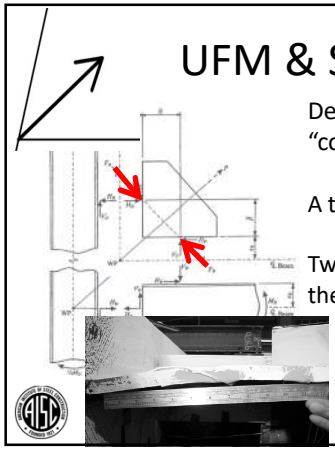
UFM & Seismic Design



Deformation compatibility for tension "consistent with the intended behavior":

A tension load causes buckling – SURPRISING

Two objects cannot occupy the same space at the same time – NOT SO SURPRISING

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Developing an Eye for Connection Design

Developing an Eye for Connection Design

Q: How does one develop engineering judgment?

A: This was the question I set out to answer, when I first proposed this Night School topic and format.

And really one I have struggled with for several years.

How did I develop my eye for connection design?

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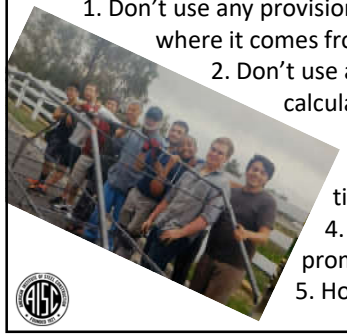
Mentors

Pull the magic string.
~~~ Michael Orlandella



1. Don't use any provision of the *Specification* until you know where it comes from – until you know WHY. Derive it.
2. Don't use a table in the *Manual* until you can calculate the value by hand.
3. Don't use a computer to do anything you couldn't do by hand given enough time.
4. Don't let your "by inspection" make promises your calculations can't keep.
5. Hold yourself to a high standard.

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Mentors

I read some of Bill Thornton's papers when I was in graduate school and applied for a job, not to the company, but directly to Bill. I liked the way Bill approached problems and had already decided I wanted to work for a fabricator.

The unusual manner in which I had applied for the position put additional pressure on me to perform to a high standard.

You need a mentor. There will be debates.

72
~~~

Mentors

I then had the honor and pleasure of working with (and sometimes against) a lot of very smart people to solve a lot of difficult problems.

There are more people than will fit on this slide.
It takes a village, and a lot of vigorous debate.

73

Mentors

I also had the honor and (sometimes not) the pleasure of working with a lot of engineers who assumed I did not know what I was doing, who refused to provide information, who framed structures in odd ways, and who created difficult problems to solve.

There were a lot of vigorous debates.

74

Mentors

What if you don't get to work for someone like Bill Thornton?

What if you never get to attend committee meetings?

What if you have no mentors?

And he could have been a builder
He could have been the one
To turn his dreams to steel
Cathedrals in the sun…

There are strange rivers
Rivers that you cannot see
And there are strange rivers
Who know our destiny
~~~ John Stewart

75

Mentors

If all you have at the end of the week is a paycheck…
If you truly find yourself without a mentor…
If you are not learning anything…
If it is no fun…
Then look for something better.

You have to steal an education from them.
You have to try to get more out of them than they are willing to give.
~~~ Larry W. Muir

Mentors

"Every man I meet is my superior in some way, and in that I learn from him."
~~~ Ralph Waldo Emerson

There are a lot of smart people who keep their heads down and their noses to the grindstone, who choose to spend their free time with their families and not in committee rooms or writing papers.

I encounter engineers on a regular basis who have an incredible grasp of engineering and solve complex problems everyday, but do not show up in magazines or design standards or Internet searches.

I suspect these engineers had mentors too – and can be mentors.

77

Session 1

Vigilance

"If I have seen further it is by standing on the shoulders of Giants."
~~~ Isaac Newton

Understanding the significance of what is seen.

These can be mentors too.

78

Session 1

Vigilance

Understanding the significance of what is seen:

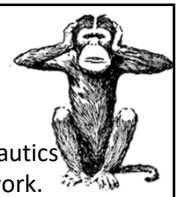
We live in an amazing time. An amazing amount of information is available at our fingertips.

My tips:
- Read published papers and attend webinars to know what exists.
- Study research reports and perform calculations to understand what is introduced in published papers and webinars.
  - Derive everything you can.

79

Session 1

Vigilance



Understanding the significance of what is seen:
- Stability - The National Advisory Committee for Aeronautics
  Your (great) grandparents' tax money at work.
- Bolts – Guide to Design Criteria for Bolted and Riveted Joints
  - University of Texas Austin
  - Lehigh University
  - University of Illinois
- Moment End Plates
  - University of Oklahoma
  - Virginia Tech

This stuff is all free.

80

Session 1

Vigilance

Understanding the significance of what is seen:

- Welding - James F. Lincoln Arc Welding Foundation
- All kinds of steel-related stuff:
  - AISC Continuing Education Archives
  - AISC Research
  - AISC Engineering FAQs
  - AISC Steel Solutions Center
  - www.LarryMuir.com

This stuff is all free.

81

Session 1

Vigilance

Understanding the significance of what is seen:

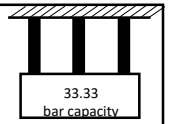
- Used book stores
- Inter-library loans
- Join AISC. They are practically paying you on a per page basis.

This stuff is cheap.

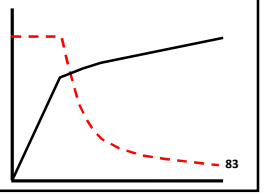
82

Session 3

Some models are useful



- Create simple models to explore complex ideas
- Draw free-body diagrams
- Think about stiffness and ductility
- Structures are everywhere. Think about them:
  - When working in the yard
  - When working on your car
  - When walking around a store



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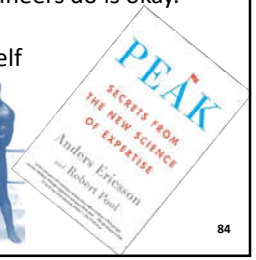
Session 4

Practice & Challenge

- Prove that the basic and unexamined assumptions you rely on everyday are correct using rigorous calculations and models.
- Prove that something "wrong" that other engineers do is okay.
- Engage in Vigorous Debate
- Be your own best enemy – Try to prove yourself WRONG.
- Derive everything you can.
- Teach it to someone else.



84

Session 4

Practice & Challenge

- Ask questions? Ask Why… Again… And Again… And Again… Until you run out of time or patience or interest.
- Better yet team up with someone else and pepper each other with questions. Make each other justify everything.
- Subject yourself to scrutiny where it is assumed you are wrong and sort of stupid. Being young, inexperienced, and working for a fabricator will put you way ahead of the game in this regard.

Closing Thoughts

I have not gotten to all of your questions.

All questions will be addressed.

AISC and I are working on the best format to address outstanding questions.

Generally the preference will be to make questions and answers available to all attendees.

86

Closing Thoughts

This Night School:

- was a lot of work
  – even more than I thought it would be.
- was controversial.
- was Potentially Dangerous.
- was A Labor of Love.
- did not turn out exactly as I had hoped.
- Something I Would Like to Try Again – Only in a More Controversial and Potentially Dangerous Way.

87

Closing Thoughts

I have been lucky and have been “in the room” when decisions that affect our industry were made.

I have been able to discuss and debate issues with the experts in our industry.

I have had the privilege of working with the “average” engineers and contractors as they try to solve their problems.

88

Closing Thoughts

I feel that I have an obligation to share some of what I have learned.

Hopefully, I have done some of that with this Night School.

Thanks for sharing your questions and concerns… and listening to me ramble.

Let's do it again.

Cheers.

Thank you!

AISC | Questions

Smarter. Stronger. Steel.

Individual Session Registrants

PDH Certificates

- All WFH individuals associated with a group registration will be issued a certificate.
- All individuals attending at your connection: you will receive an email on how to report their attendance from: registration@aisc.org.
  - Be on the lookout: Check your spam filter! Check your junk folder!
  - Completely fill out online form. Don't forget to check the boxes next to each attendee's name!

8-Session Registrants

PDH Certificates

One certificate will be issued at the conclusion of all 8 sessions.

8-Session Registrants

PDH Certificates

One certificate will be issued at the conclusion of all 8 sessions.

Quiz 8 issued: September 1, 2021
Final Exam issued: September 8, 2021
Quiz 8 and Final Exam due: September 28, 2021

PDH Certificates and EEU Certificates of Completion will sent by: October 1, 2021

8-Session Registrants

Access to the quiz

Information for accessing the quiz will be emailed to you by Thursday. It will contain a link to access the quiz. EMAIL COMES FROM NIGHTSCHOOL@AISC.ORG.

Quiz and attendance records

Posted Thursday mornings. www.aisc.org/nightschool -- Click on Current Course Details.

Reasons for quiz

- EEU – You must take all quizzes and the final exam to receive EEU.
- PDHs – If you watch a recorded session, you must pass quiz for PDHs.
- REINFORCEMENT – Reinforce what you learn tonight. Get more out of the course.

Note: If you attend the live presentation, you do not have to take the quizzes to receive PDHs

8-Session Registrants

Access to the recording

Information for accessing the recording will be emailed to you by Thursday. The recording will be available for four weeks. (For 8-session registrants only.) EMAIL COMES FROM NIGHTSCHOOL@AISC.ORG.

PDHs via recording

If you watch a recorded session, you must take *and pass* the quiz for PDHs.

8-Session Registrants

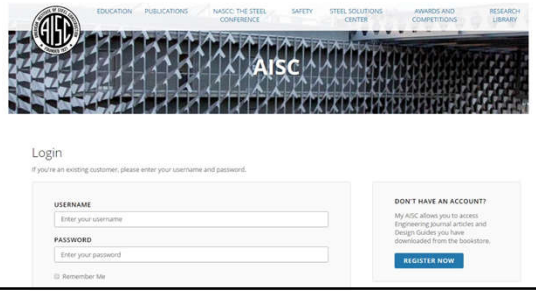
Night School Resources

Find all your handouts, quizzes and quiz scores, recording access, and attendance information all in one place!

8-Session Registrants

Night School Resources

Go to www.aisc.org and sign in.



8-Session Registrants

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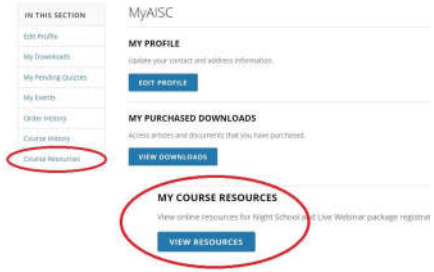


8-Session Registrants

Night School Resources

Course Resources

8-Session Registrants

Night School Resources

Night School 13: Design of Industrial Buildings

8-SESSION PACKAGE RESOURCES

8-Session Registrants

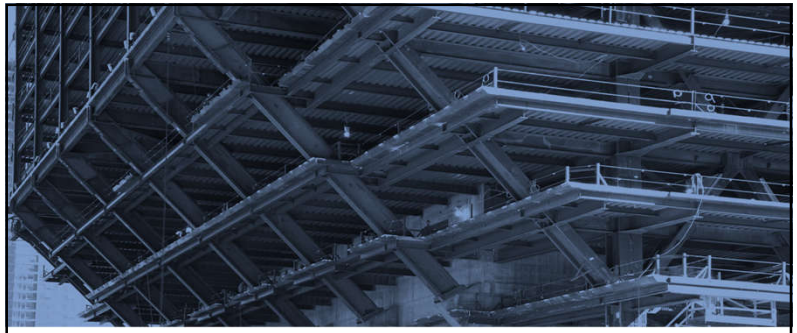
Night School Resources

- Weekly "quiz and recording" email.
- Weekly updates of the master quiz and attendance record, found at www.aisc.org/nightschool26. Scroll down to Quiz and Attendance records.
  - Updated on Friday mornings.

8-Session Registrants

Night School Resources

- Webinar connection information
  - Reminder email sent out Tuesday mornings
- Links to handouts also found here



AISC | Thank you

Smarter. Stronger. Steel.