ATA ENGINEERING, INC.

Webinar:
Modeling Bolted Joints in Femap

Rachel Backes, ATA Engineering

March 31, 2021

13290 Evening Creek Drive S, Suite 250, San Diego CA 92128

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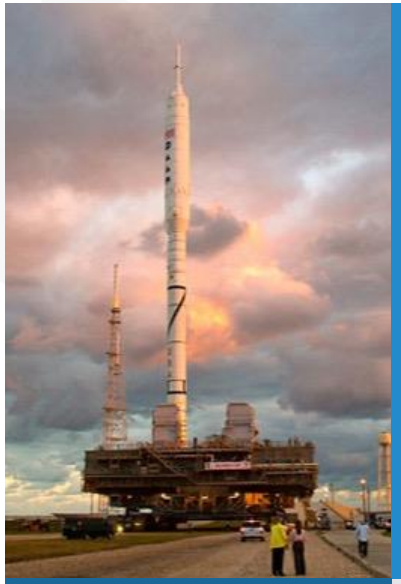

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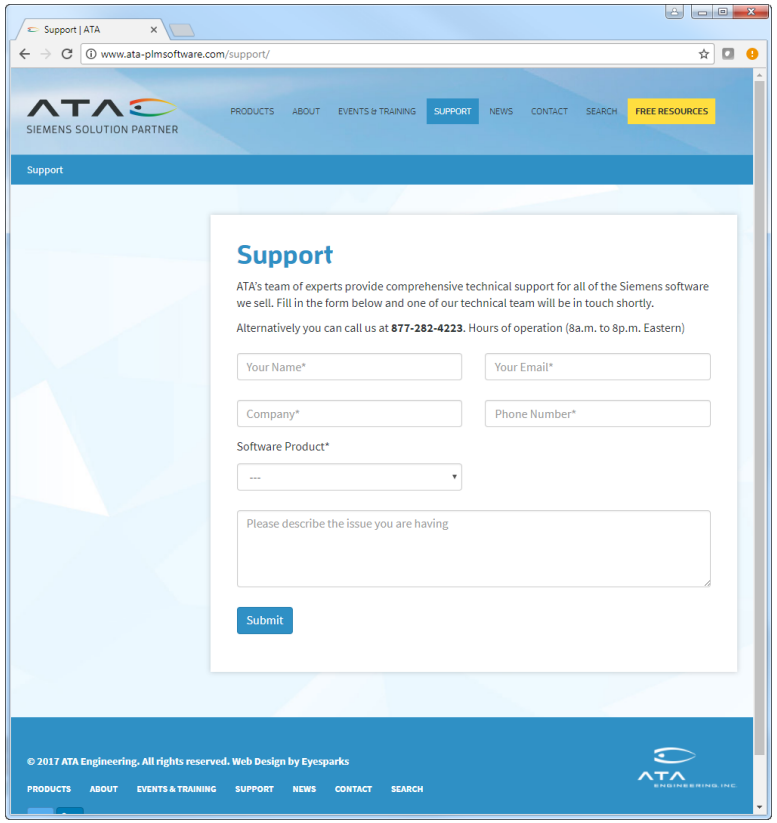

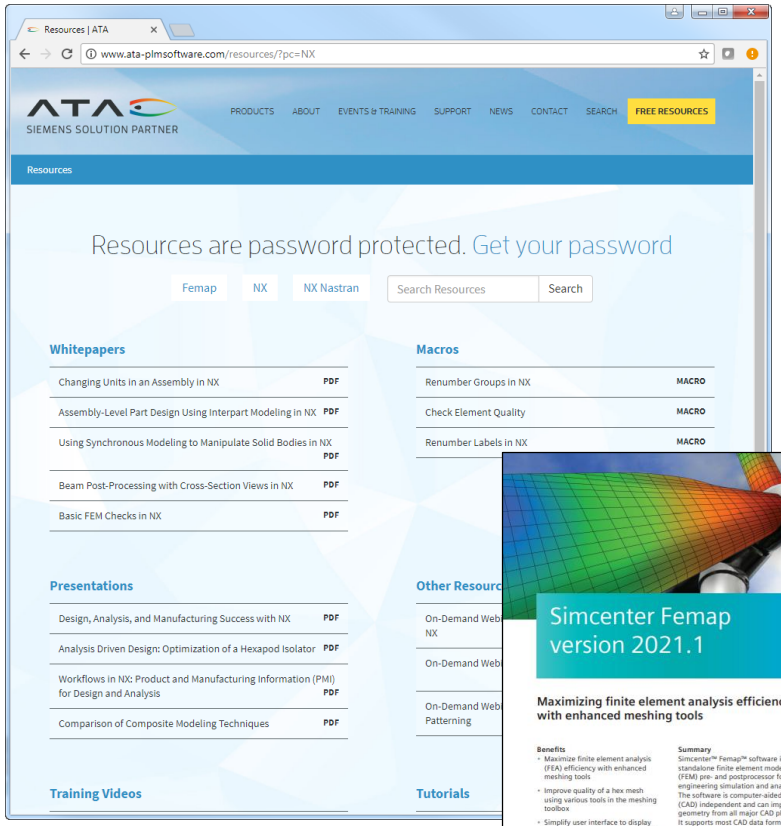

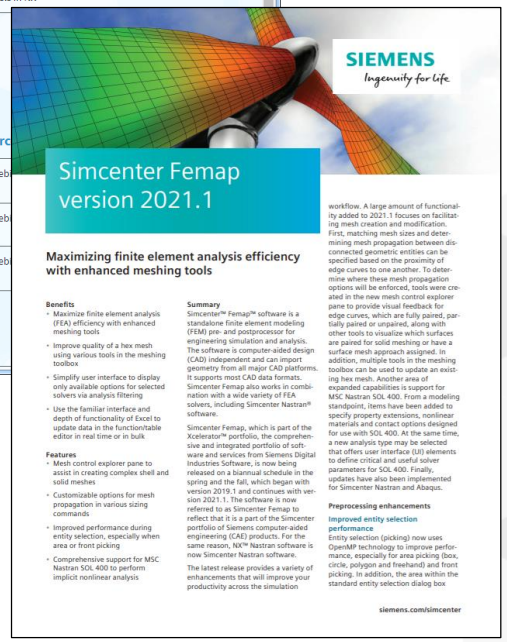

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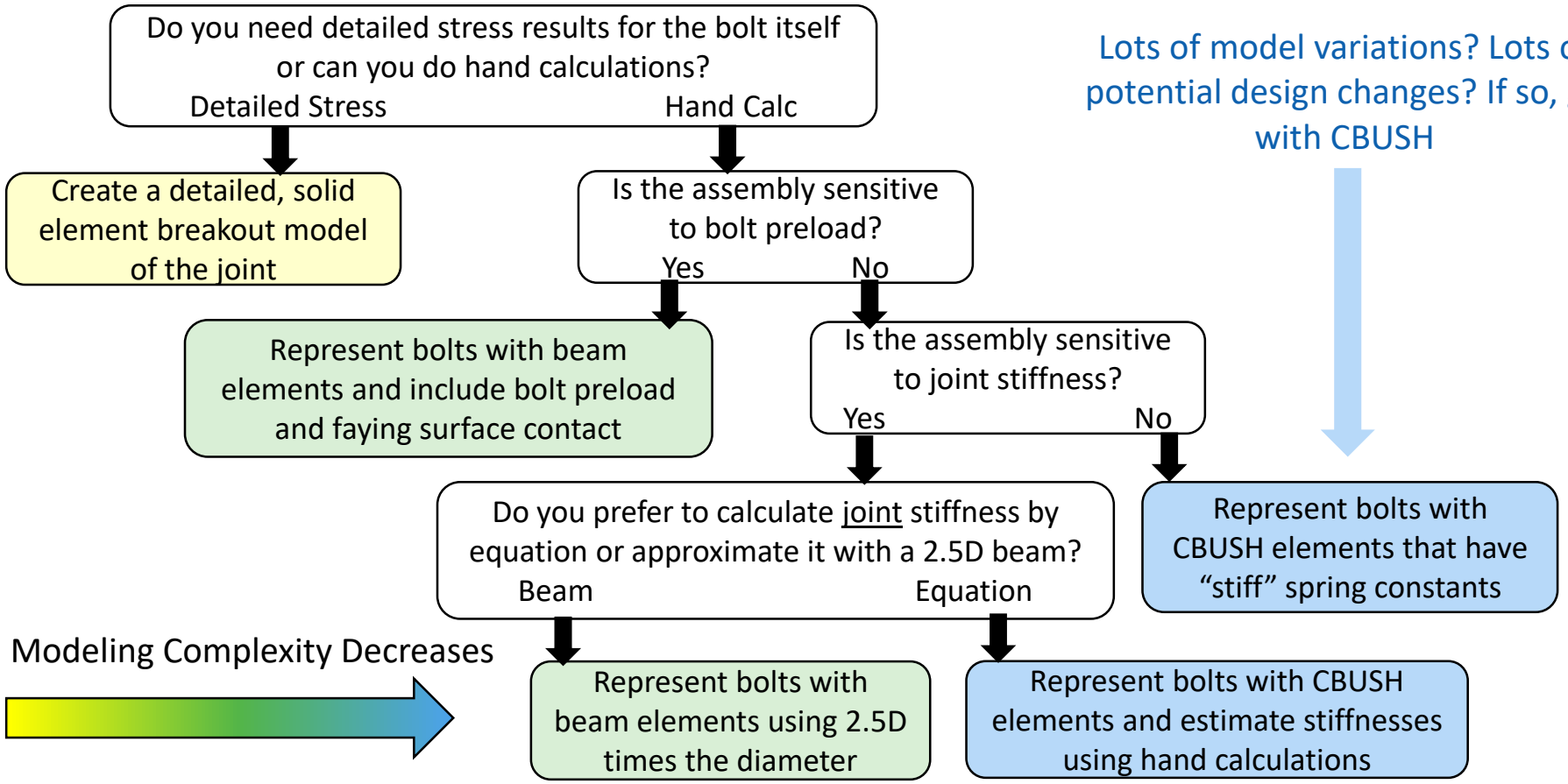
Fasteners – Stiffness Element

- Fasteners are almost always simplified in FE models. The decision tree below provides general guidelines for modeling fasteners.



Fasteners - Configuration

Typically, Joint Diameter, D_J is the smallest value of:

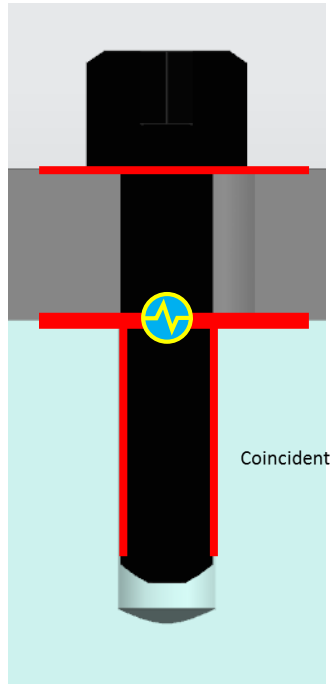
- Twice the radial distance to the closest edge
- Distance between holes
  - Avoid overlapping spiders
- Diameter resulting from 30 deg cone through plate thickness from bolt head diameter

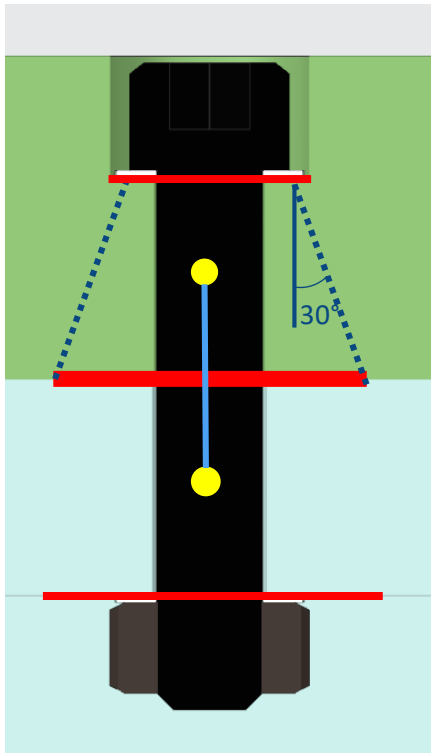
Use D_J or available material to determine size of spiders at head, nut, and faying surface

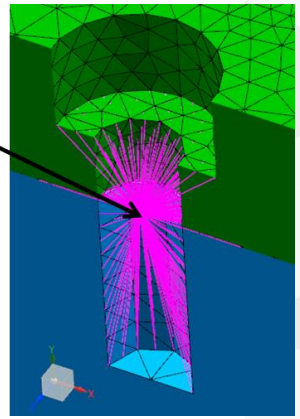
Spiders only include surfaces along fastener shaft if there are threads (inserts) or direct shear

Locate Beam nodes at center of part

Locate CBUSH nodes at interface(zero length)







Fasteners – "Rigid" Spiders

- You have several options for connecting your stiffness elements to your mesh
- Good rule of thumb is to mix something overly soft with something overly stiff to balance the system
- "Soft" and "Stiff" joints are not necessarily bad.
- **USE ENGINEERING JUDGEMENT!!!**

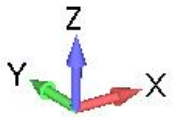
Warning!
This slide provides general suggestions only.
There are MANY opinions on modeling fasteners. If your company/customer/reviewer has a preferred methodology, then use that as the default for that project and vary as necessary for accurate modeling.

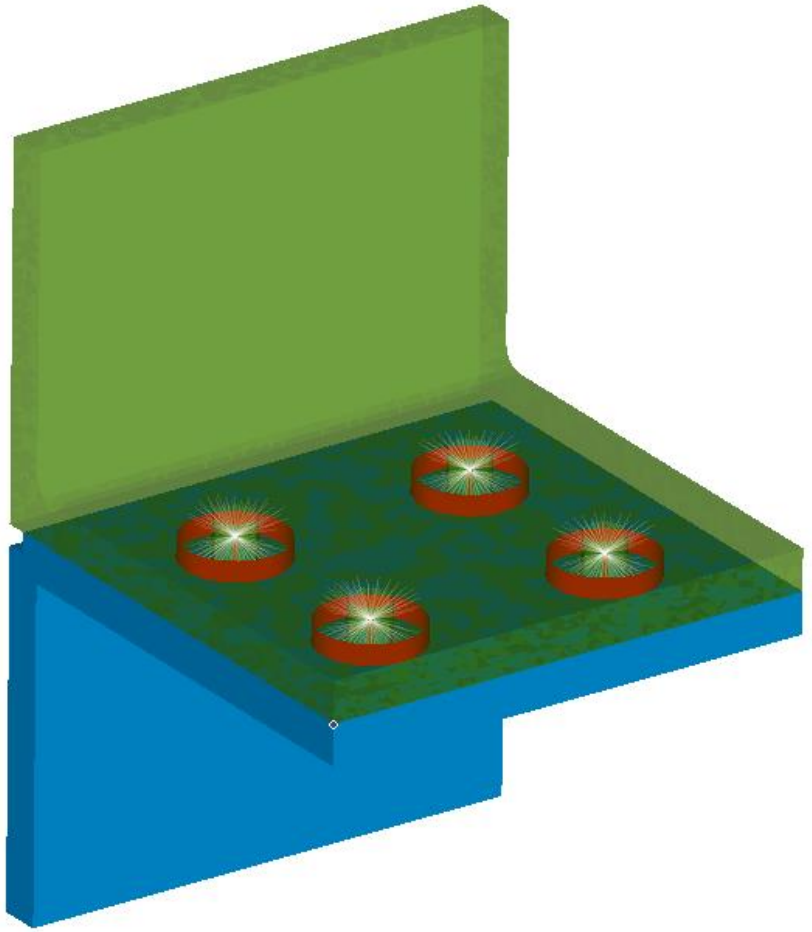
Stiff Beams are the best choice for any **thermal** model
RBEs should be used only when necessary and with extreme caution

	Beams 1.0xD	CBUSH k_bolt	Beams 1.0xD w Preload & Contact	Beams 2.5xD	CBUSH k_joint	CBUSH k_stiff
RBE3	Very Soft	Very Soft	Soft	Kinda Soft	Kinda Soft	Good
RBE2	Soft	Soft	Good	Good	Good	Stiff
Stiff Beams	Soft	Soft	Good	Good	Good	Stiff

Femap Demo

- Create bolt mesh connecting two brackets
  - RBE2 spiders
  - 2.5D Beam stiffness elements

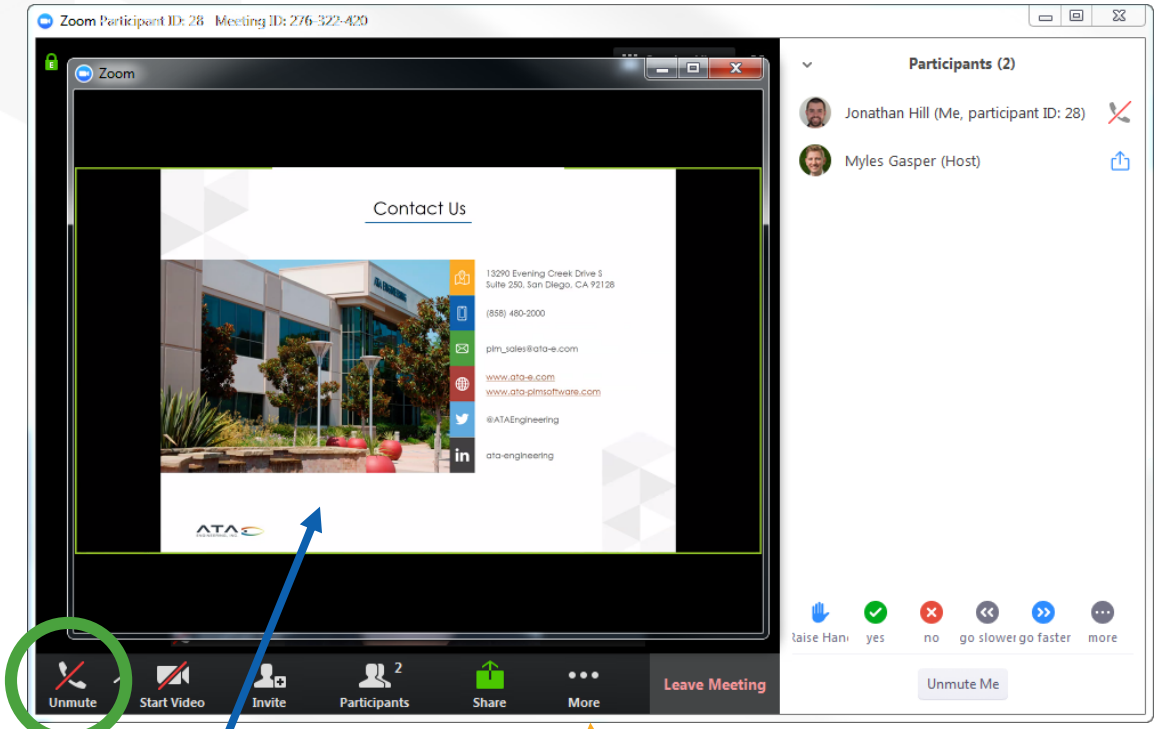




Questions?

Submit questions in the chat or unmute yourself now

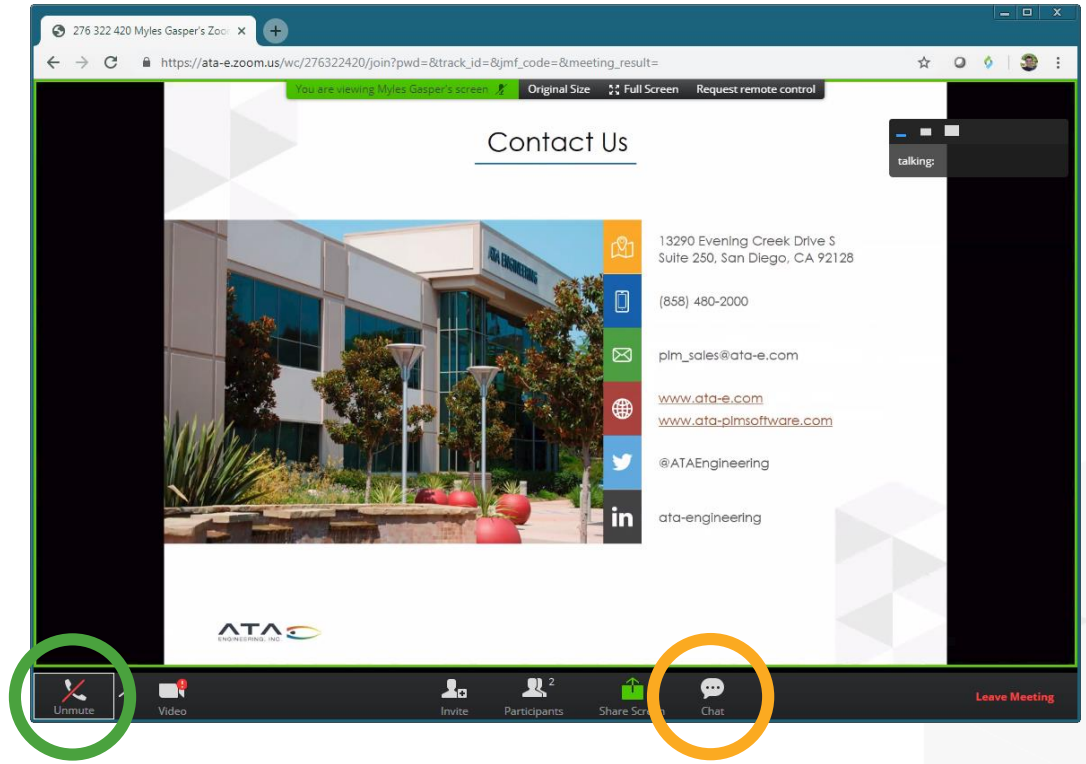
Zoom Application



Screenshare in separate window

Chat is available under More

Web Interface



Contact Us

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