MICE Partial Return Yoke PRY Fabrication

06 November 2013

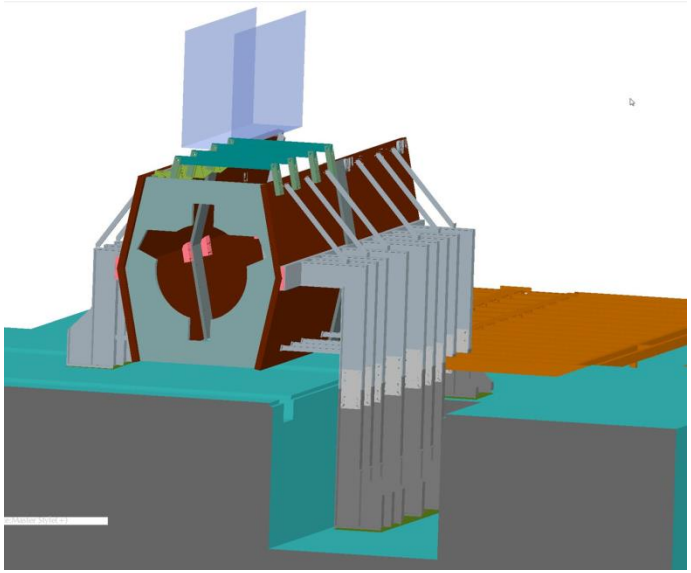
Stephen R. Plate

Brookhaven National Laboratory

Outline

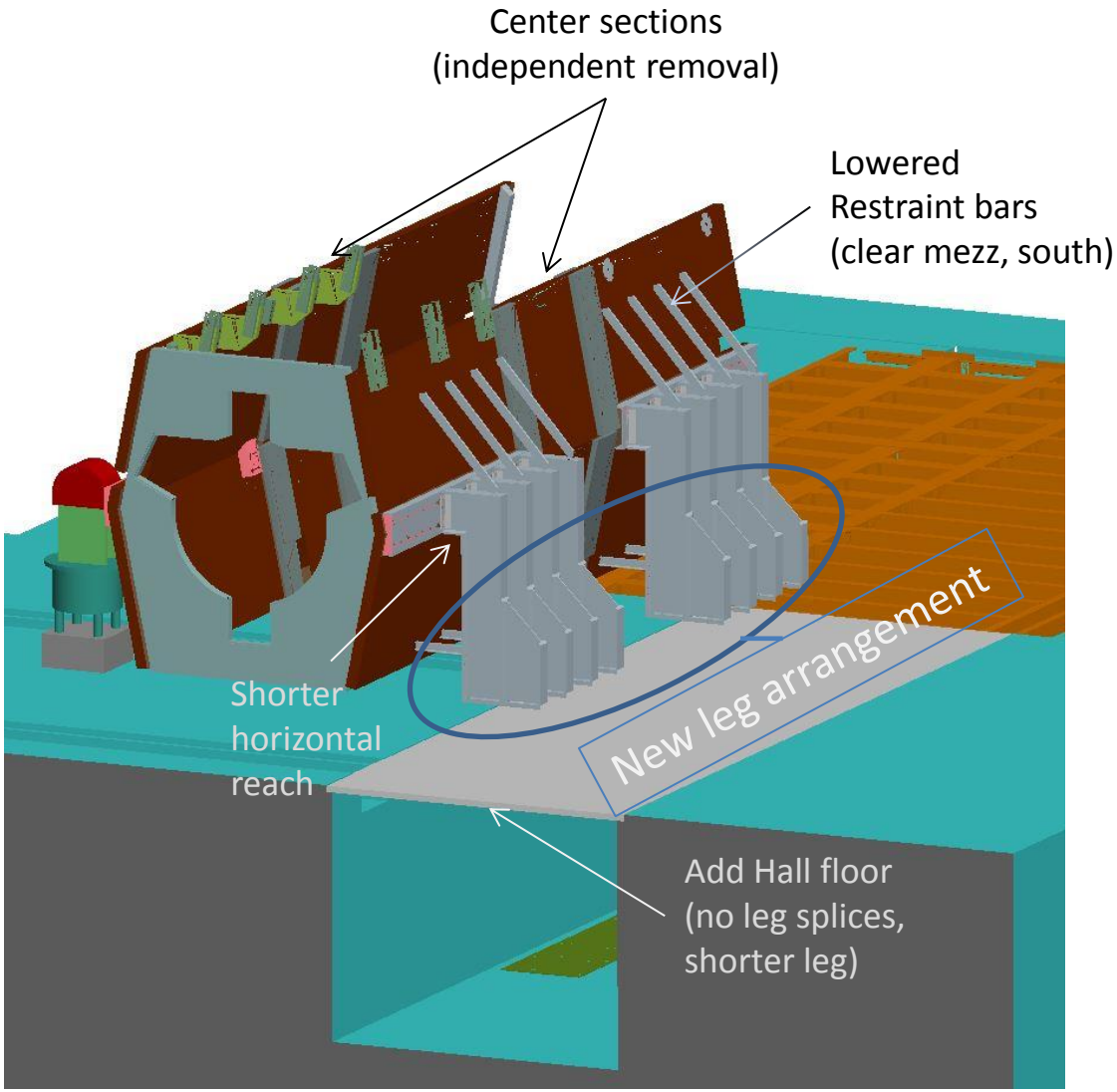
- 6-Section Design Change – update
- Cost & Procurement Status
- Work to complete

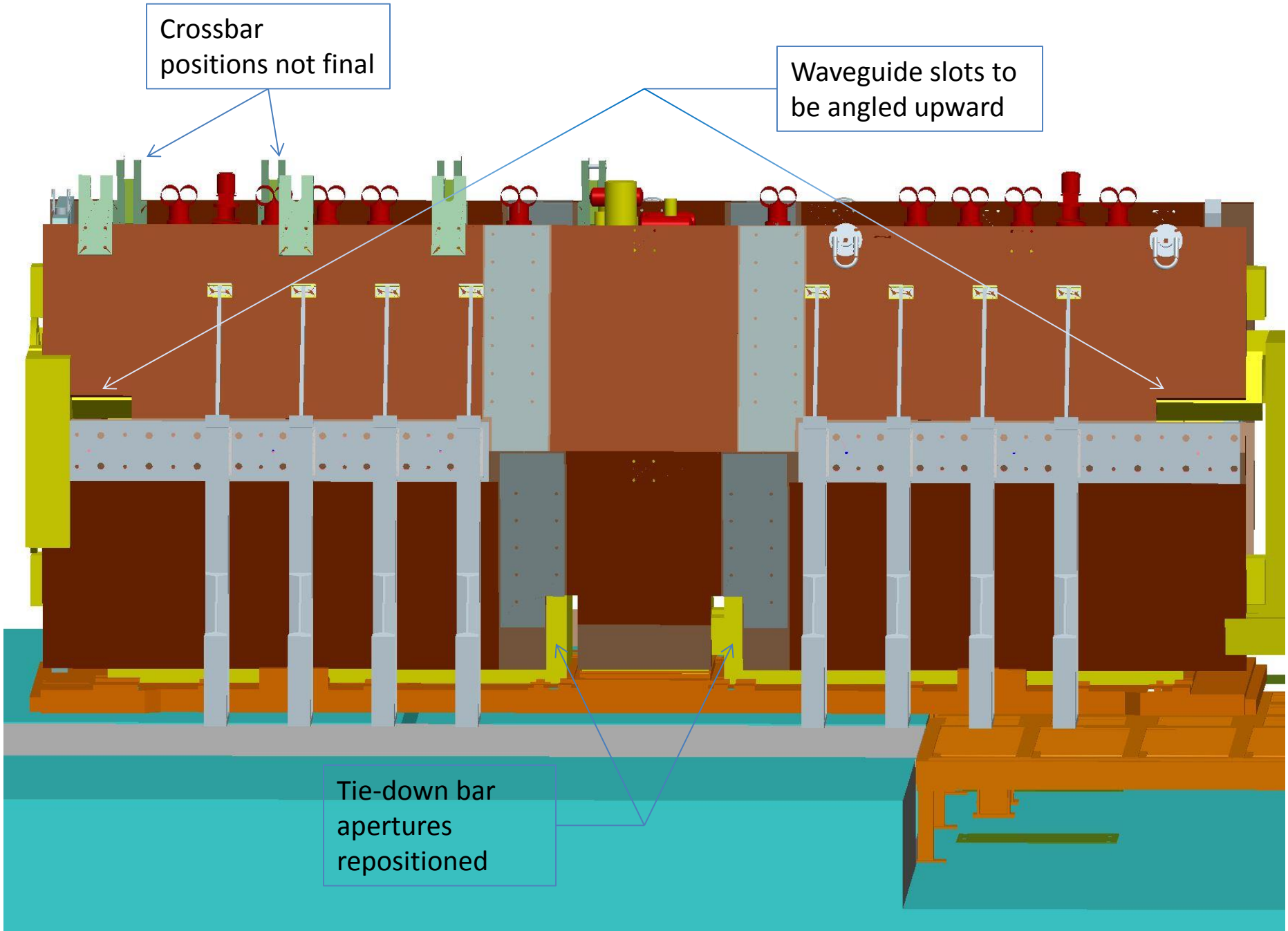
Previous design



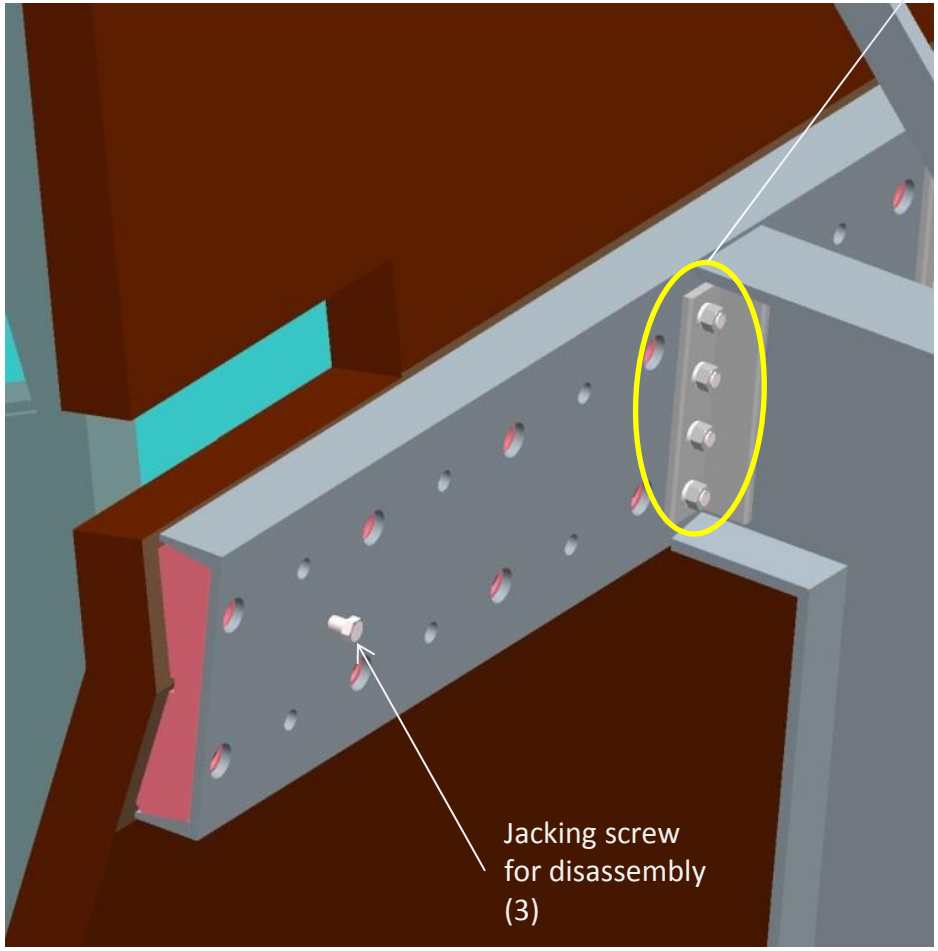
New design

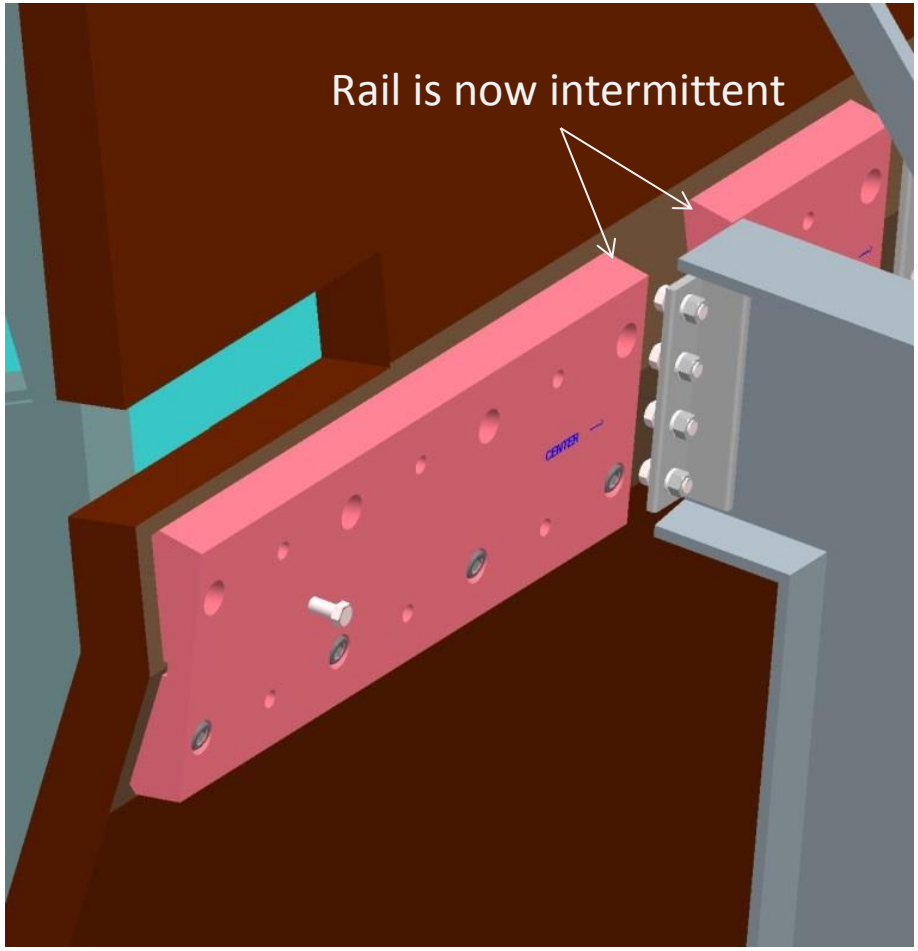
Left/right symmetry



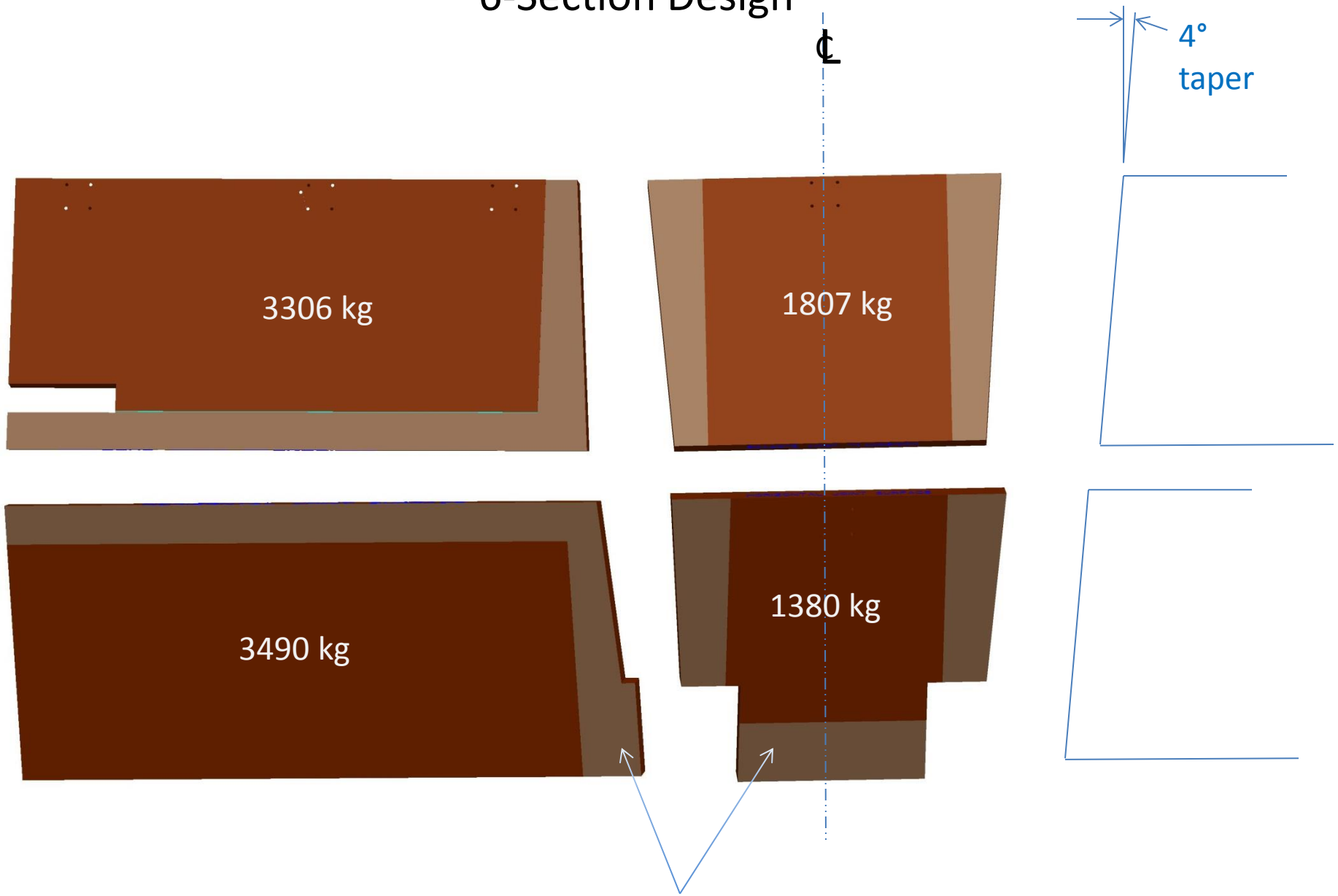

Crossbar positions not final
Waveguide slots to be angled upward
Tie-down bar apertures repositioned

Bolted leg-channel connections





6-Section Design



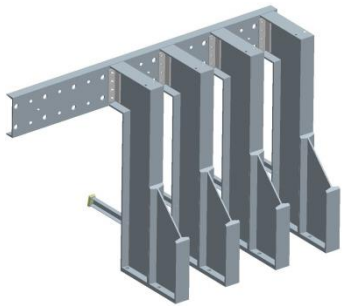
Lighter color indicates machined areas

Fabrication Cost & Procurement Status

- JFE steel order (JFE, Kurashiki, Japan)
  - 100 mm thick main plates, 50 mm backing plates
  - Steel of magnetic uniformity
  - Material total ~$70,000 for 12 plates (8 end, 4 ctr, 8 backing plates)
  - Delivery: ~16 weeks

- Machining
  - Separate vendor, to be identified
  - ~$2850, each plate

- Framework drawings
  - Some dwgs. out for quotation
  - 3 suppliers queried
  - Awaiting responses



Work to complete

- Modifications to shielding plates
  - Reposition crossbars
  - Virostek plate extension mounts and flux leakage mitigation parts
  - Finalize position and size of slots for tracker waveguides (angled, not normal to surface)
  - Add drilled/tapped holes for bolted connections, hoist rings, crossbar mounts
  - Assembly and detail drawings for all of the above items
- Deflection/Stress Analysis
  - Recheck new model in ANSYS Workbench
  - No surprises expected, but need verification
- Structural Framework
  - Assembly and detail drawings for restraints bars & lower support arms

BACK-UP INFORMATION

Assembly Procedure
(in progress)

MICE Step IV Partial Return Yoke Shielding Assembly Procedure

6-Piece Design

FRAMEWORK

1. Locate footprint template on floor for framework on south side. Drill floor to receive framework mounting hardware.
2. Assemble and install south side framework (P/N___) in place, under mezzanine. Framework must be surveyed into place properly to provide correct spacing for installation of center shield sections.

LOWER SHIELD CONSTRUCTION

3. Build lower end shield sections (P/Ns___, ___). Backing plates (P/Ns___, ___) must be attached to INSIDE surface of shield sections.
4. Build lower center shield section (P/N___). Backing plates (P/N___, ___) must be attached to OUTSIDE surface of shield section. Hardware to attach center section backing plates should NOT be fully torqued to specification at this time.
5. Attach Hoist Ring assemblies (P/N___) to top inside of lower end shield section to create correct tilt angle during placement of section. Observing safe lifting practice, lift section with crane.
6. Guide support rail sections of shield assembly into steel channel of framework while allowing section to rest against lower support arm. Check thickness of shim at lower support arm and customize shim if required.
7. While on crane, align holes in support rail with clearance holes on channel flange using special threaded alignment pins (P/N___). Once properly aligned, install screws through channel and tighten rail to channel. Remove alignment pins.
8. Disconnect crane hook from section.
9. Remove hoist ring assemblies and install guide blocks (P/N___) using same holes.
10. Install second lower end shield section on framework in same manner. Check spacing between shield sections for proper center section clearance.
11. Attach hoist ring assembly and install lower center shield section in opening between end sections. Center section will rest on lands provided on end sections. Backing plate hardware must be loosened at this time.
12. Align holes through inner and outer backing plates and center shield section. Install screws through to inner backing plates. Tighten all screws to specification.

UPPER SHIELD CONSTRUCTION

13. Build upper end shield sections (P/Ns___, ___). Backing plates (P/Ns___, ___) must be attached to INSIDE surface of shield sections.
14. Build upper center shield section (P/N___). Backing plates (P/N___, ___) must be attached to OUTSIDE surface of shield section. Hardware to attach center section backing plates should NOT be fully torqued to specification at this time.
15. Attach Hoist Ring assemblies to top outside of upper end shield section to create correct tilt angle.
16. Lift and place upper section on top of lower section; align shield by installing into guides on lower shield. Align bolt holes with framework using alignment pins.
17. Install restraint bar assemblies (P/N___). Bolt to framework and to back of shield. Customize shim at shield as required.
18. Disconnect crane hook.
19. Install second upper end shield section in same manner. Check spacing between upper shield sections for proper center section clearance.
20. Attach hoist ring assembly and install upper center shield section in opening between end sections. Center section will rest on lower center section. Backing plate hardware must be loosened at this time.
21. Align holes through backing plates and center shield section. Install screws through to inner backing plates. Tighten to specification.
22. Check alignment of shield surfaces. Loosen screws, adjust shims, and retighten as required. Hoist rings can remain on upper sections for storage if desired.

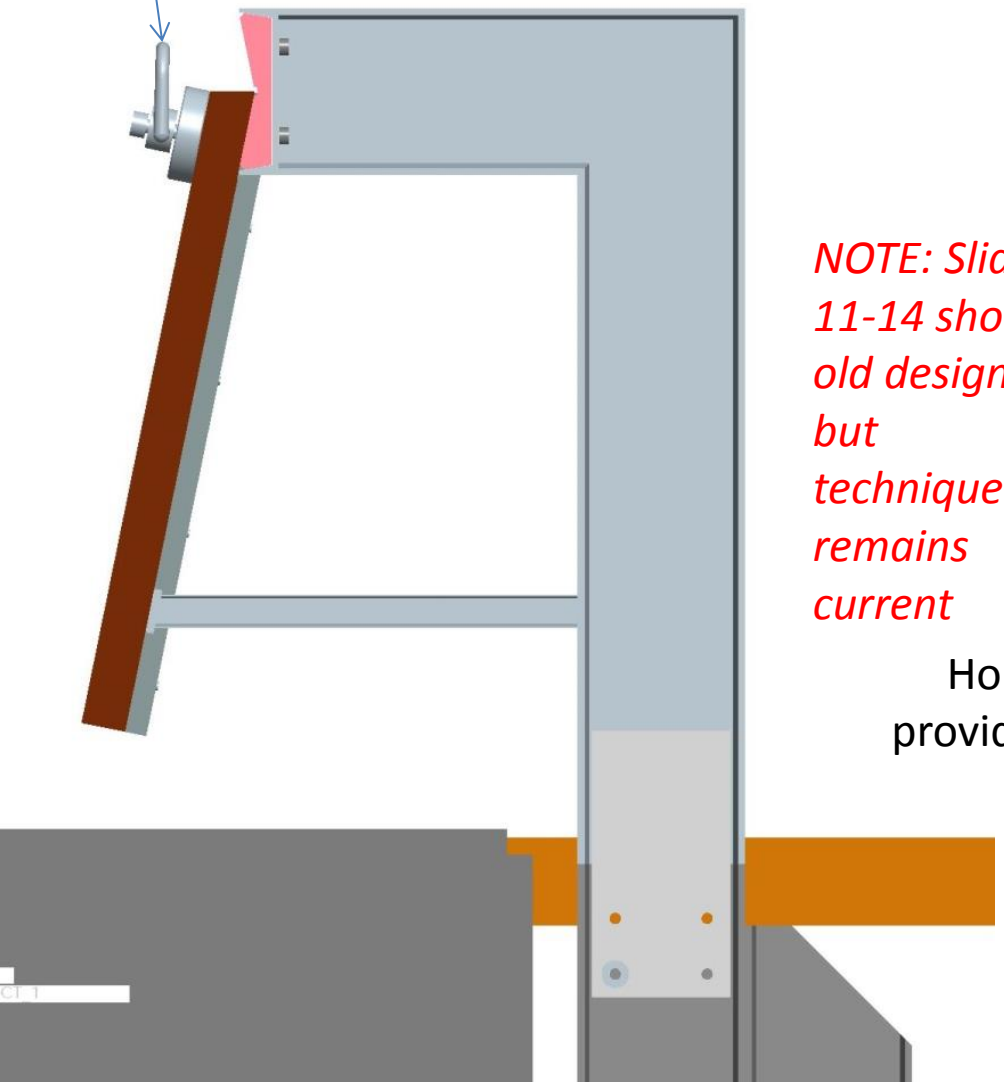
VIROSTEK PLATE EXTENSION INSTALLATION

23. Install mounts / flux leakage mitigation parts in preparation for Virostek plate extension halves.
24. Install Virostek plate extension halves at each end of shielding assembly. Check position and shim as required.

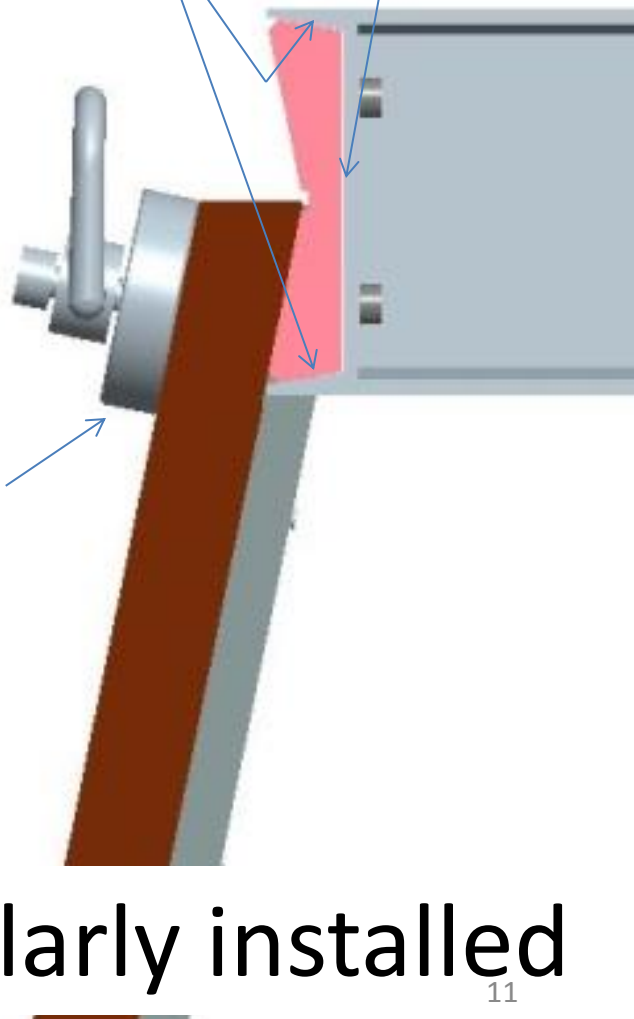
EXPERIMENT INSTALLATION

25. Install Spectrometer Solenoids and AFC in accordance with RAL engineer's procedure.
26. For construction and installation of north side shielding, repeat south side procedure.

Install Section 1



NOTE: Slides 11-14 show old design, but technique remains current



Section 2 is similarly installed

Install Section 3 (and 4)

Lower hoist rings removed; guide blocks installed
(also shown on isometric, Slide #4)

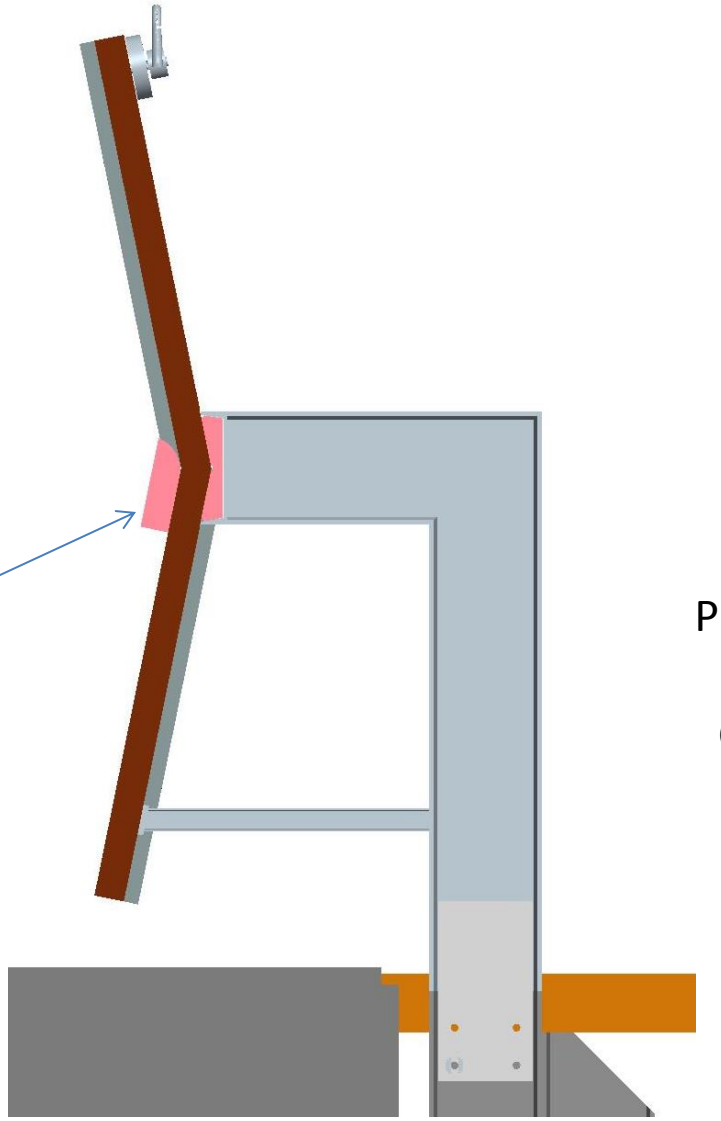
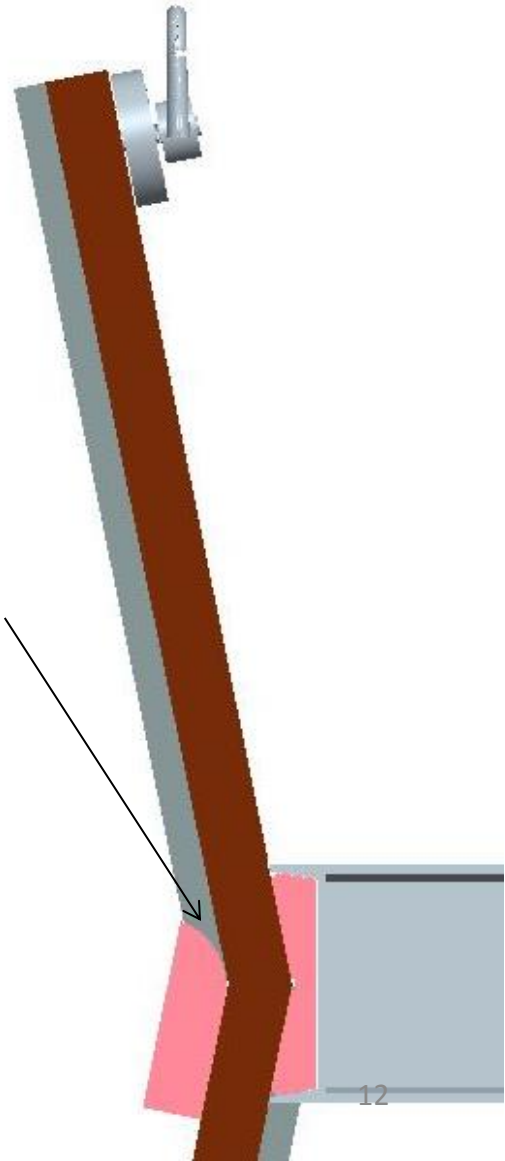
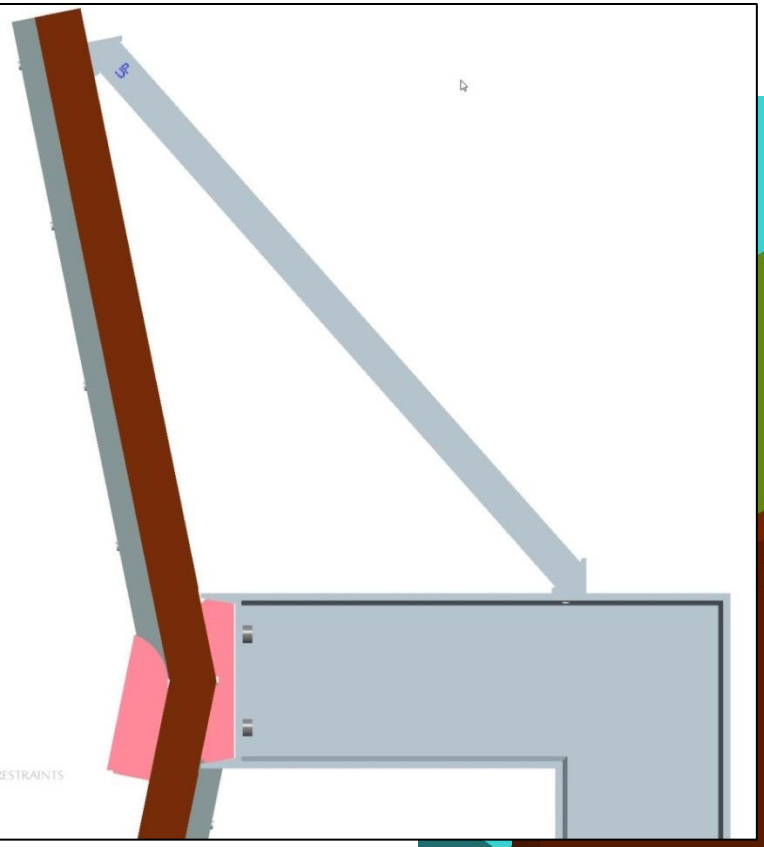
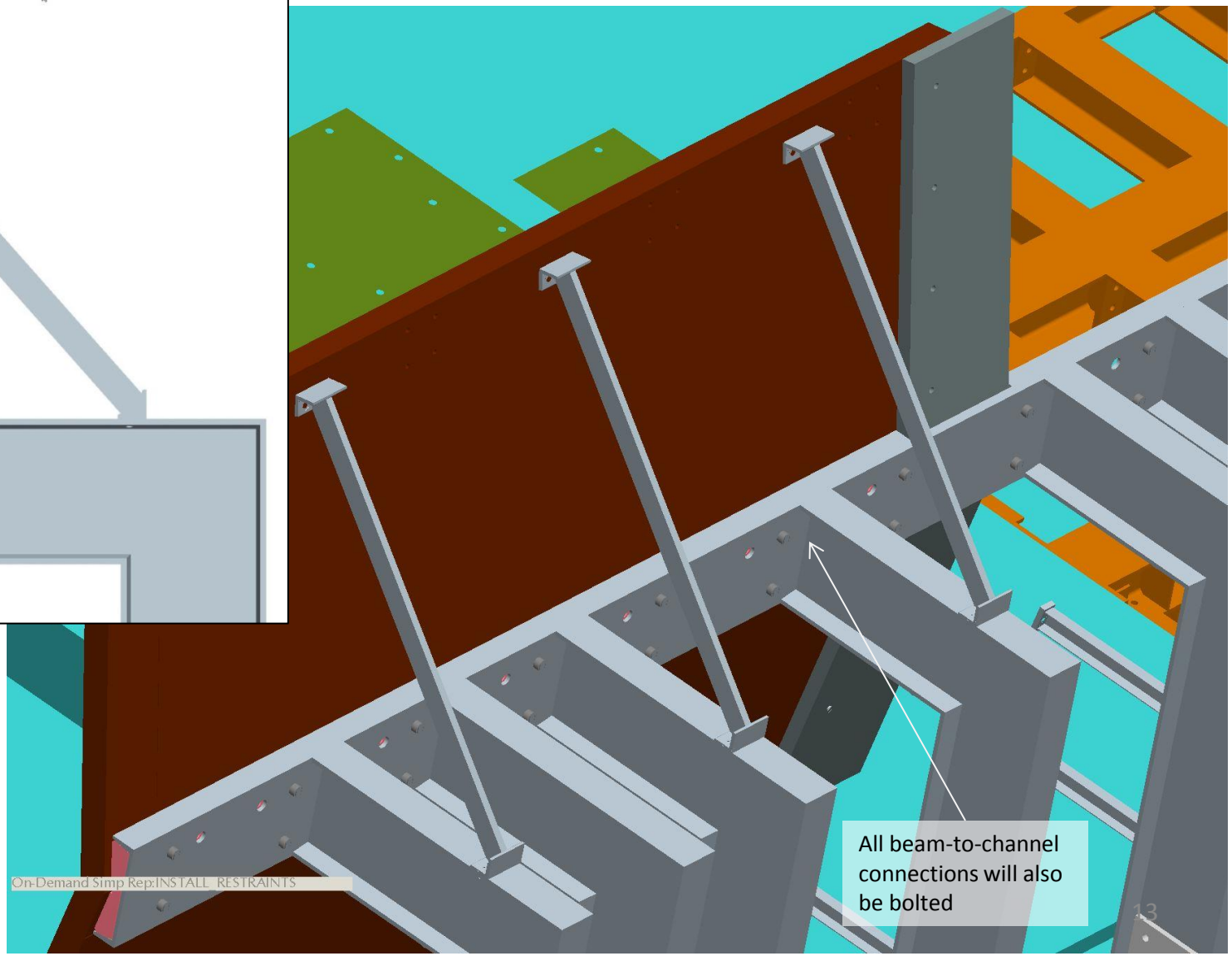


Plate guided into engagement during lowering



Install Restraint Bars





(Assembly Technique – continued)

- … Install Virostek plate extensions
- Install spectrometer solenoids and AFC
- Build and install shielding on north side, same technique as south side
- Install north/south load-sharing cross bars