



Fermilab

**Particle Physics Division
Mechanical Department Engineering Note**

Number: MD-ENG- 340

Date: April 29, 2011

Project Internal Reference:

Project: SCDMS

Title: The new design of the monorail for the Drift C3 area of the Ladder
Lab @ Snolab

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Reviewer(s):

Key Words: Super CDMS, Monorail, Hoist, Lifting, Hook, Adapter, Slot,
Alignment, Angular, Cavern, Beam, Connector, Ceiling.

Abstract Summary:

The new version of the monorail design will retrofit the existing 12 ton lifting hitches of the Ladder Lab @ Snolab; the new connecting adapters will align the monorail in lateral, vertical and angular direction, and will also create the maximum lifting distance under the hoist hook.

Applicable Codes:

“Allowable Stress Design”, AISC, 9th edition

“Below-the-Hook Lifting Devices”, ASME B30.20

#5022, ES&H Manual, FermiLab.

The Main function of the Monorail:

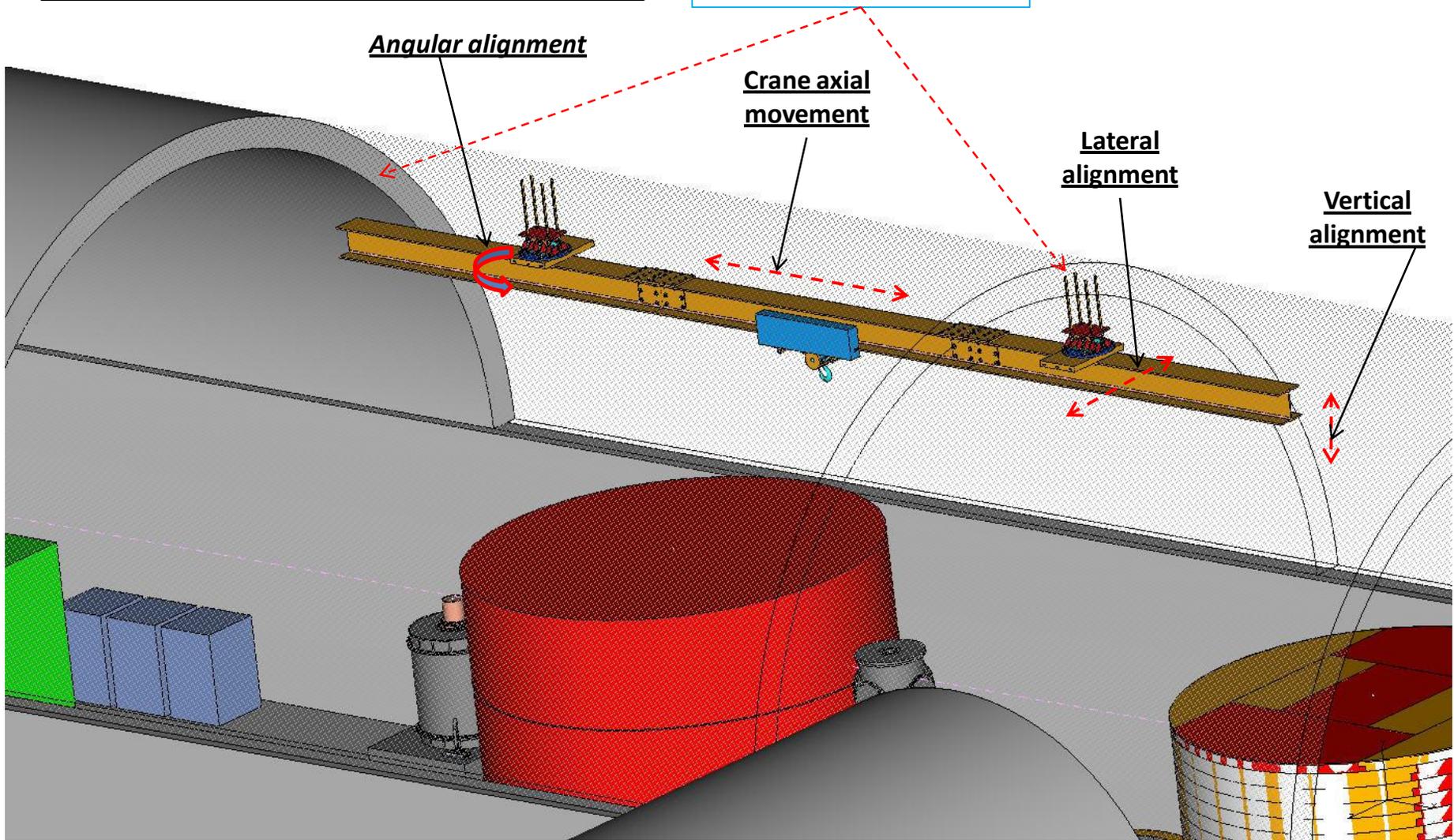
- *As a guide device for the crane hoist, the crane hoist with the lifting object moves in the axial direction of the monorail.*
- *As a structural support device for the lifting hoist and the lifting objects within its lifting specifications per applicable industrial codes.*

The main feature & specification of the Monorail:

- *Retrofits with the existing 12 ton ceiling lifting hitches.*
- *To connect different hitches by the alignment in lateral, vertical and angular dir. through the special design features of the Monorail.*
- *3 ton (metric) lifting capacity, 241” under the hook in vertical lifting distance, 39 ft axial rail travel distance.*

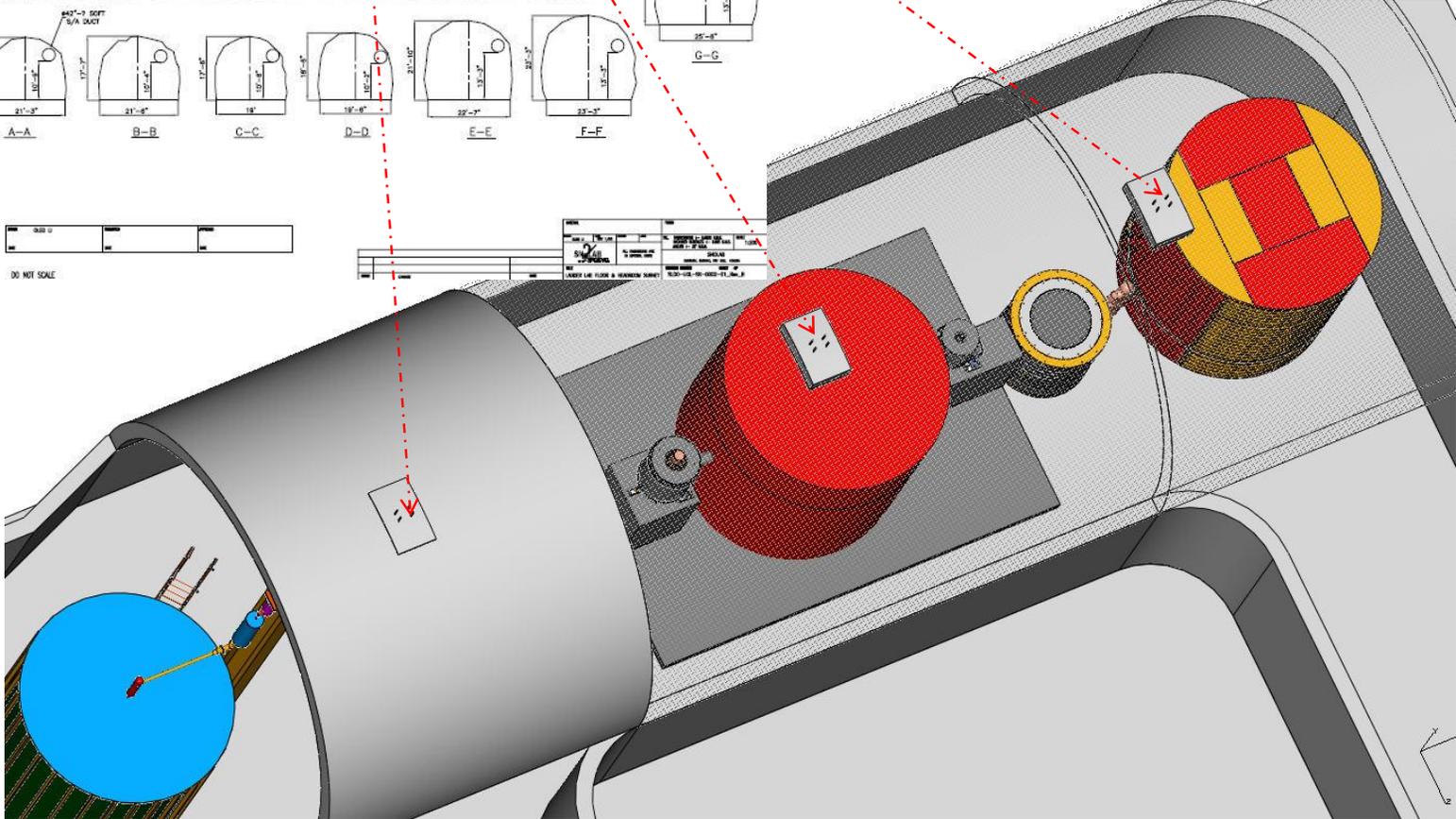
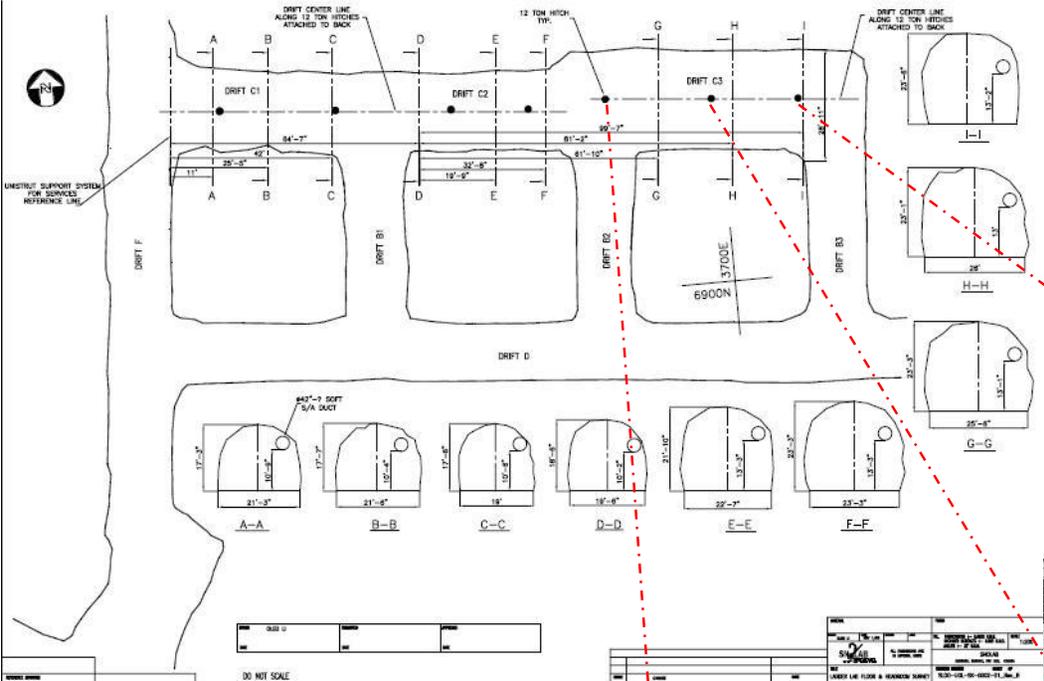
Main features of the new Monorail design

Ladder Lab Drift C3 ceiling

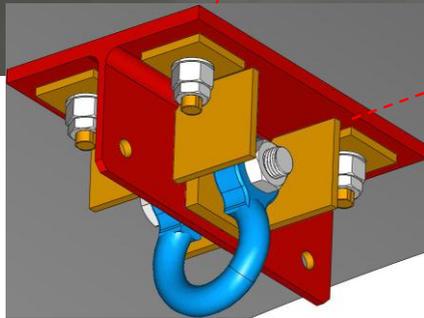


- **Angular alignment:** +/- 13 deg., see page 11
- **Lateral alignment:** 24", see page 12
- **Vertical alignment:** See page 10 & page 13.
- **Crane hoist movement:** 39 ft, see pages 14 & 15.
- **Under hook net height:** 241", see page 15.

**Ladder Lab Floor
and Headroom Area**

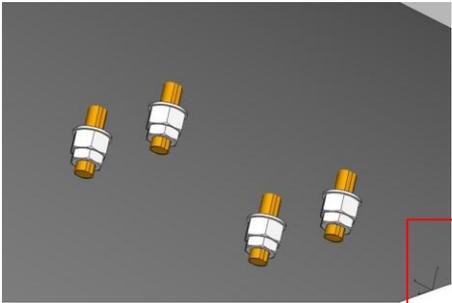
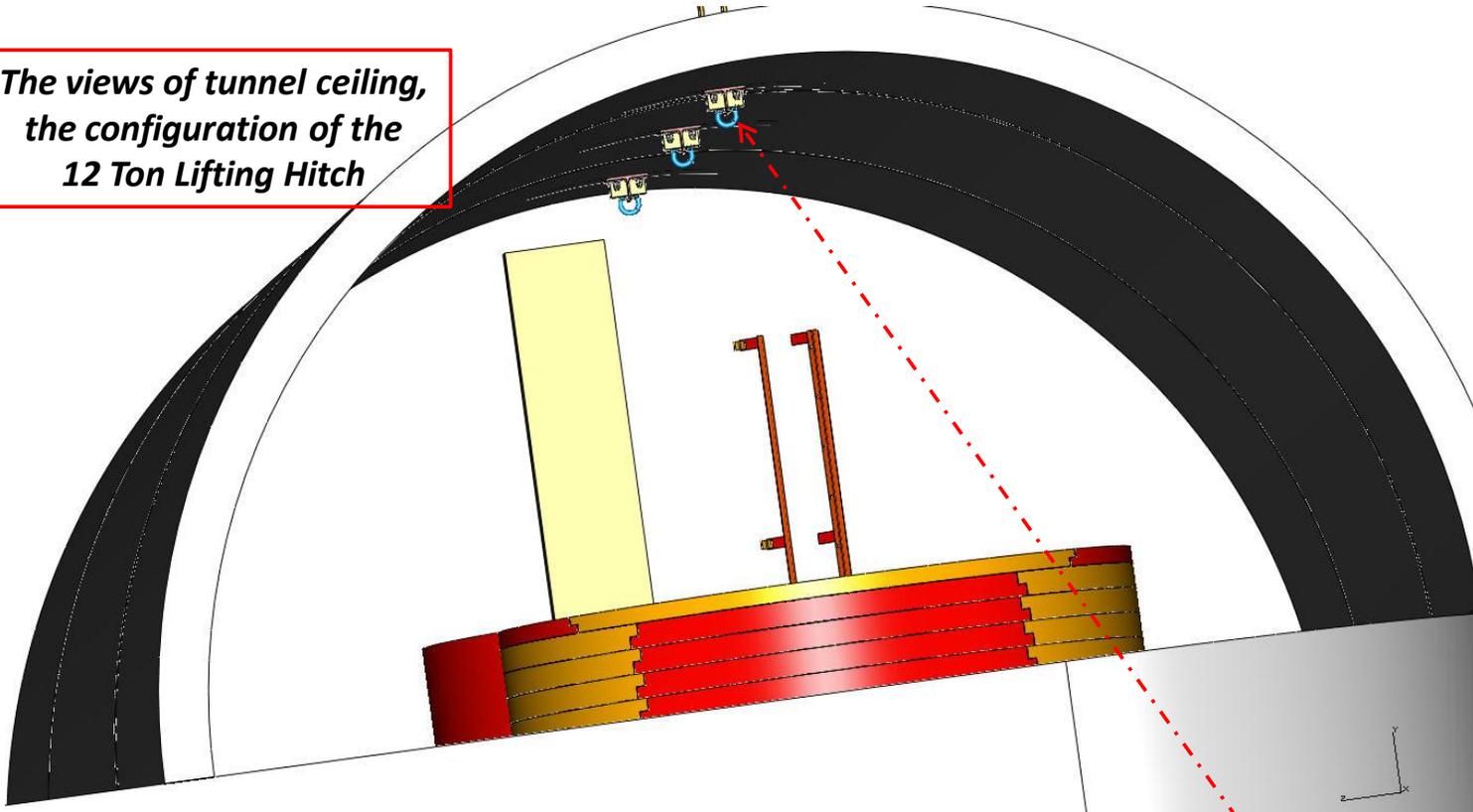


The views of the experimental area



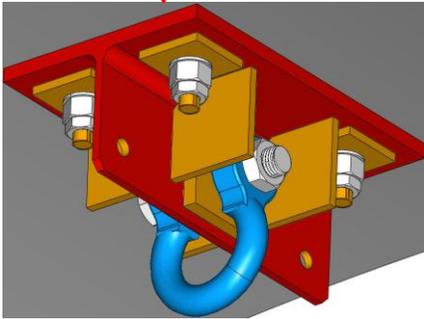
12 ton lifting hitch

***The views of tunnel ceiling,
the configuration of the
12 Ton Lifting Hitch***

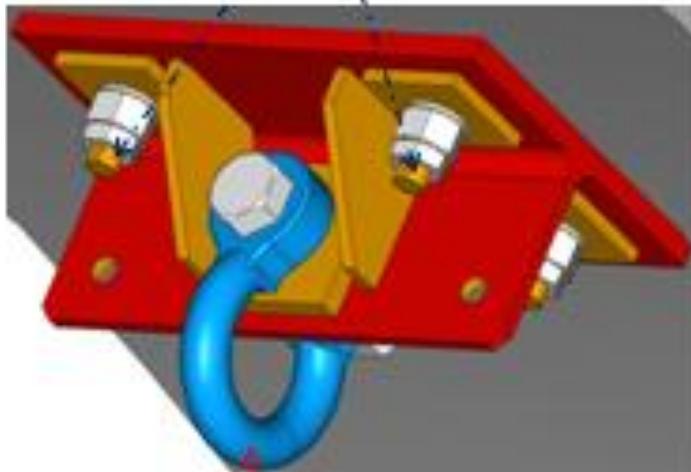


***The view of the existing 4
Dywidag Threadbar
From the tunnel ceiling
(after removed the existing
mtg. bracket and the 12 Ton
anchor shackle***

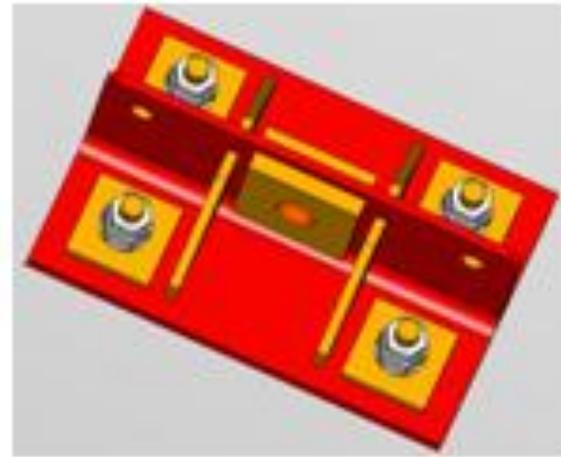
**The view of the existing
12 Ton Lifting Hitch mounted
on the ceiling
(per dwg. #99-071-E-02649)**



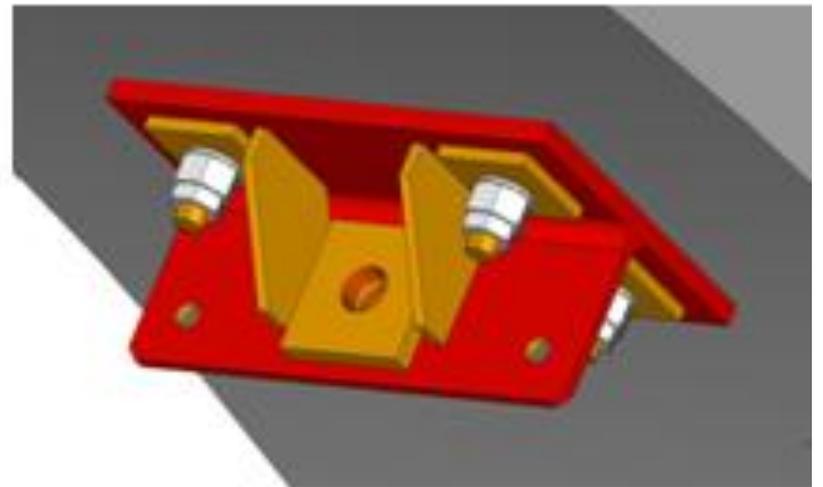
Split ends of the thread Rebars (4)
(Assuming the lifting hitch is not replaceable)



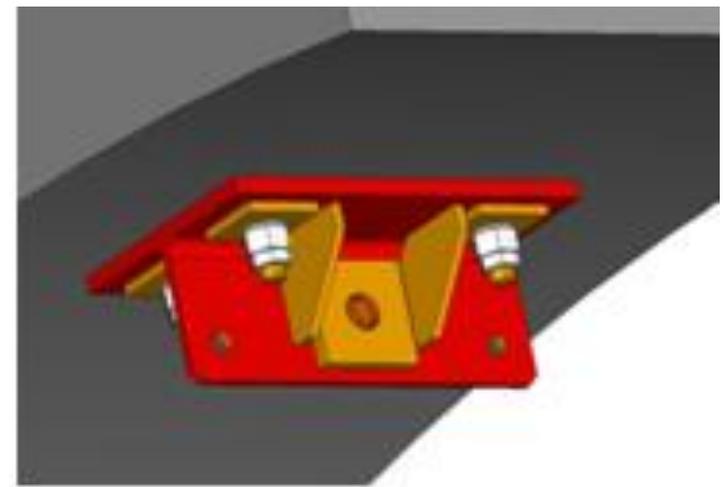
12 Ton Anchor Shackle with its
bolt & nut are replaceable



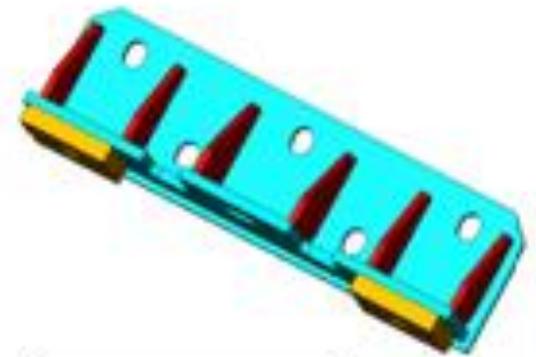
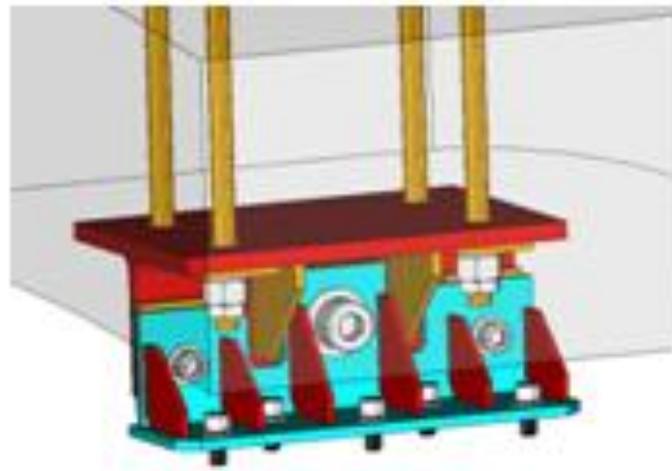
The views after removed the
Anchor Shackle & its bolt & nut



Install the adapter bracket #1
(2 views from different angles)



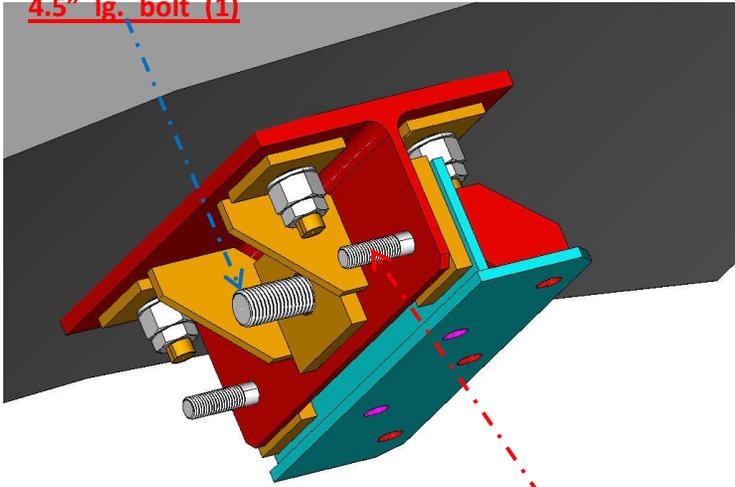
Lifting Hitch w/o Shackle



Adapter bracket 1
(~23 lbs)



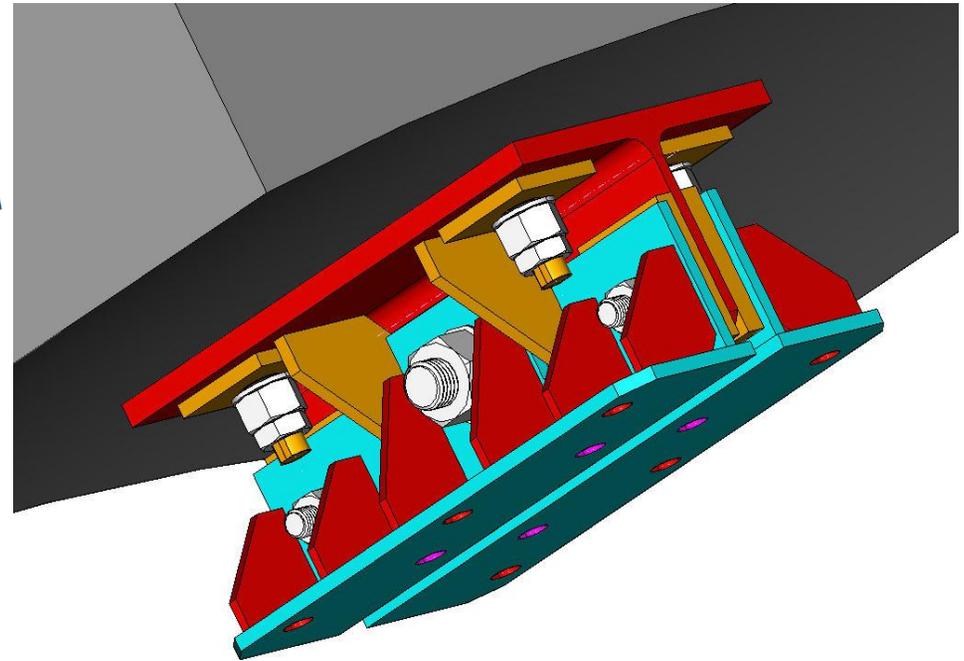
1.25 x 7 UNC,
4.5" lg. bolt (1)



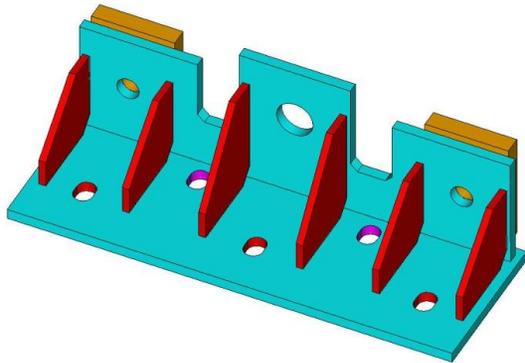
Lifting Hitch with Adapter
bracket 1 only

3/4 - 10, UNC, 4" lg. bolts (2)

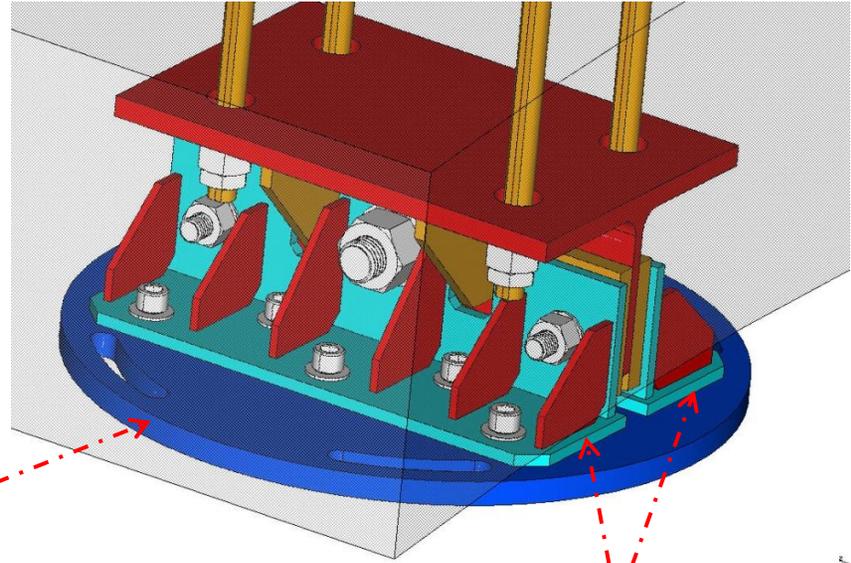
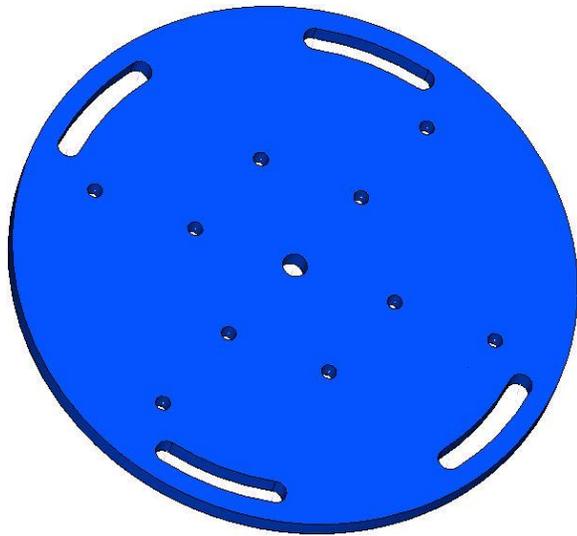
Install both Adapter brackets with the Lifting Hitch



Lifting Hitch with both Adapter
brackets installed

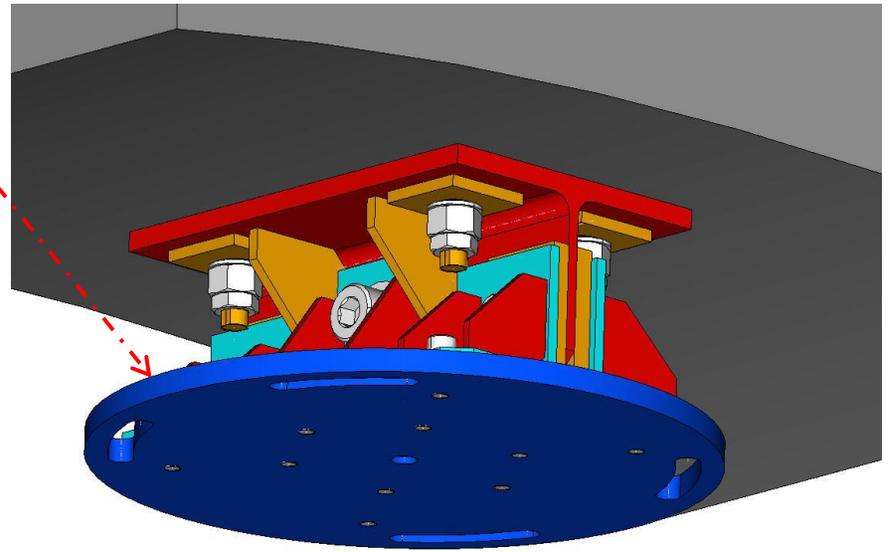


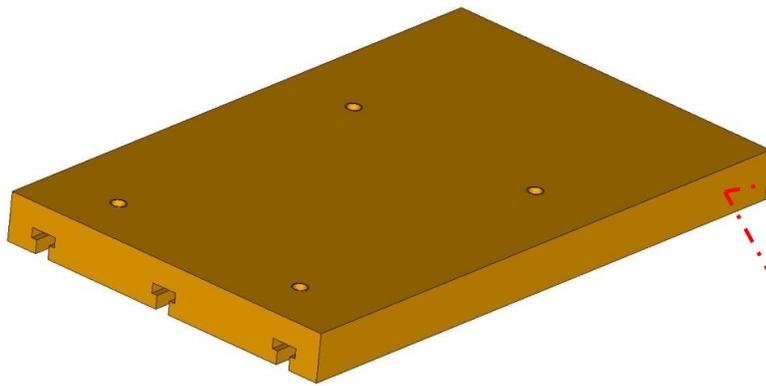
Adapter bracket #2
(~ 23 lbs)



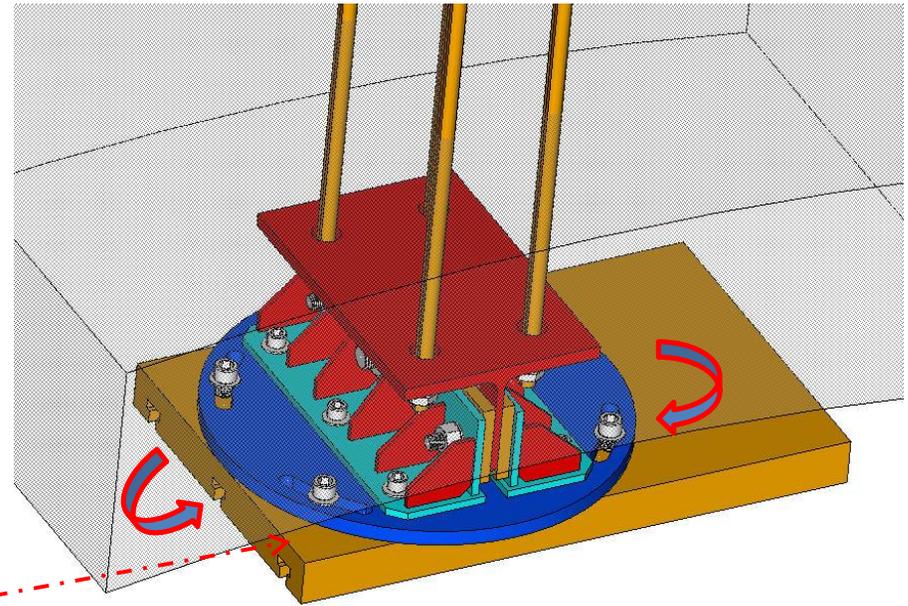
Adding shims for leveling if it's necessary

Install the angular adjust connector underneath of the two adapter brackets (63 lbs).

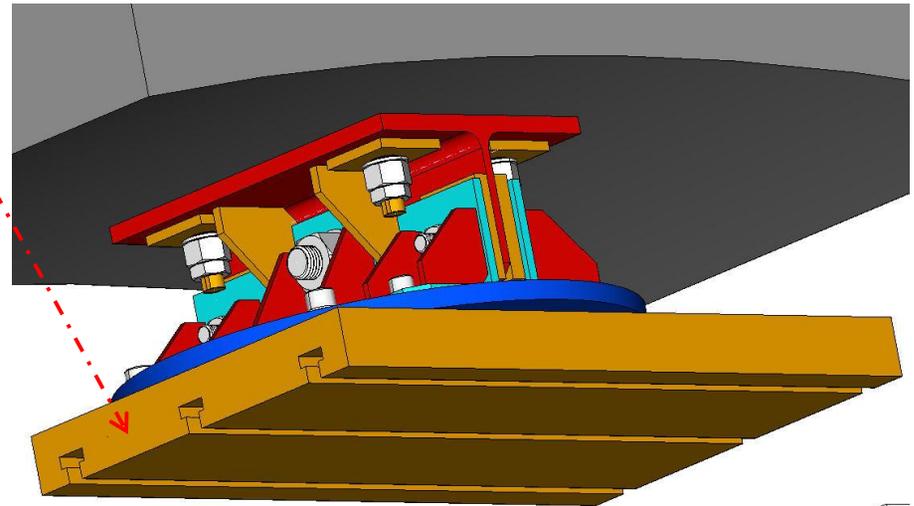




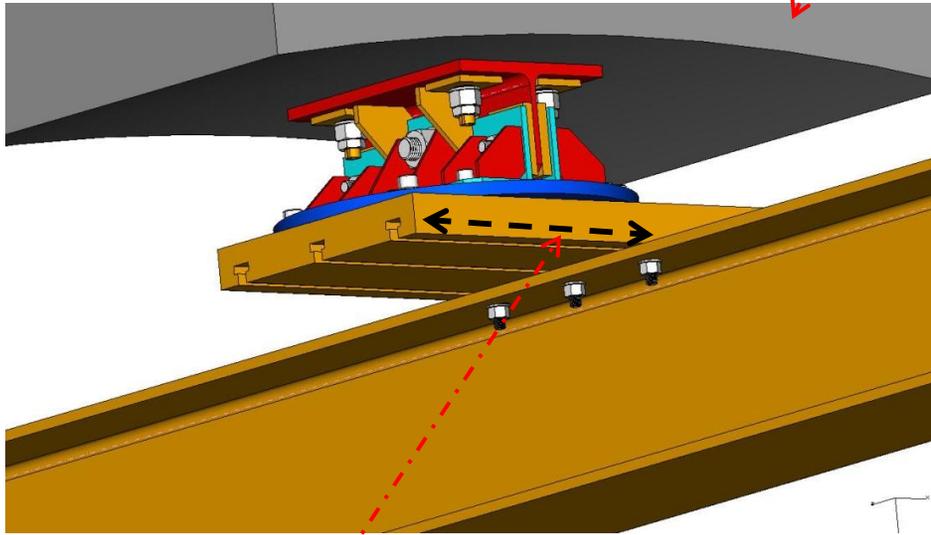
T-slots beam connector
(28" x 17" x 2.25")
(279 lbs)



Angular adjustability ~ +/- 13 deg.

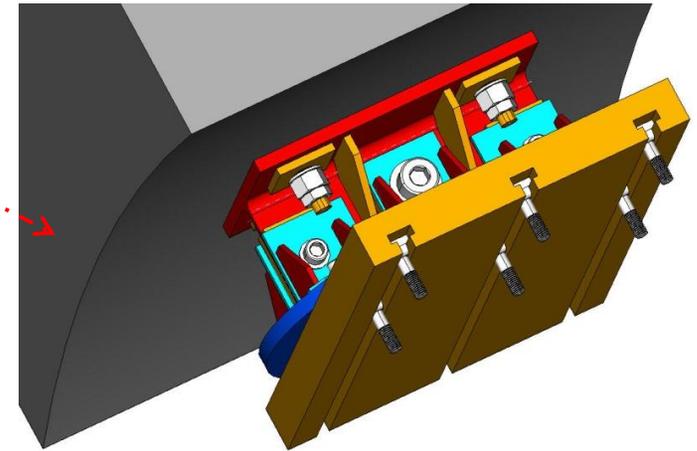


Install the I-Beam with the new version of mounting Adapter.



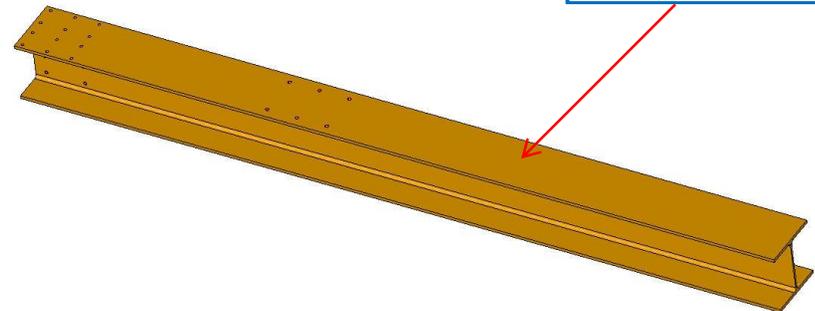
**Adjustability along the T-slots
(beam lateral direction)**

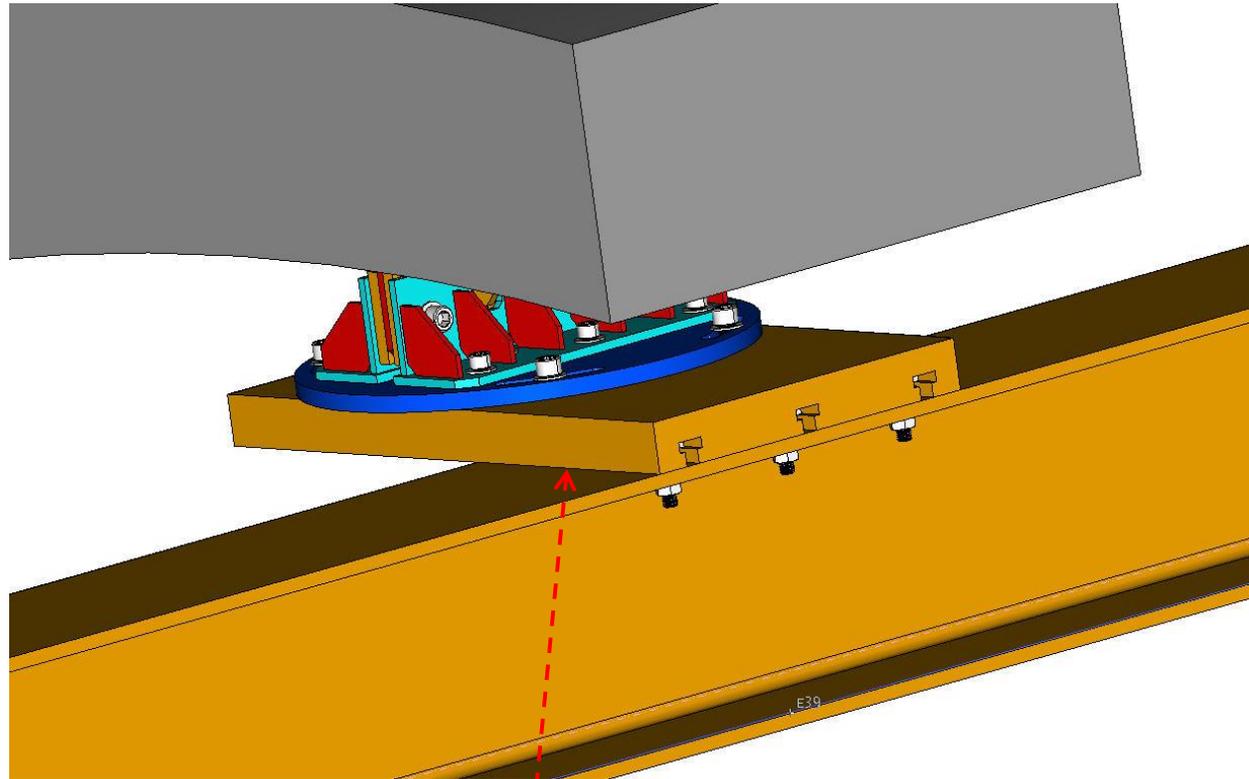
Ceiling



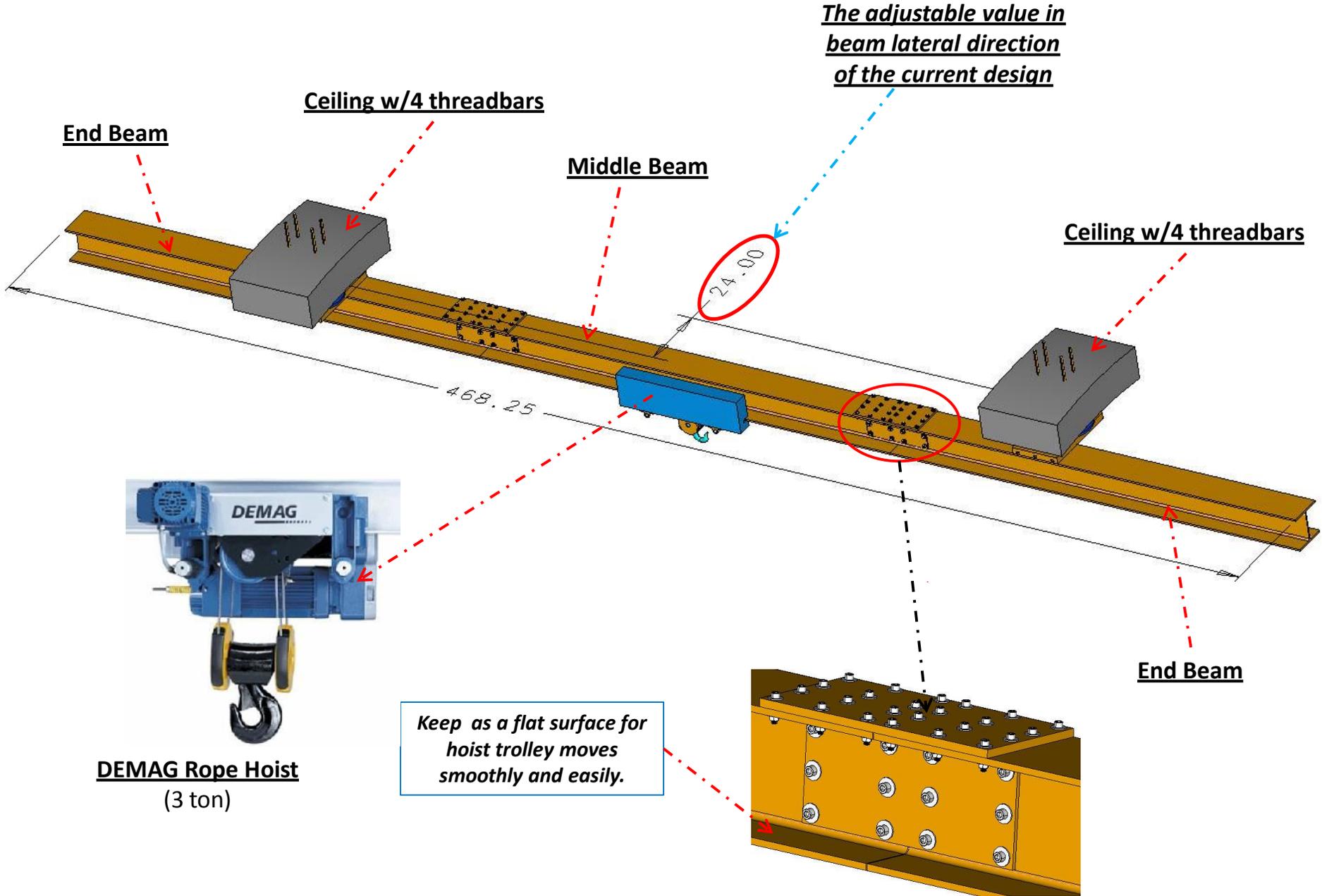
**View from the bottom
of the Adapter bracket**

**W12 x 65 I-Beam,
156" (13') length,
Mounted on the new
ceiling bracket.**

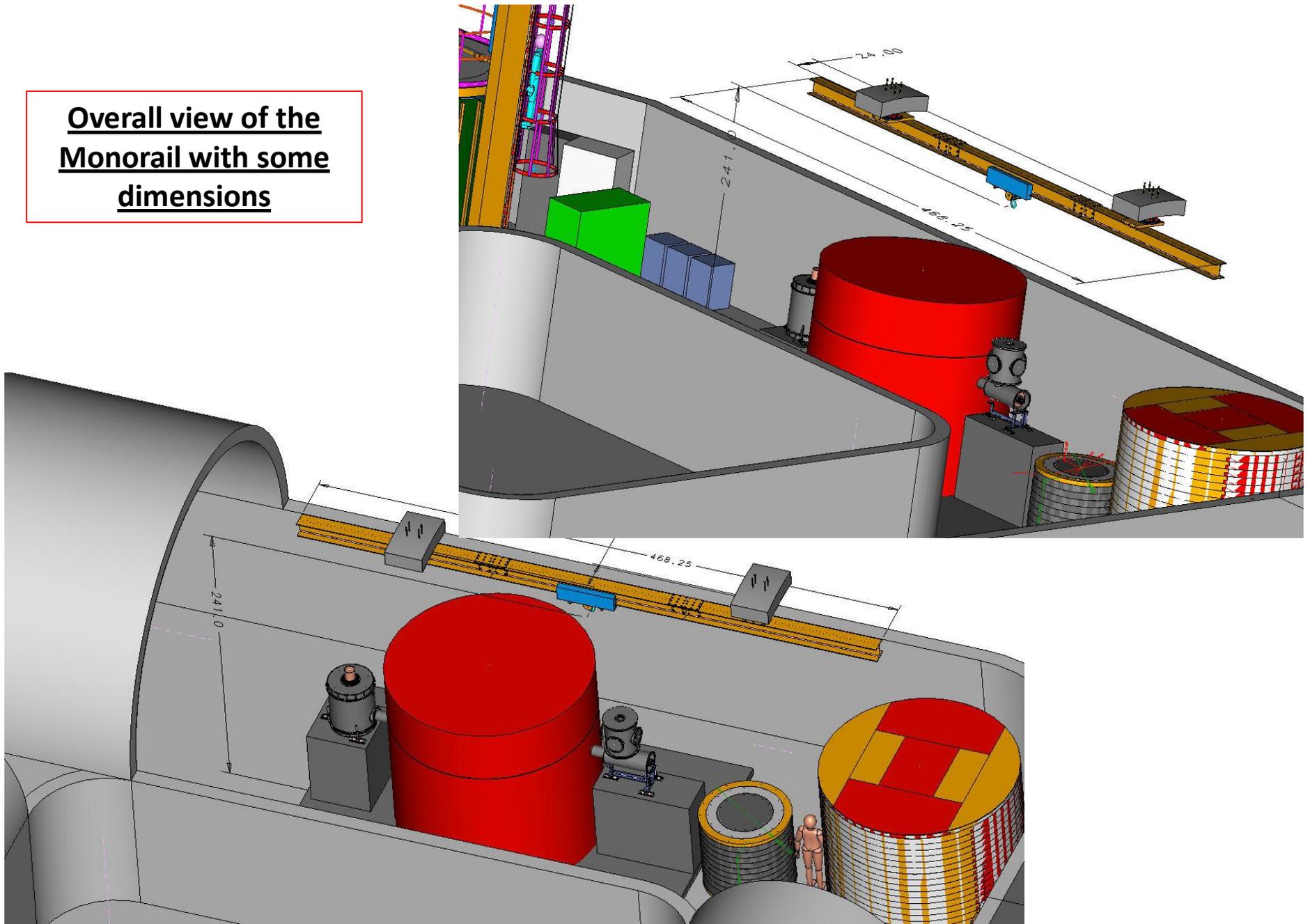




Adding shims between slot connector & the top surface of the beam for vertical (Y dir.) adjustment if it's required.



Overall view of the Monorail with some dimensions



More view from Drift C3 area with some facilities & utilities.

