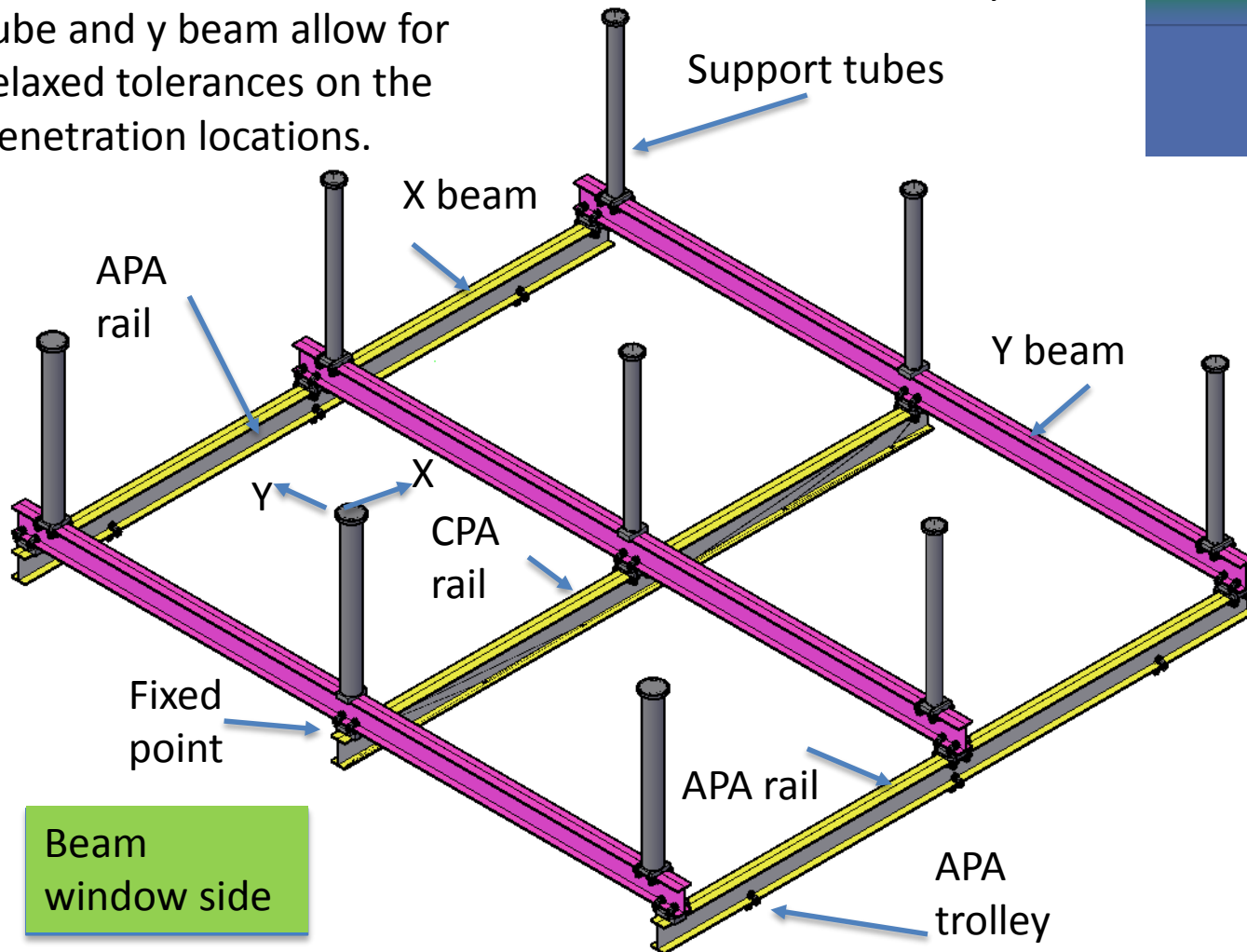


TPC Support Installation

- Overview
- Installation of the support rails
- Details of the rail from the SAS to the clean room
- Requirements to the warm structure, accuracy of feed thru, height accuracy and survey, support of crossing tubes, loads translated to warm structure

Overview of support

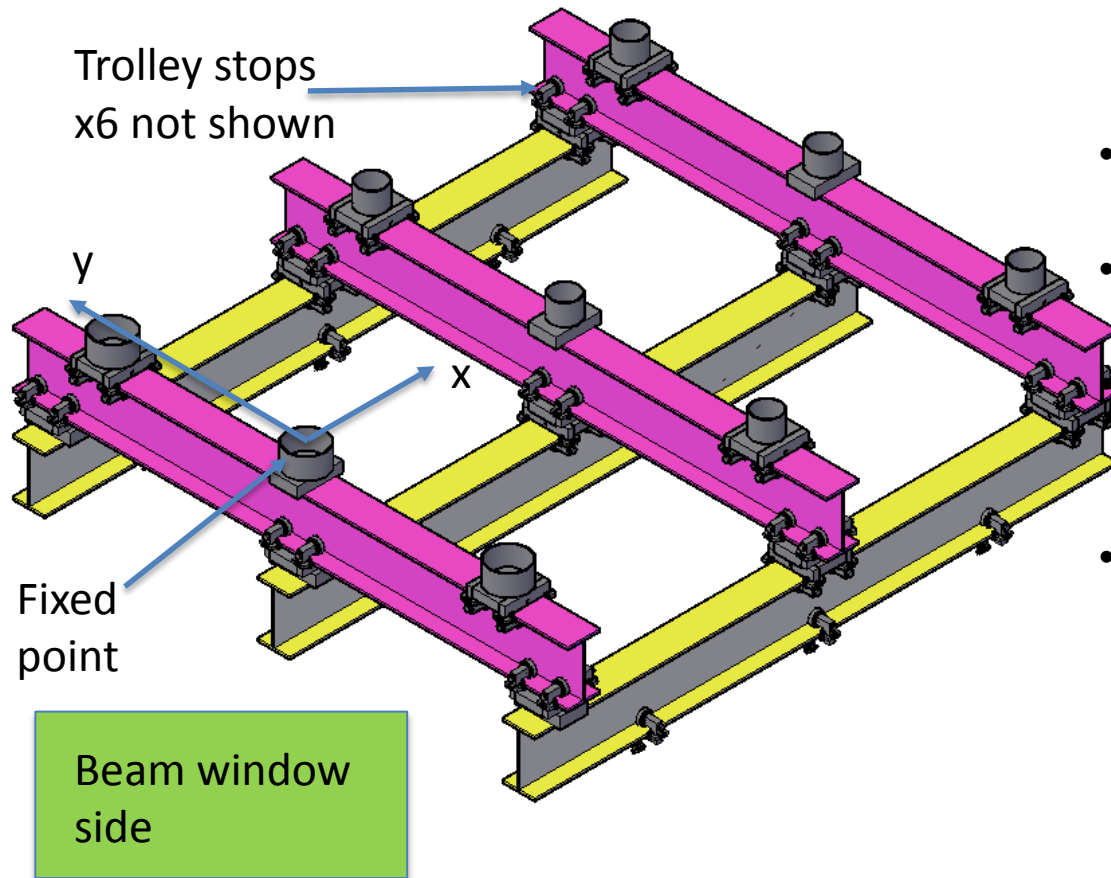
Roller mounted beams and slotted holes between support tube and y beam allow for relaxed tolerances on the penetration locations.



Installation:

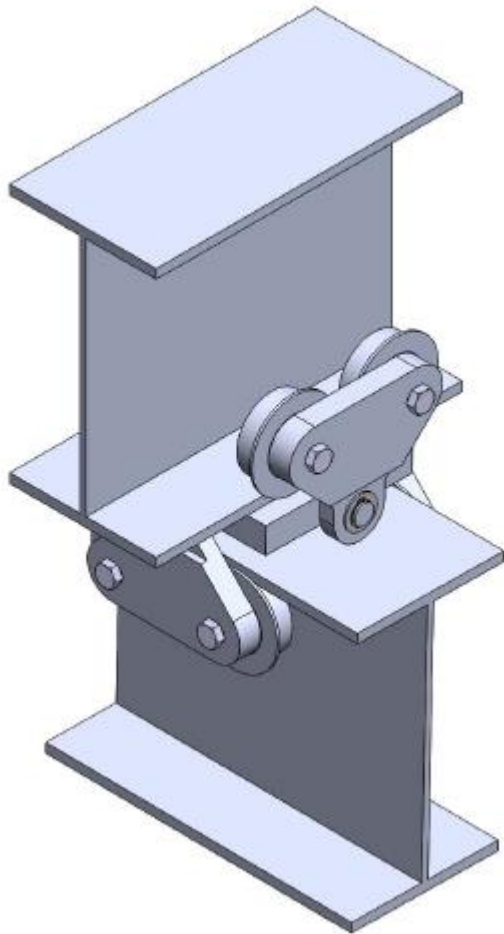
1. Install the 6 support tubes above the APA rails.
2. Lift the y beams through the center penetration and secure the beams at the ends.
3. Install remaining tubes and connect beams at midpoint.
4. Rig the x beams through the cable penetrations and mount them.

“Compressed” view of support



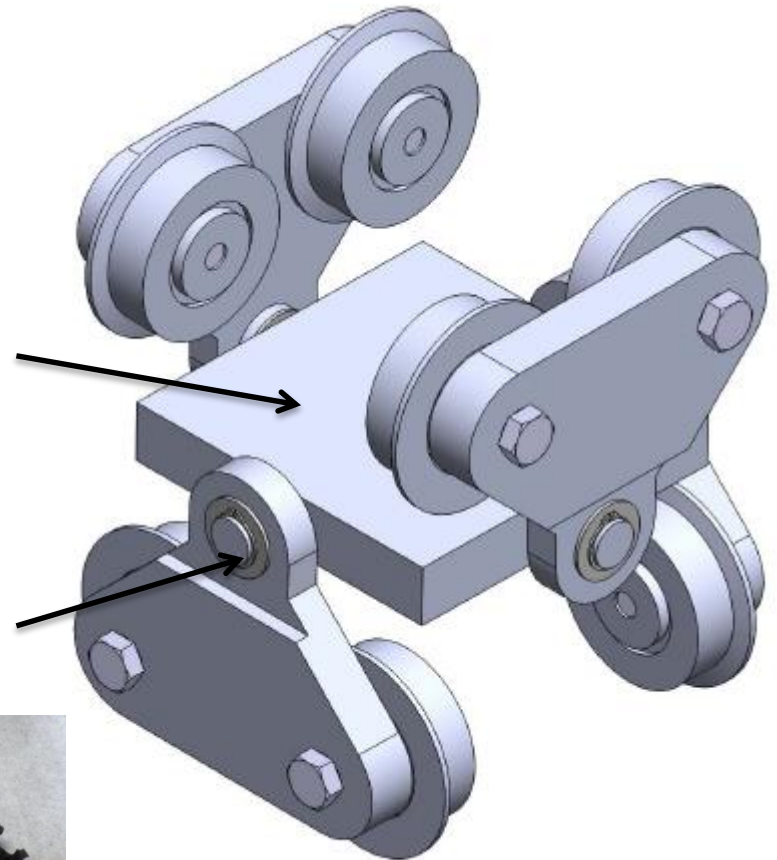
- Y beams are fixed at the midpoint in x, y, and z and allowed to contract towards $y = 0$.
- X beams are constrained on the beam window side to minimize moment with respect to the beam window.
- X beams are free to roll in y for installation
- After installation, the middle x beam is locked to the y beam. As the Field cage shrinks, the outer 2 x-beams are pulled to the center.
- APA trolleys closest to the beam window will be constrained after installation.

Beam Trolley Design



Articulating connection allows for load sharing due to tolerance and roof deflection

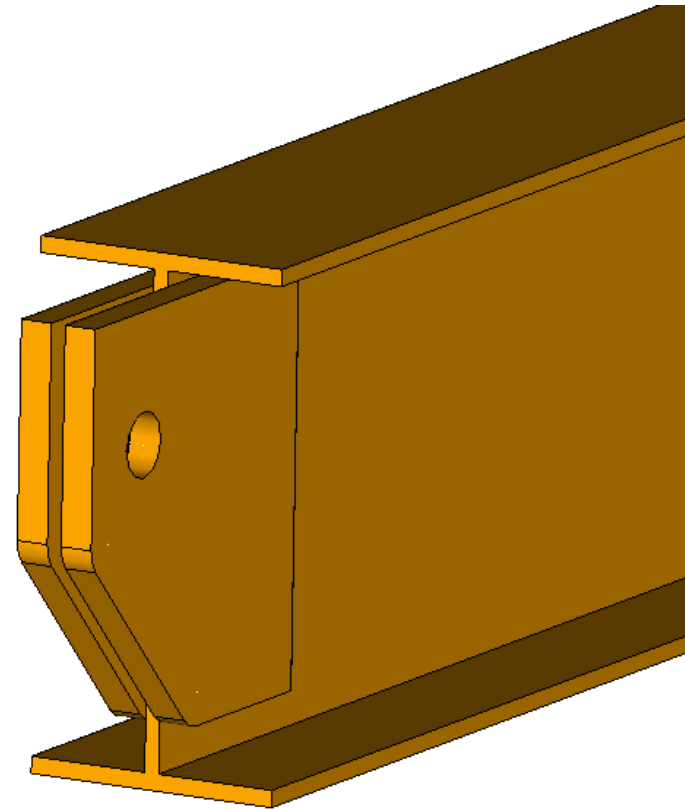
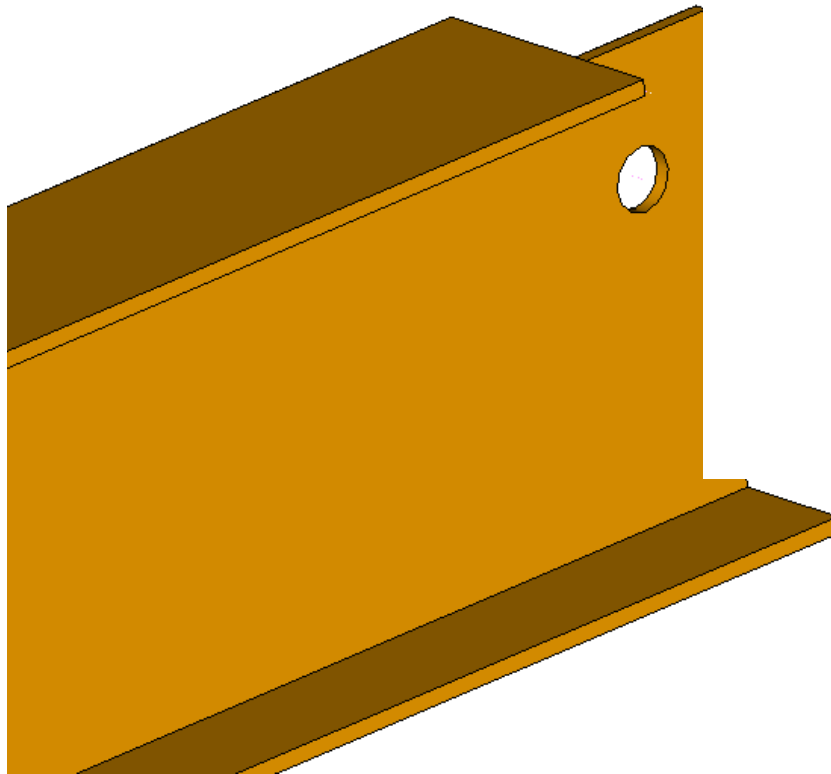
Dry bronze bushing – to be purity tested



Considering Barden bearings which have been tested in LAr and gaseous Argon. Also considering bearings with ceramic balls – sizing minimum SF of 3

Support Beam Pivot

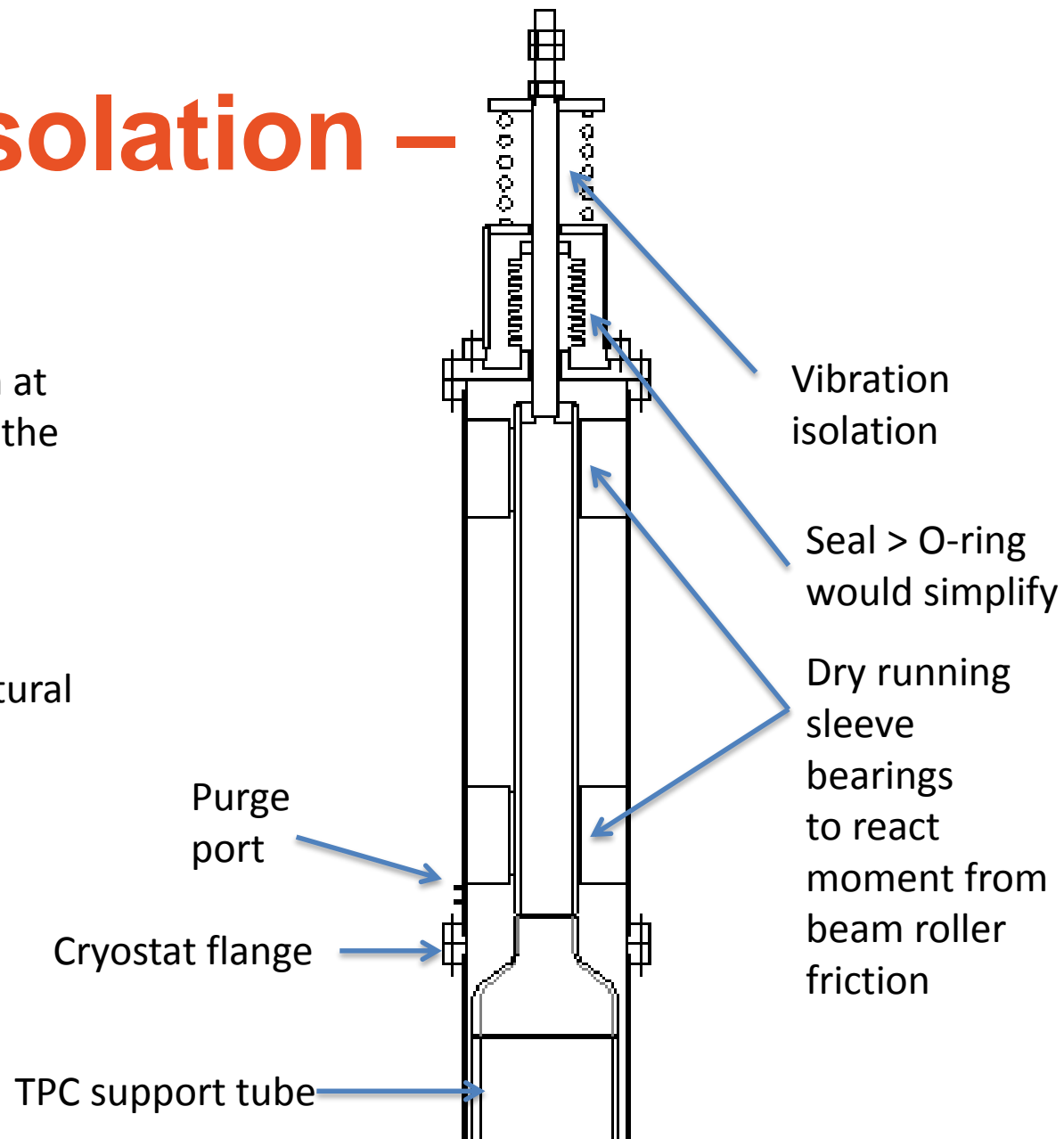
Beams will have to pivot in center to p
would applied with roof deflections



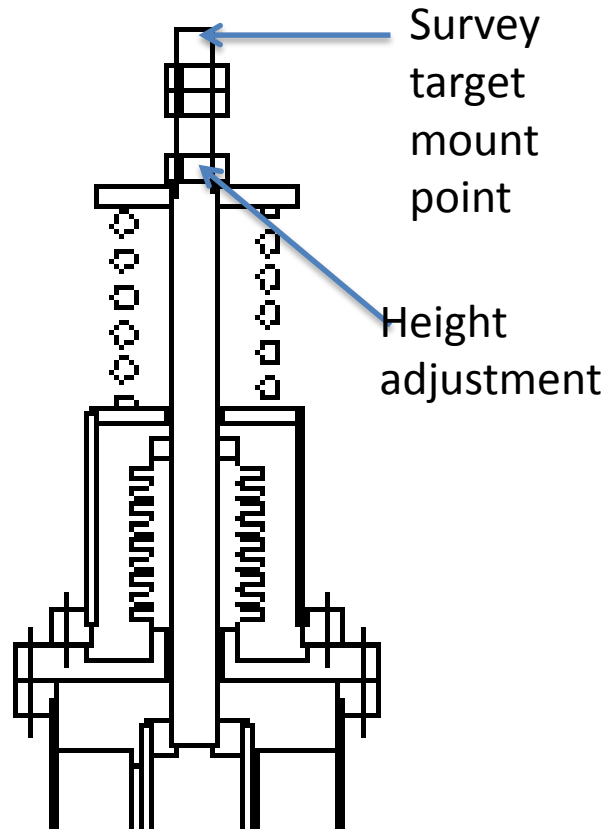
LBNF design from Russ Ruzinski
Design in progress

Vibration isolation – If needed

It is best to eliminate vibration at the source, but if not possible the maybe TPC could be spring mounted. The low frequency spring mass system would not transmit higher frequency disturbances near the wire natural frequencies.



Height adjustment



The TPC will be designed to be flexible enough to accommodate Thermal contract and expansion and the anticipated roof movements.

At installation, the height of the TPC support tubes will set to anticipate the roof distortion expected during the operating state of the cryostat. If necessary, adjustments can be made with a cold TPC

Support of the TPC to the cryostat roof

- Installation of the support rails

Note: Largest rail will be ~ 4 m long and 130 kg

Fork lift or rail lifting tool is probably needed to deliver the beams through the TCO.

Transport options inside the cryostat

Beam delivered with casters (preferred)

Beams delivered before roof is installed (unlikely?)

Once in position, the beams would be temporarily spliced for lifting.

Support of the TPC to the cryostat roof

- Installation of the support rails

Mounting rails

Connect a plate to splice the beam and a post assembly to the top of the beam to splice the joint and to provide a stable lifting point above the c.g.

Lift the beam through the center port.

Secure beam at north and south end.

Disconnect the crane from the center point.

Repeat remaining y rails

Lift x rails from the y rails

Comment: This method requires multipoint access from inside

.

Details of the rail from the SAS to the clean room

- 4m long beams will be lowered into horizontally into the SAS
- Casters maybe used to move to hoist coverage in clean room if needed.

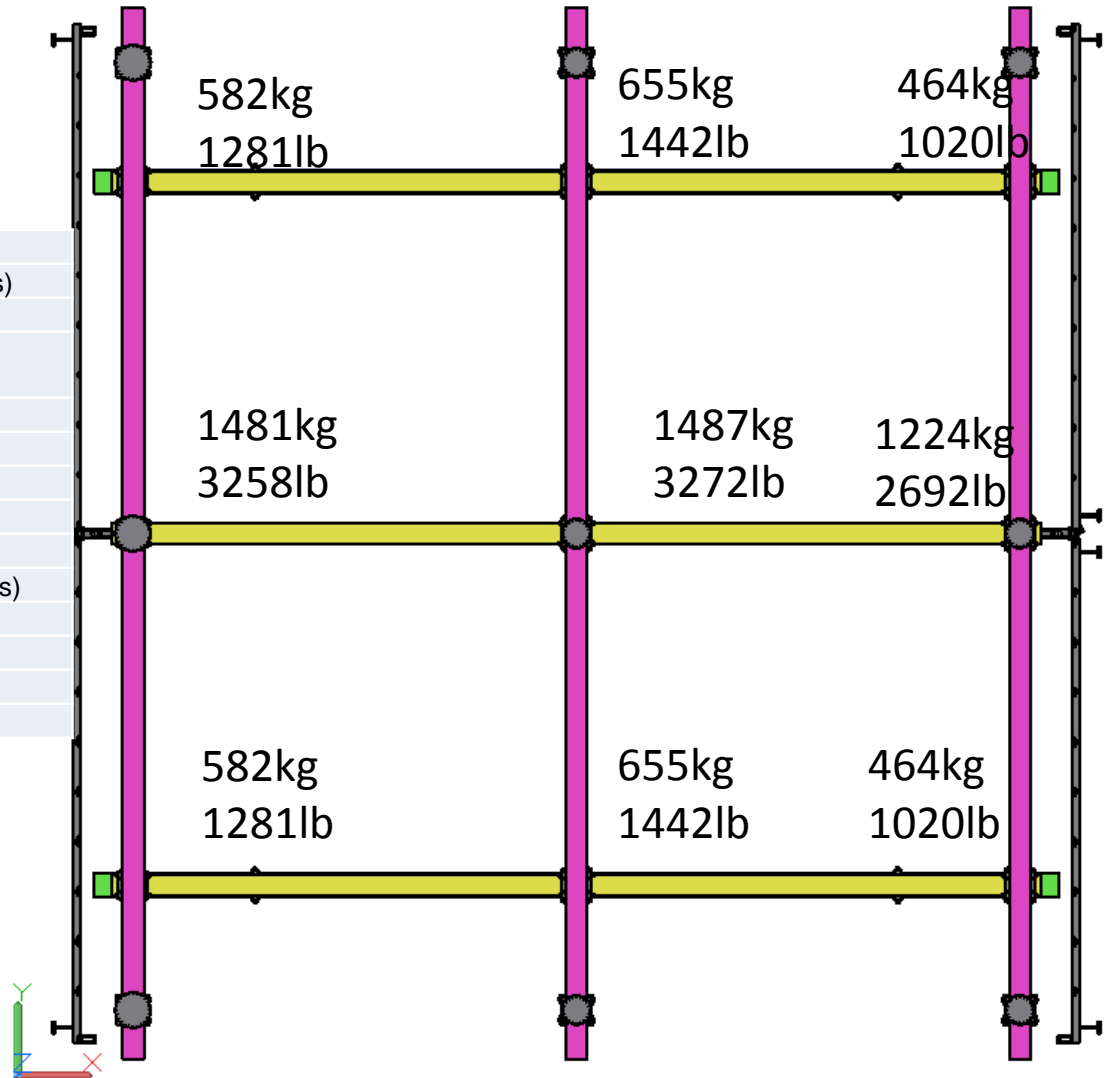
Requirements to the warm structure, accuracy of feed thrus, height accuracy and survey, support of crossing tubes, loads translated to warm structure

- Current concept has some compliance to errors in the feedthrus. However it is important for the fixed point to be positioned accurately ... ~3mm. Also if the flange is not level on the top of the cryostat the ~2m length of the penetration could cause a lot of error at the support point mount points .
- Will need to survey the mounting surface to the support tubes for position and level.
- Would be nice to know more details about what is being supplied to mount the support tube to.

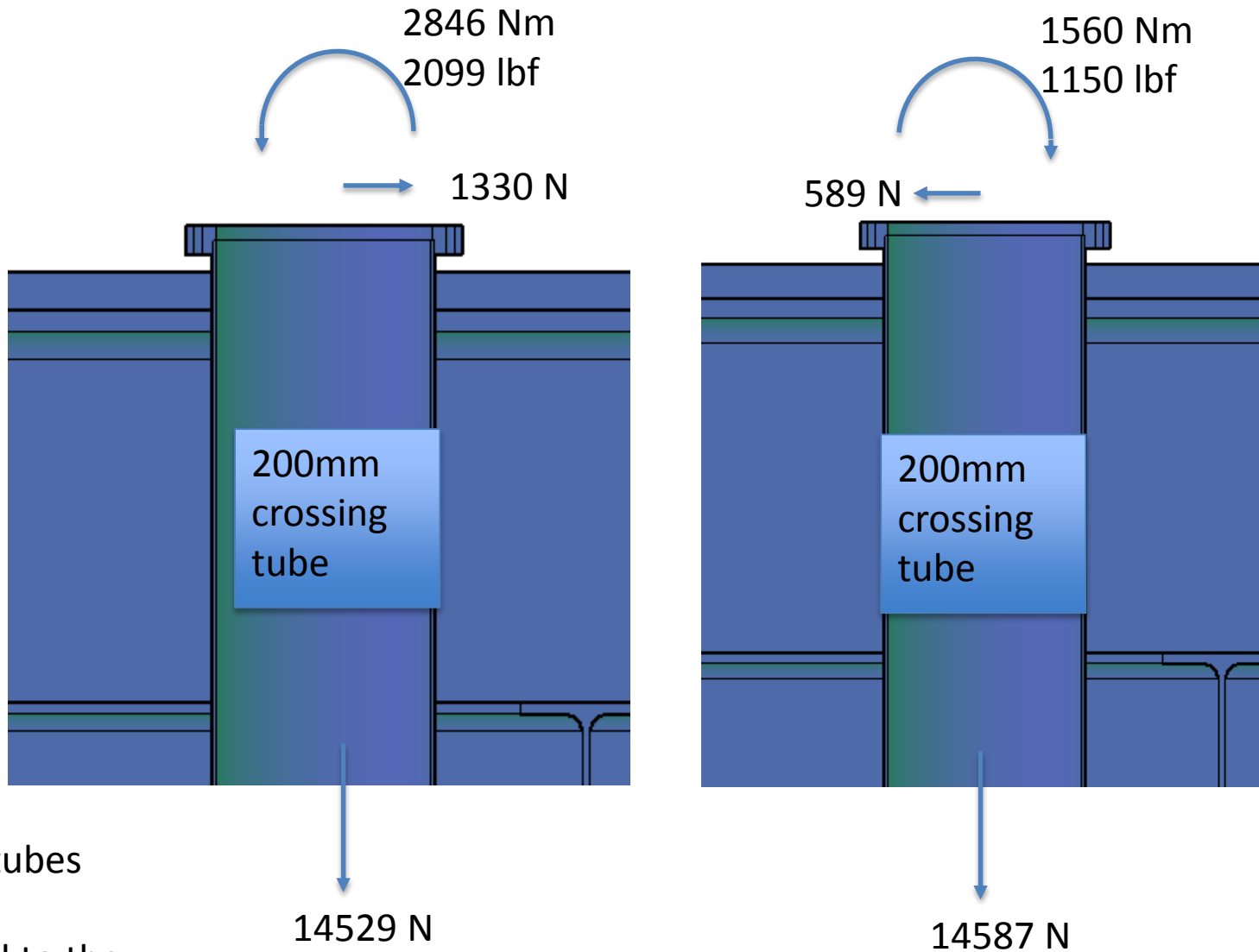
Loading with 2.5 meter gap

Estimated dry weights of components:

900	=APA weight (lbs)
880	=FC weight top and bottom together (lbs)
935	=EW one corner (lbs)
	=CPA 1/2 wide COLUMN
285	(lbs)
500	=BEAM weight (lbs)
16707	=TPC and beam weight (lbs)
409	=APA weight (kgs)
400	=FC weight top and bottom together (kgs)
425	=EW one corner (kgs)
130	=CPA 1/2 wide COLUMN (kgs)
227	=BEAM weight (kgs)
7594	=TPC and beam weight (kgs)



Roof load requirements – Two worst cases



Crossing tubes will be reinforced to the warm structure

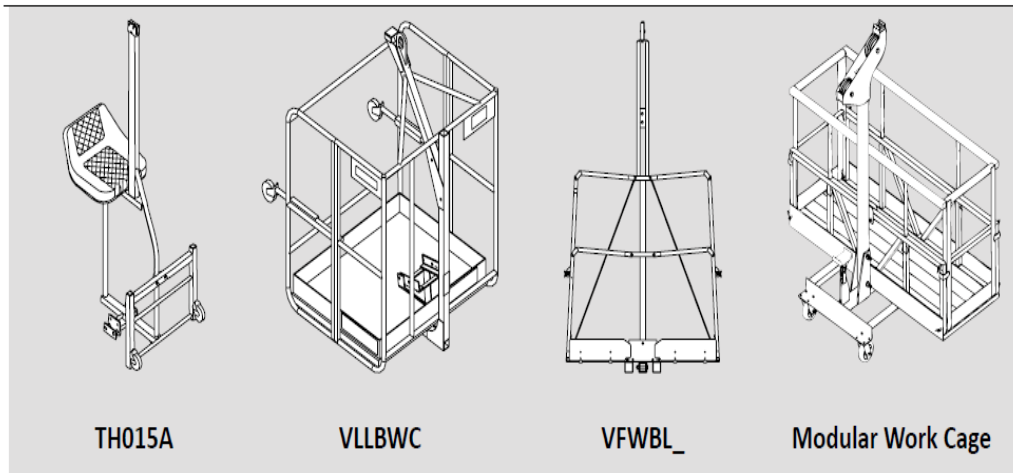
Back up slides

14 Work Cage & 1-Point Suspension

Can pass through small openings

Work Cage & 1-Point Suspension Platform Components				
Part No.	Description	Weight	Capacity	Pass Through Opening
TH015A	Bosun's Chair	55 lbs.	–	18" diameter (disassmb.)
VLLBWC	Low Back Work Cage	130 lbs.	500 lbs.	18" diameter (disassmb.)
VFWBL4*	Fold-Up Work Cage, opens to 4' Length	154 lbs.	1000 lbs.	24" diameter
VFWBL6*	Fold-Up Work Cage, opens to 6' Length	185 lbs.	1000 lbs.	24" diameter
VFWBL8*	Fold-Up Work Cage, opens to 8' Length	201 lbs.	1000 lbs.	24" diameter

*VFWBL_ comes with Mullion Rollers.



Ideal for inspection work and confined areas.

Steel mesh floor; 39½" wide × 34⅞" deep × 46" high. 62" to top of wire rope guide.

Folds up to 13" × 20".

One-point suspended modular work cages can be set up using the 1-meter or 2-meter modular platform section (shown) with the modular work cage stirrup (MODSWC) See page 13.

Allows access to smaller work openings or areas, such as chimneys, wind turbines, or boiler access. Lightweight platform for easy maneuvering, erecting and transporting.

Aluminum plank jack system



Suspended scaffolding

4

Saturn® Hoists Superior Suspension Performance



Saturn® electric and air hoists offer superior performance with built-in safety aspects to

Maintenance Indicators

- A built-in hour meter indicator when the

Climbing-Type Traction Hoists

5

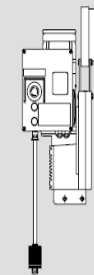
Saturn® Electric Hoists

Model No.	Description	Capacity	Speed	Height	Depth	Width	Weight
LES01SW	P35 Saturn® Lightweight Electric Hoist, 220V	1000 lbs.	33 ft./min.	27"	12¼"	13¼"	84 lbs.
LES01PASW	Saturn® Electric Hoist, 110V	1000 lbs.	20 ft./min.	27"	12¼"	13¼"	84 lbs.
XE701SW	Saturn® Electric Hoist, 220V	1500 lbs.	35 ft./min.	30"	12¼"	13"	123 lbs.

All hoists require 5/8" diameter, Right Regular Lay, 5 x 19 Fiber Core galvanized wire rope. 5 x 26 may be substituted for 5 x 19.



LES01PASW
LES01SW

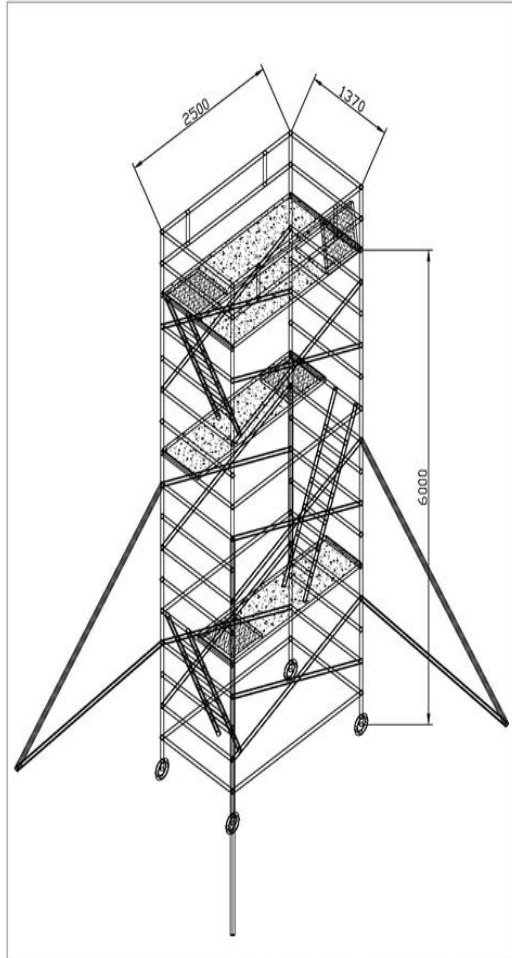


XE701SW

Scaffold used for DayaBay

UpRight

3 设计图纸
双宽 (平台尺寸): 2.5*1.37米



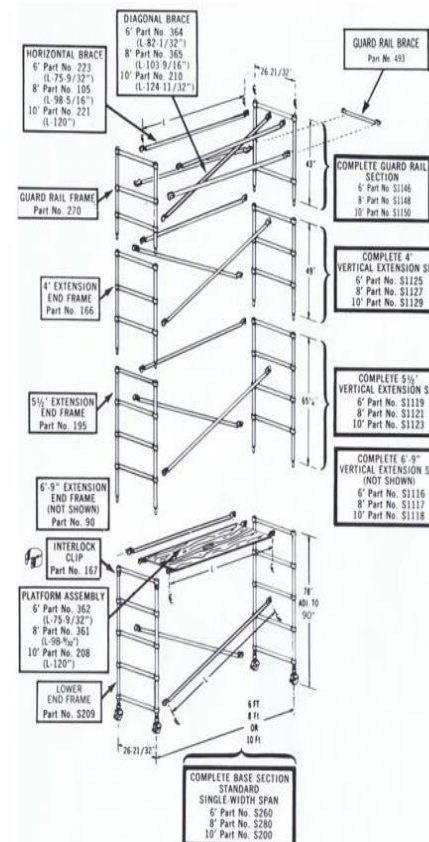
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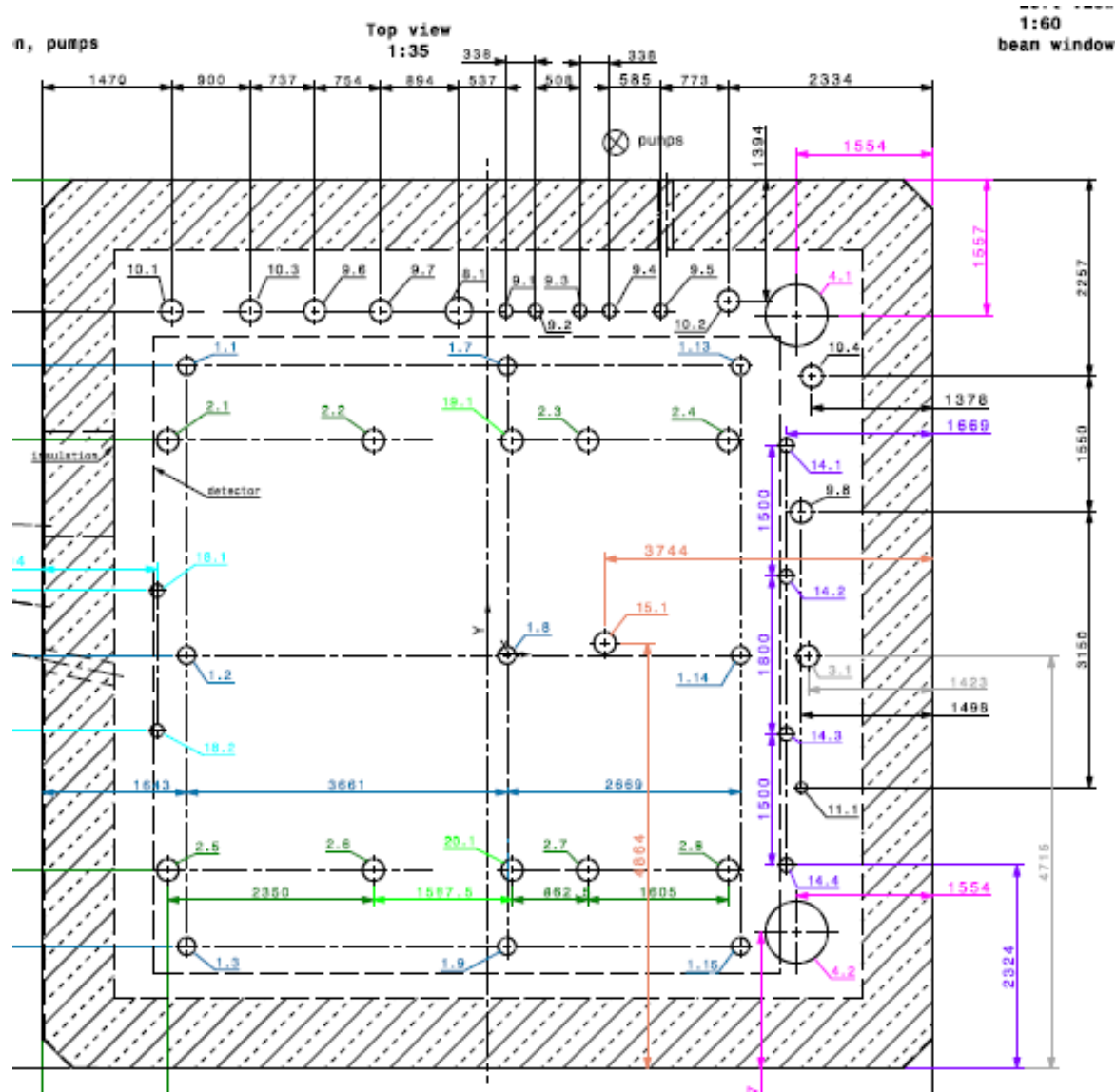
OUR PRODUCTS DEALER NETWORK LITERATURE FREE QUOTE

PARTS & PIECES

Standard Single-Width Span (click to enlarge image)



Top view of cryostat showing proximity of the cable penetration feedthrus to the support rail feedthrus



Support of the TPC to the cryostat roof

- Installation of the support rails

Mounting y rails option B

Use two building crane hooks and two long straps

Send one strap through the penetration above the north end of the beam and lift one support tube with extension and connect it to the north end of the beam

Repeat for the south end.

Lift the beam with the support tubes and thread through the penetrations.

Block the support tubes in position

Remove the extensions

Slide bushing housings over the support tubes

Transfer the load to the crane hook and remove blocking

Mount bushing housing and transfer the load back to the housing

Lower and secure the center support tube from above and from inside connect the beam

.

Draft illustration of mounting y rails option B

