CMS maintenance scenario for LS1

& Tooling

A.Surkov

University of Wisconsin

CERN

November 27, 2012

This report can be useful for LS1 planning and can be used at UXC55 for realistic arrangement of equipment inside cavern for CMS maintenance

1- PIXEL/Beam Pipe/ME1/1 reinstallation,

ME/RPC/YE4 installation,

EE/SE maintenance

2- YB0/YB1/YB2 maintenance

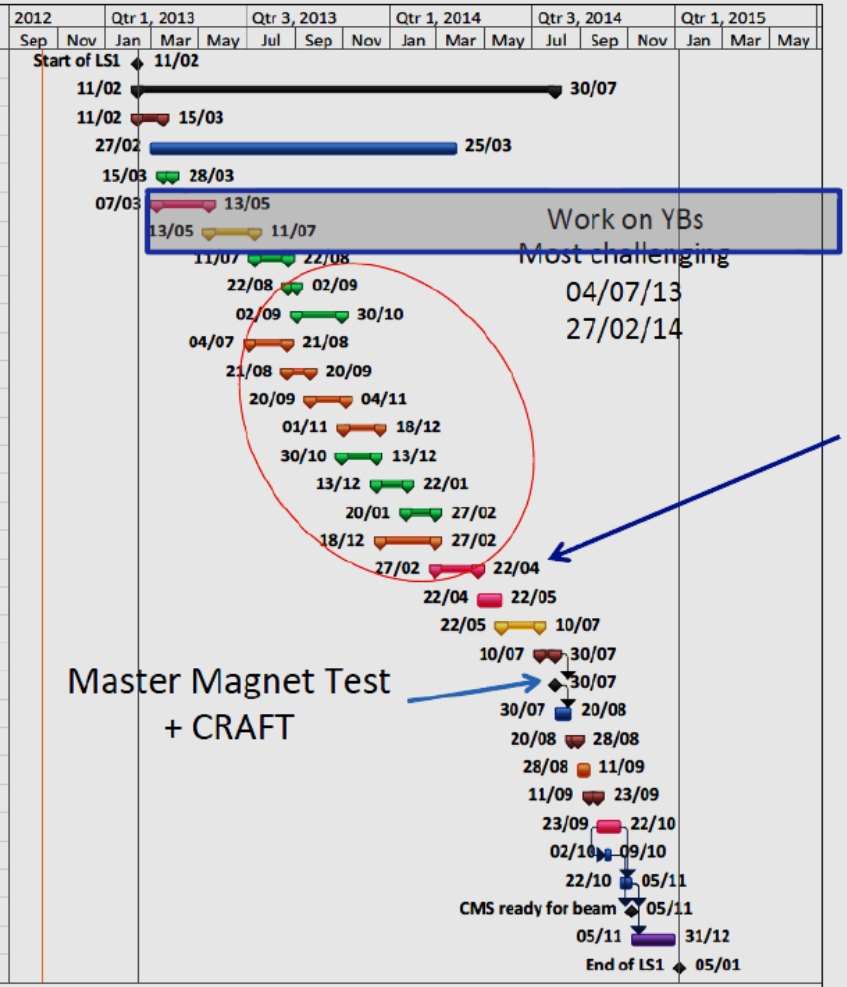
3- RP main support onto PP1 posts installation - Test

Technical Coordination

LS1 planning: v4.0

New end date : January 2015, following decision to re-work diode connections

ID	Task Name	Duration
1	Start of LS1	0 days
2	**Availability of services**	**373.5 days**
36	**Bring CMS to full open config.**	**24.5 days**
100	Replace HF PMTs	54 wks
101	**Harvest HPD from HO+ for HB; Remove CCM boxes from HE**	**9 days**
107	**Remove PIX & BP, work on YE1s CSC & RPC, TK seal inspection**	**46.88 days**
195	**Install TK seal, remove ME1/1, RE+1 maintenance, RE4 services, HB CCM**	**43 days**
218	**Install YE+4, maintain YE+1, CCM+Z, VAX+Z**	**30.5 days**
236	**Install ME+42 Back Layer**	**7 days**
239	**Maintain Ecap+Z (ME+1/1, RE+ ME+, install ME+42RE+4)**	**41.5 days**
250	**Perform work on YB0-Z with Full access to vacTank**	**34 days**
264	**Perform work on YB-1 -HO/DT/RPC**	**22 days**
273	**Perform work on YB-2 - HO/DT/RPC, EE/ES repairs, RE-4**	**31.5 days**
288	**Install YE-4, VAX-Z, GIS-Z, TAS56, Maintenance YE-1, CCM for HE-Z**	**33.5 days**
306	**Perform work on YB0+Z with Full access to vacTank**	**32.5 days**
358	**Perform work on YB+1 -HO/DT/RPC**	**19 days**
367	**Perform work on YB+2 - HO/DT/RPC, CCM for HE+Z, EE/ES+**	**28 days**
382	**Maintain Ecap-Z (ME-1/1, RE-ME-, Install ME-42RE-4)**	**42 days**
394	**Install new BP (+leak tests)**	**38.5 days**
411	Bake out new beam pipe	30 days
412	**Install PIX,PLT,BCM**	**35 days**
452	**Close CMS without T1-Z**	**13.63 days**
473	CMS close ready for Master Magnet Test	0 days
474	Master Magnet Test + validate TK seal + CRAFT	3 wks
475	**Lower HF-Z, Move YE-3/4 out by 3.5m, Open YE-4 YE-3 gap**	**6.38 days**
492	Complete installation of ME-4/2 RE-4 + commissioning	2 wks
493	**Bring HF-Z to nominal position + install T1-Z**	**7.25 days**
507	Pump down	21 days
508	Magnet Recommissioning	5 days
509	Recommissioning for beam	10 days
510	CMS ready for beam	0 days
511	Master Contingency	8 wks
512	End of LS1	0 days

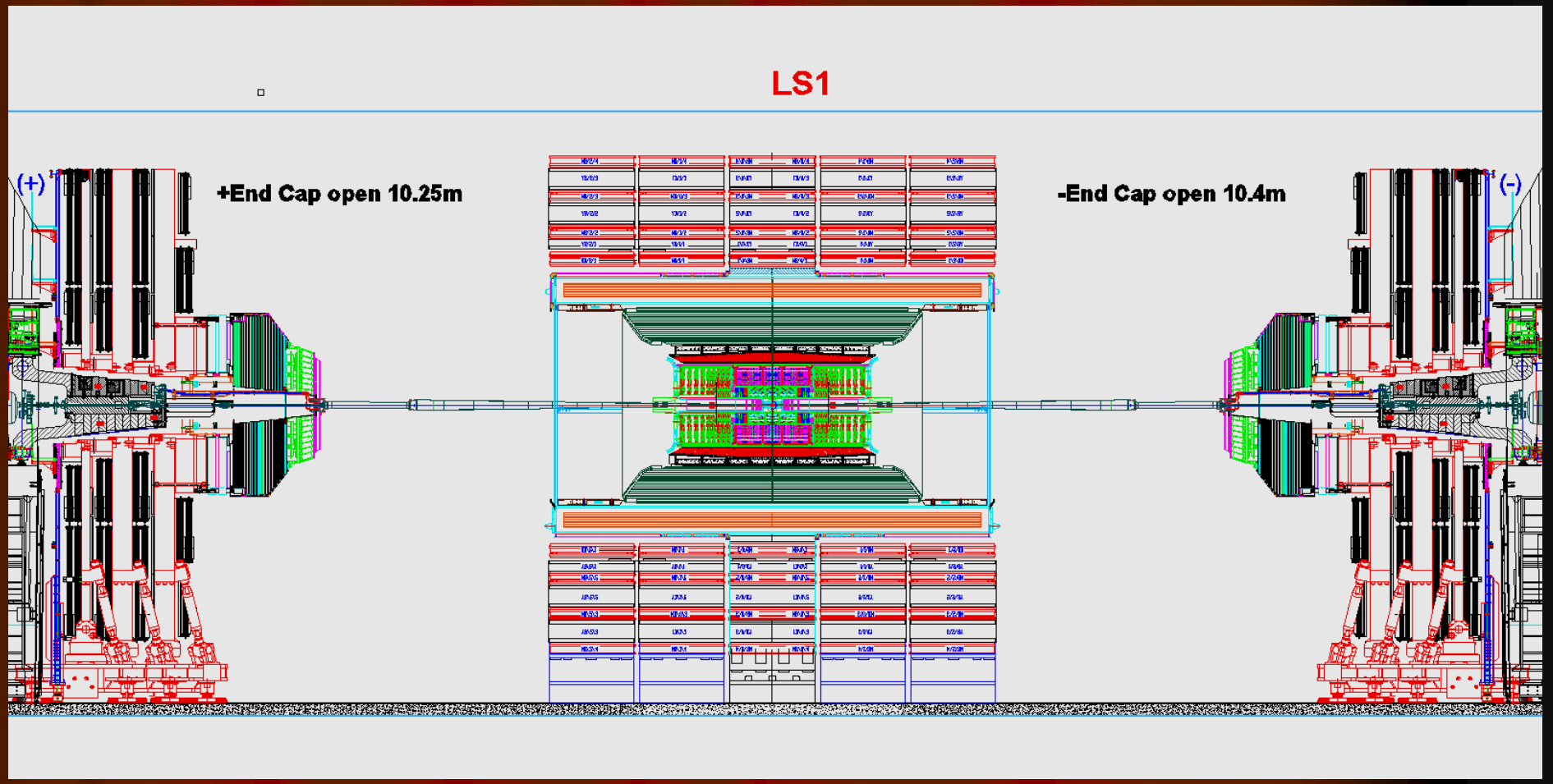


Major re-work of 1'st 5 months

-keeping end of bp installation as an anchor point.

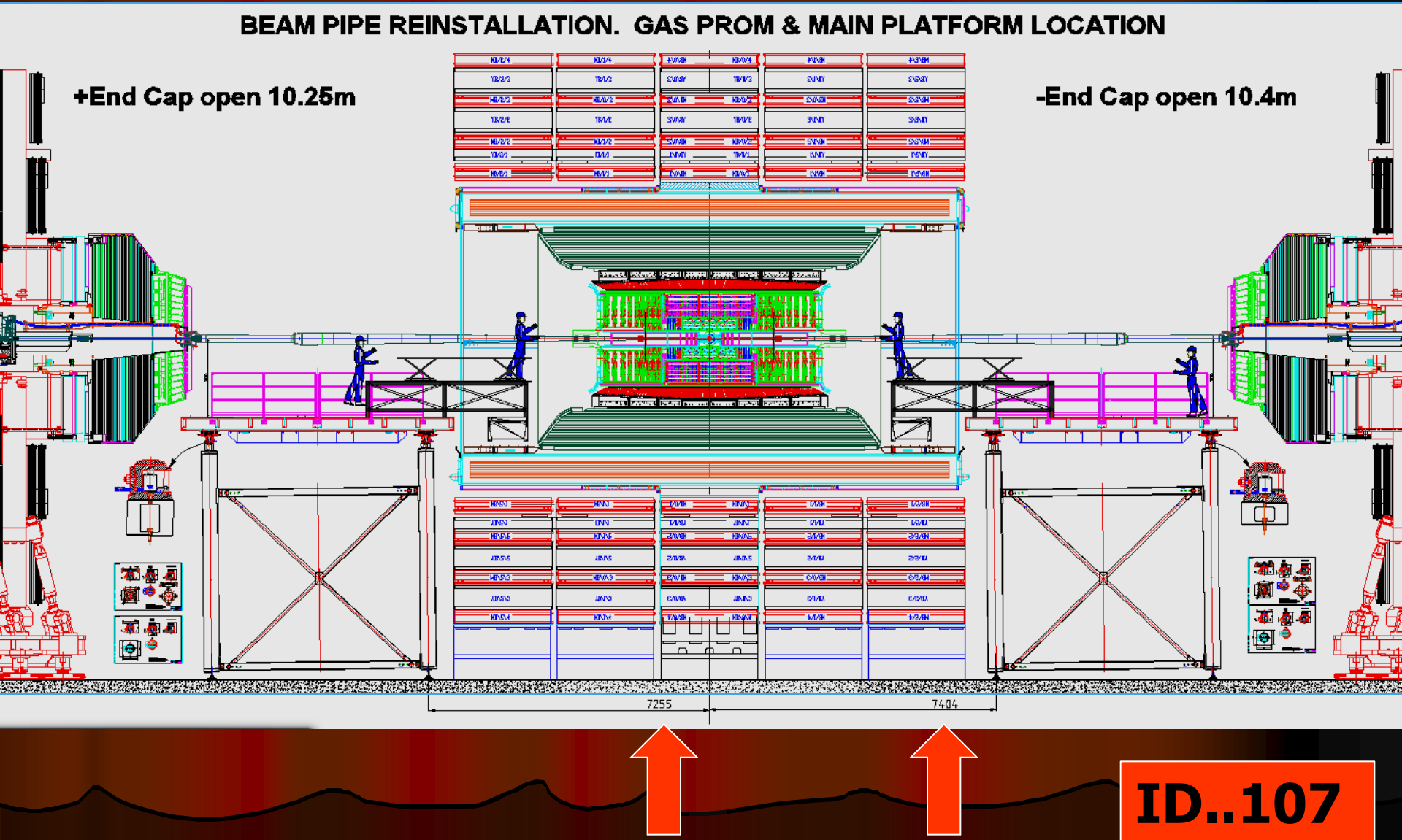
Aim,
-earlier access to Tk seal
-full access to B0 services

CMS OPENING (LS1)



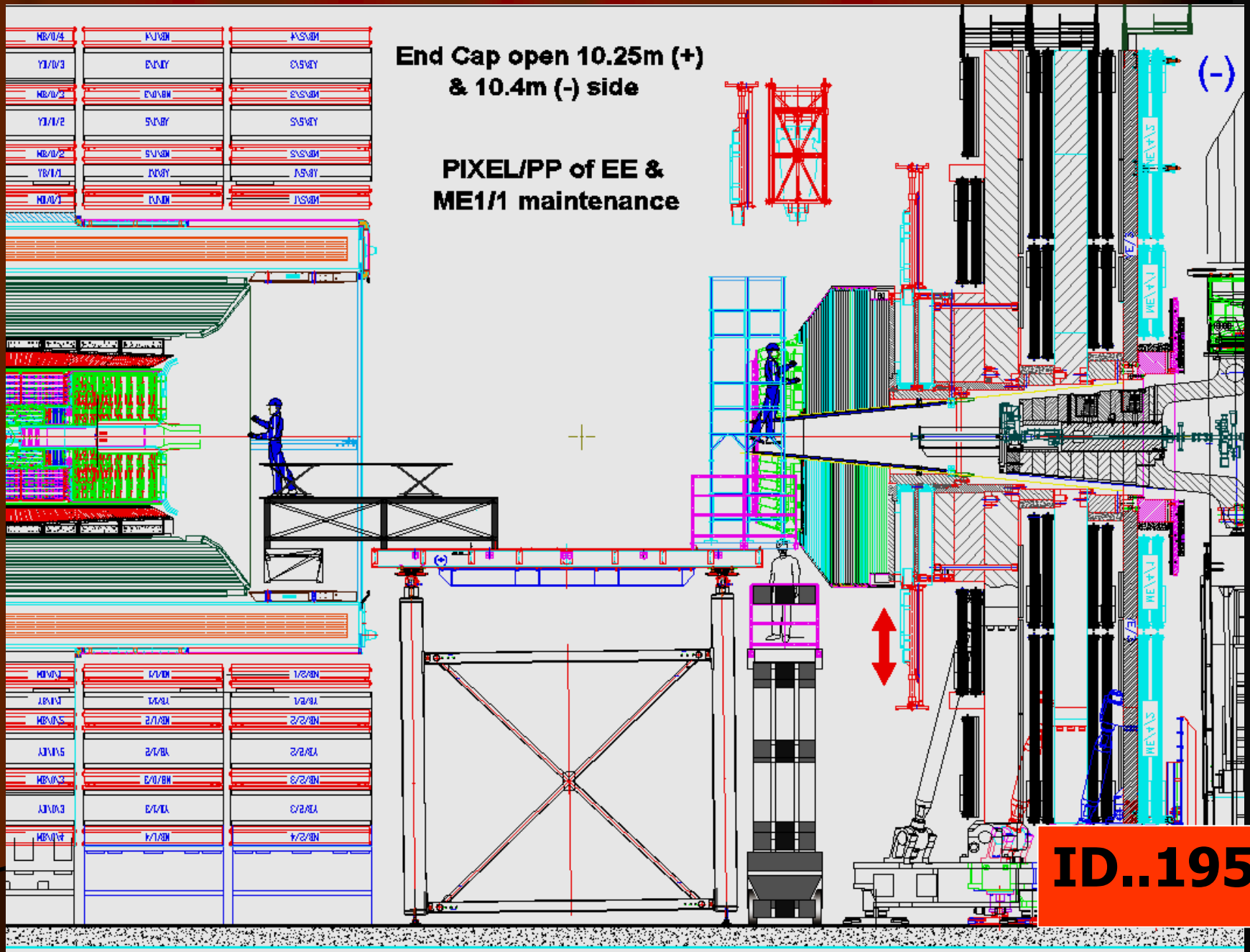
ID…36-according M.G. planning v.4.0

Remove PIXEL & BP
(gas prom platform & main platform location)

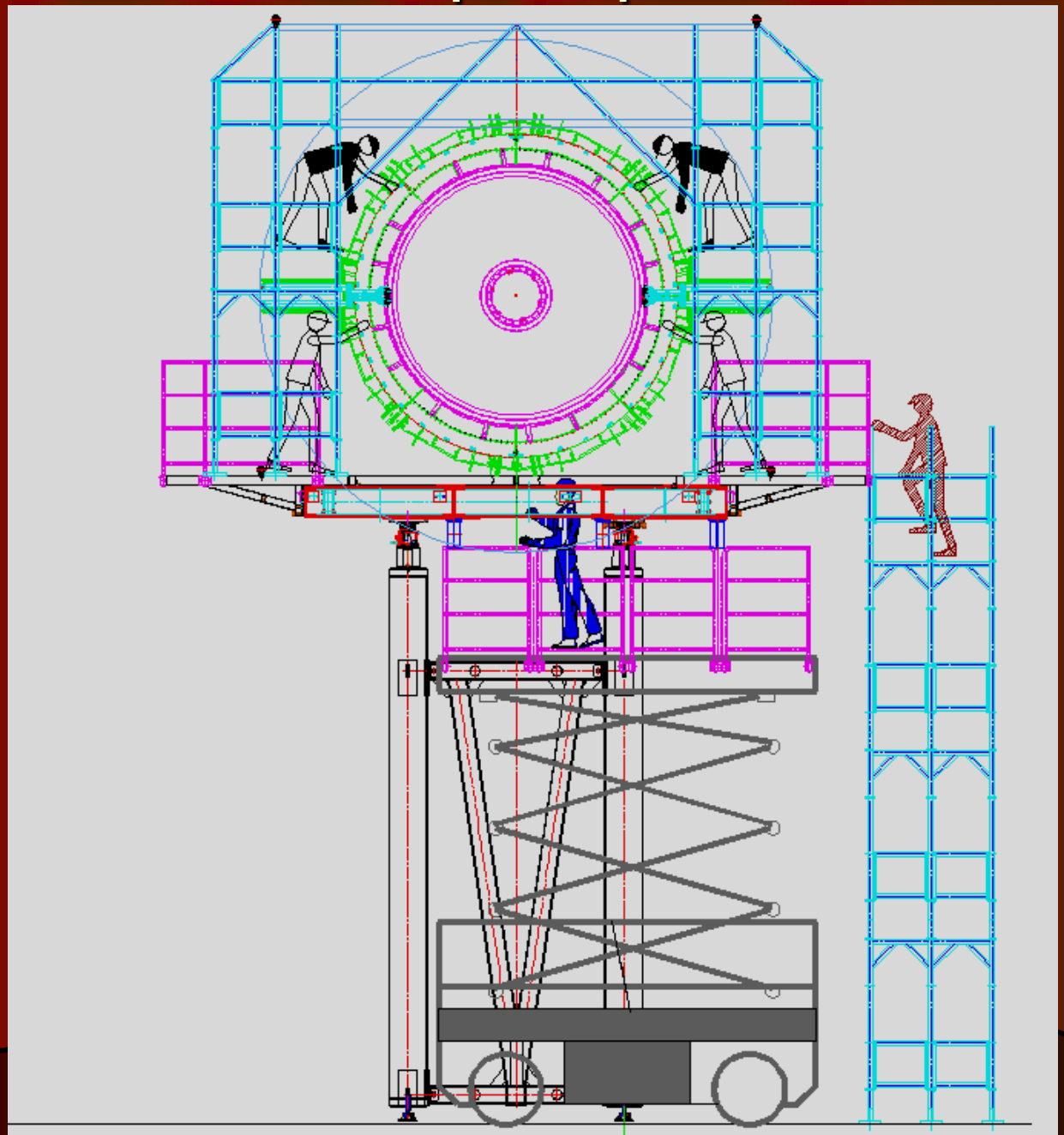


ID..107

TK seal installation-PIXEL-EE ME1/1 maintenance



Access to path panel of EE

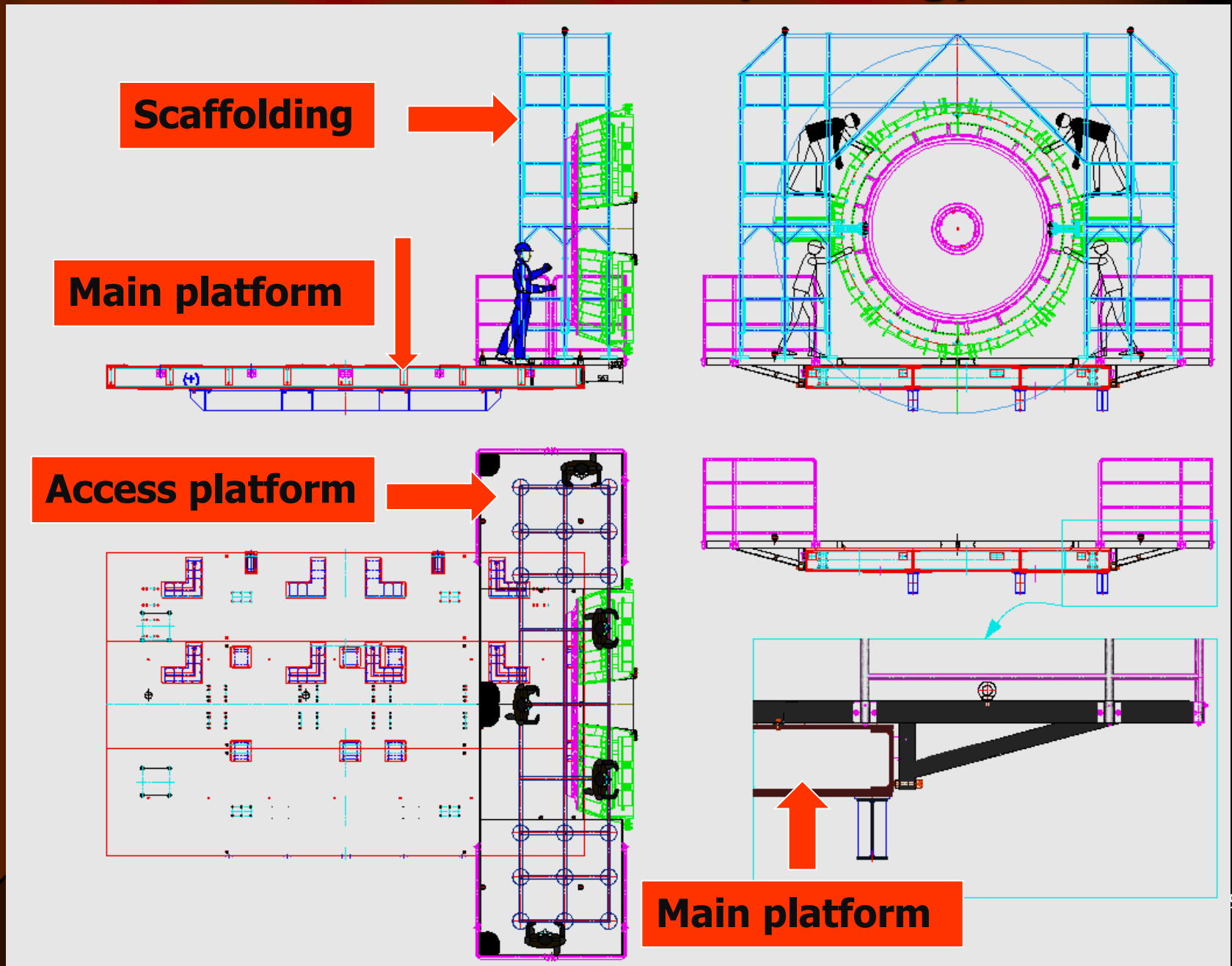


ID..195

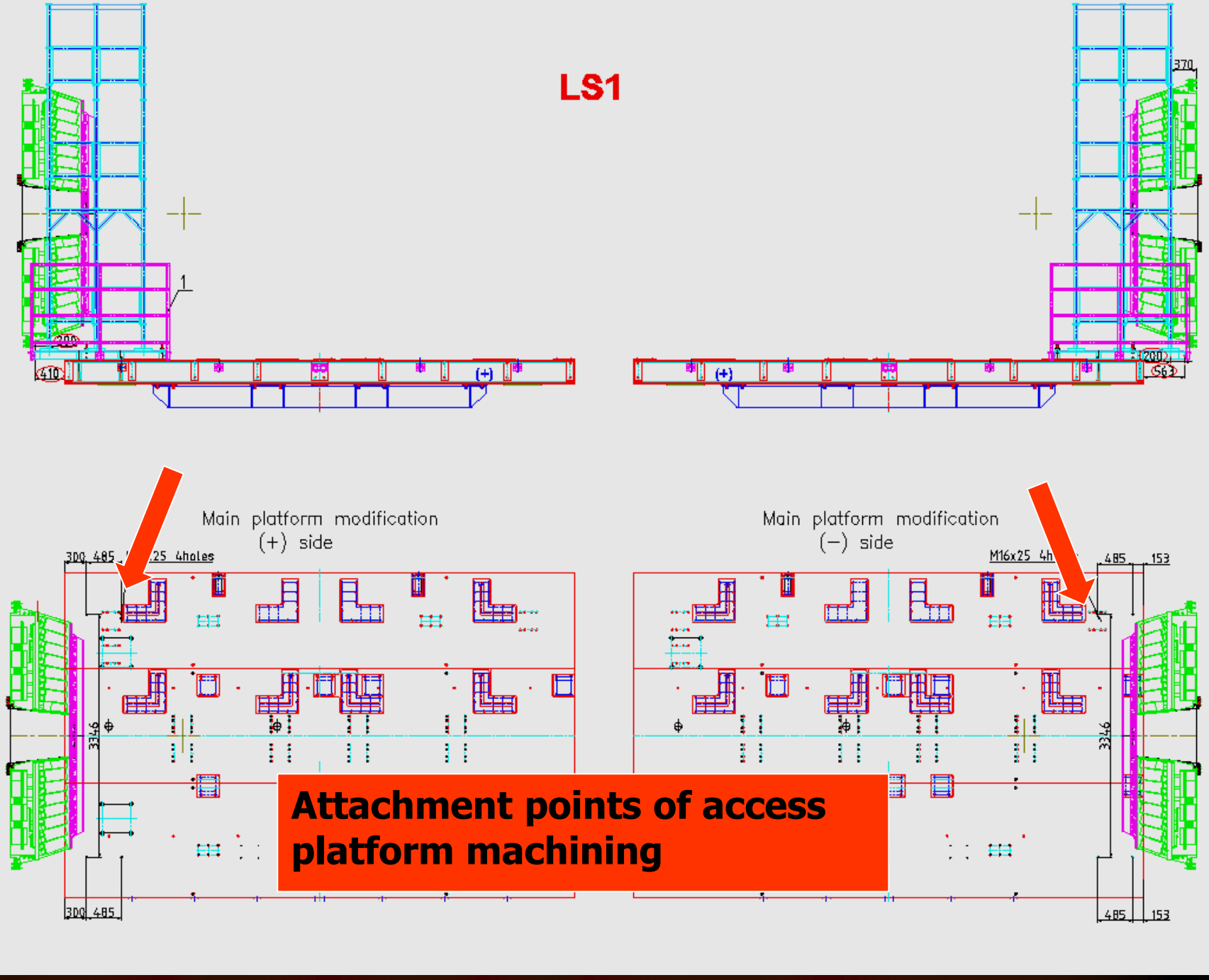
What is necessary for BP, PIXEL, EE, ME1/1 maintenance ?

1. "Gasprom" platform
2. Main platform
3. Nacelles
4. Standard scaffoldings
5. EE access platform……New
6. Supports with hydraulic jack….New
7. Shims …… New
8. Interface plates ……New
9. Screw jacks……New

EE maintenance (Tooling)

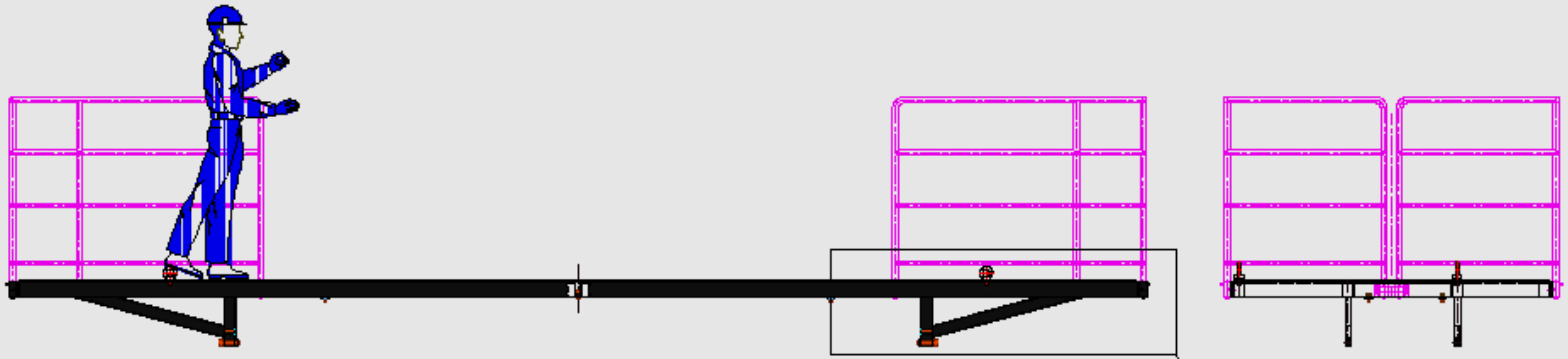


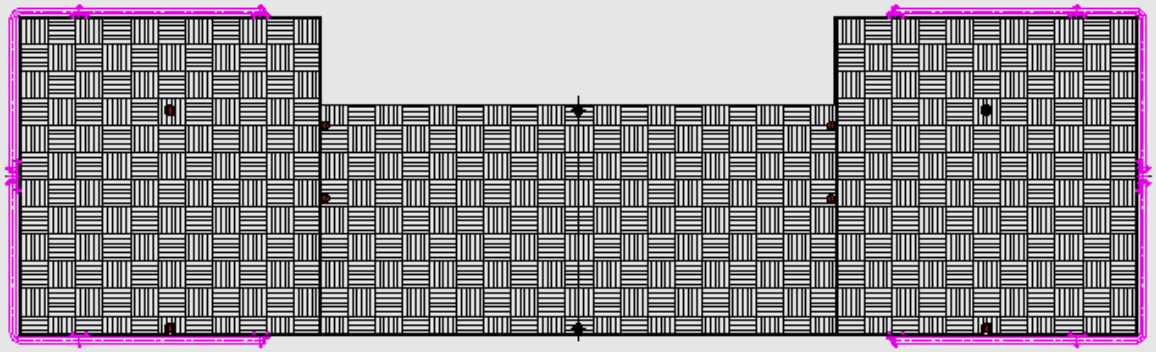
LS1



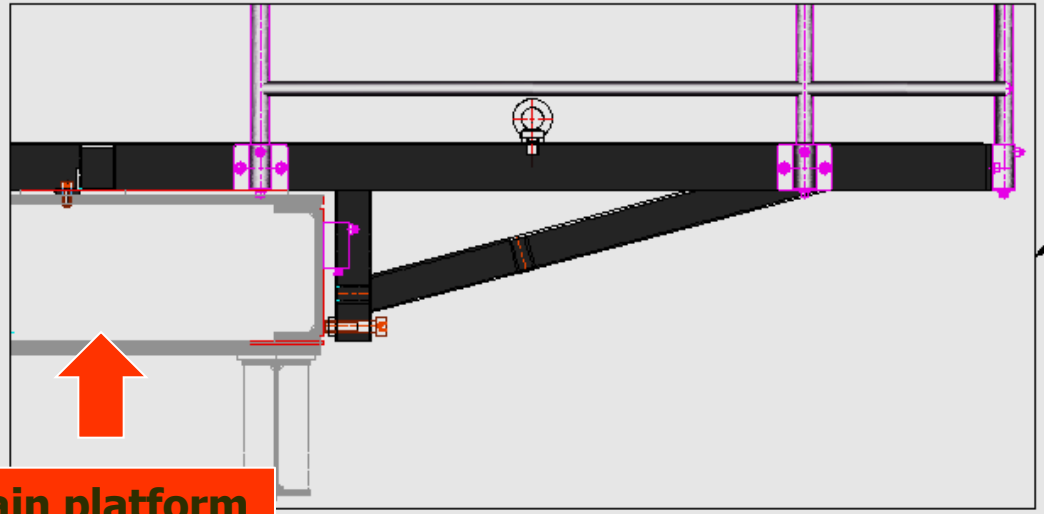
Attachment points of access platform machining

Access platform



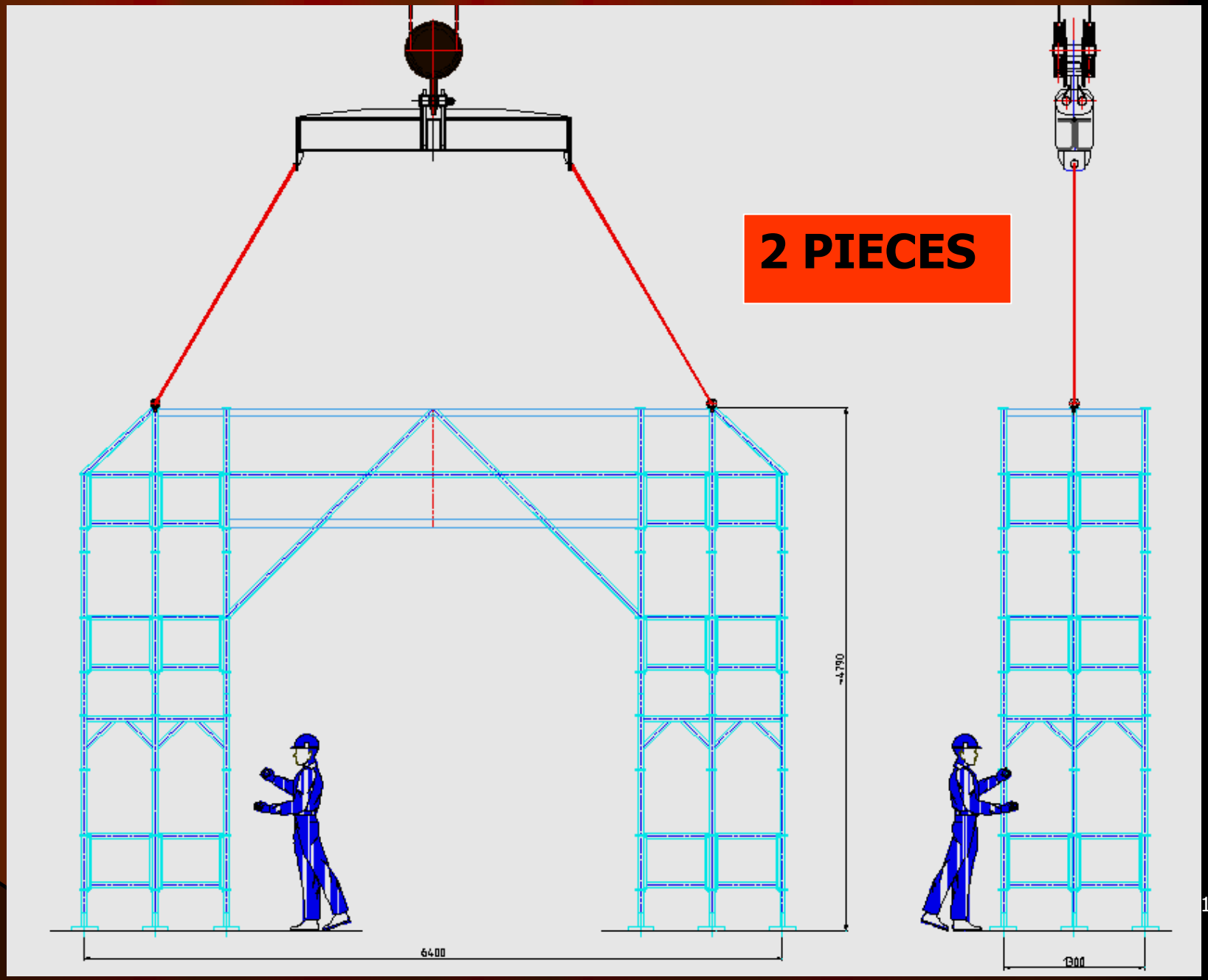


2 PIECES

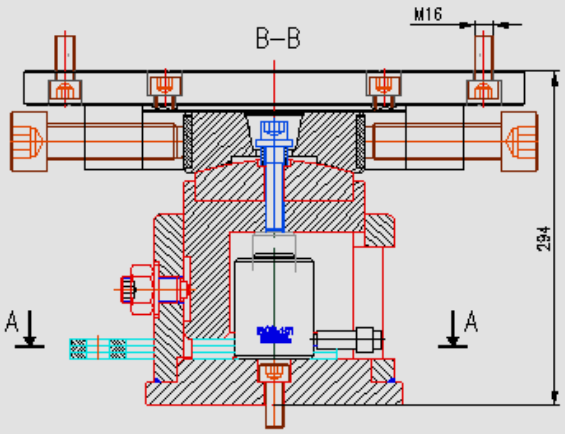


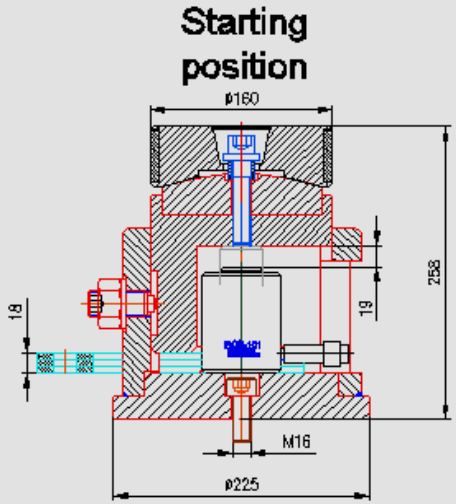
Main platform

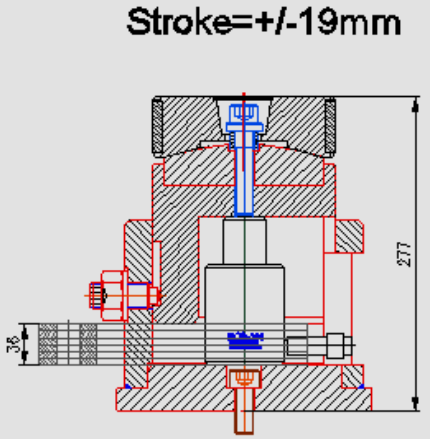
Scaffolding

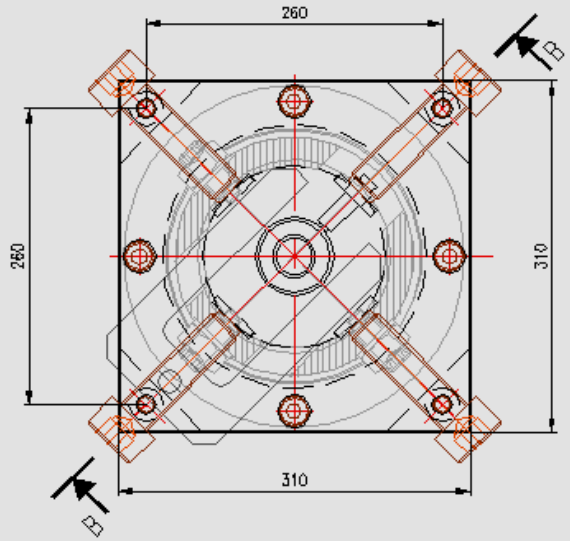


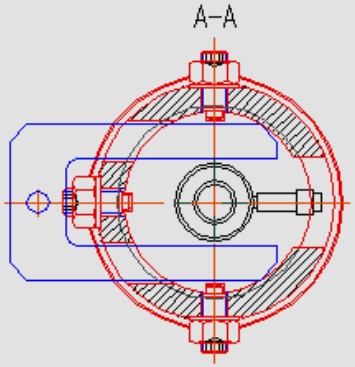
Support for adjustment of main platform (LS1)

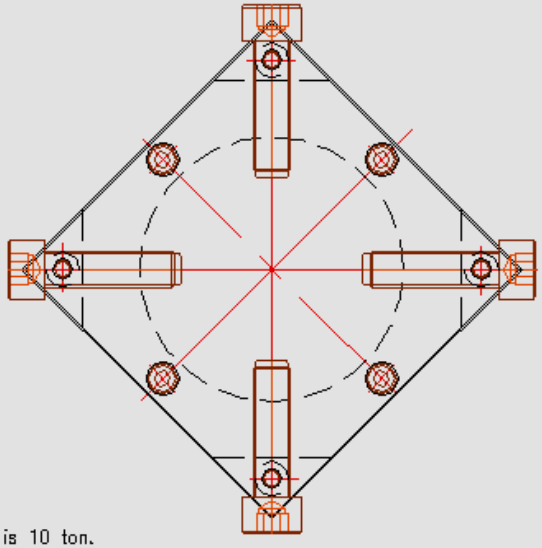










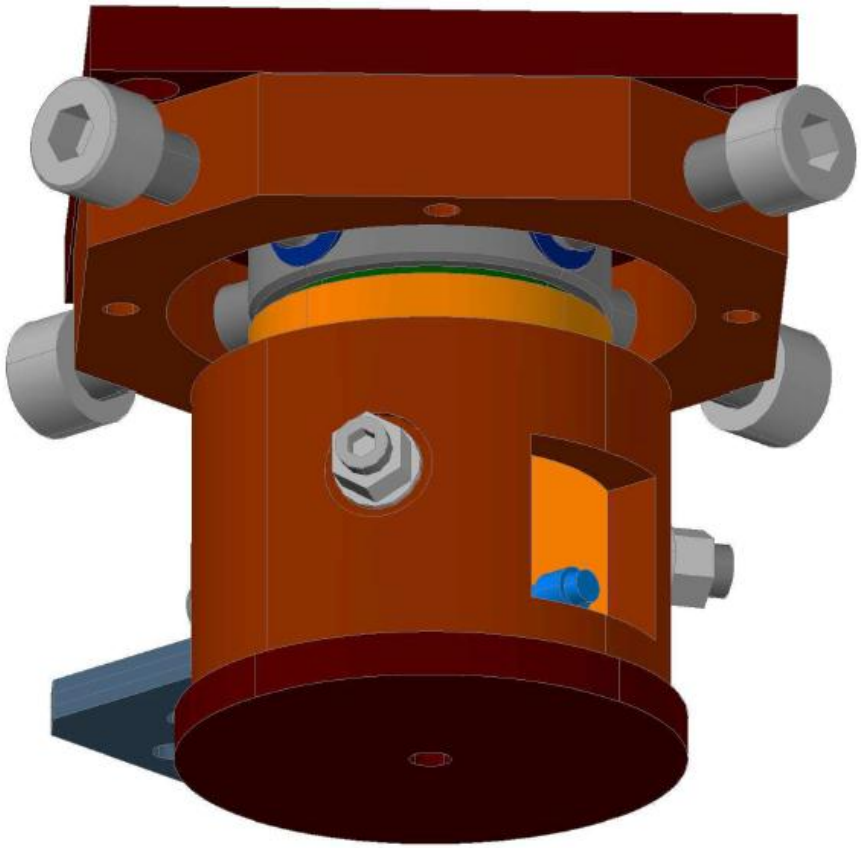


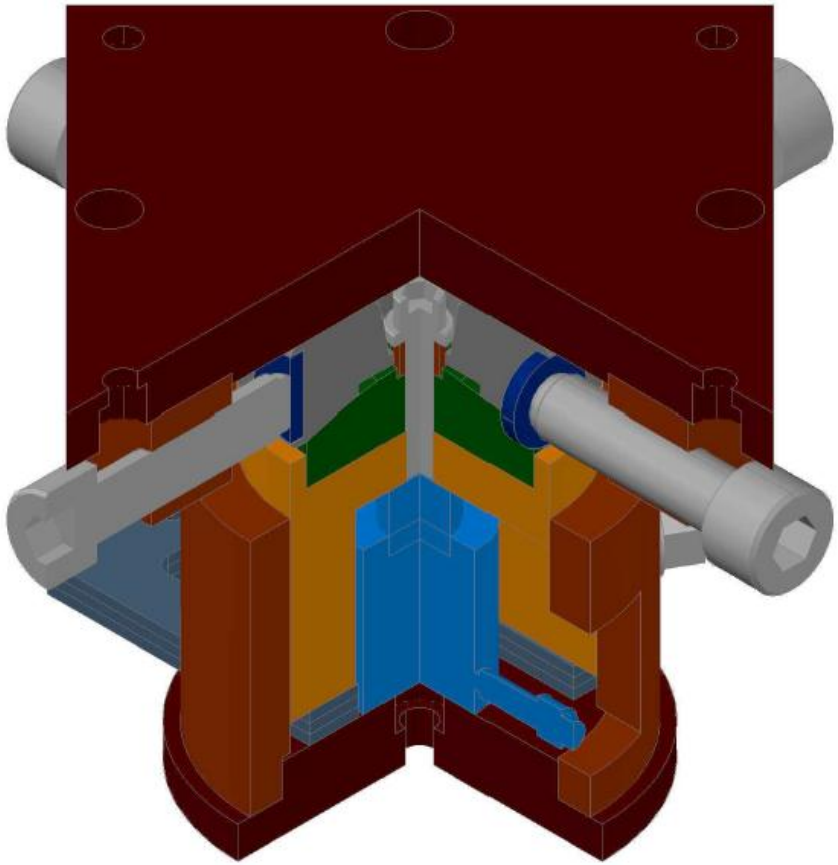
4 PIECES

1. Dimensions for references.
2. Maximum lifting power of hydraulic jack is 10 ton.
3. Maximum movement of hydraulic jack piston is +/−19 mm.
4. Friction surfaces and threaded parts must be oiled.

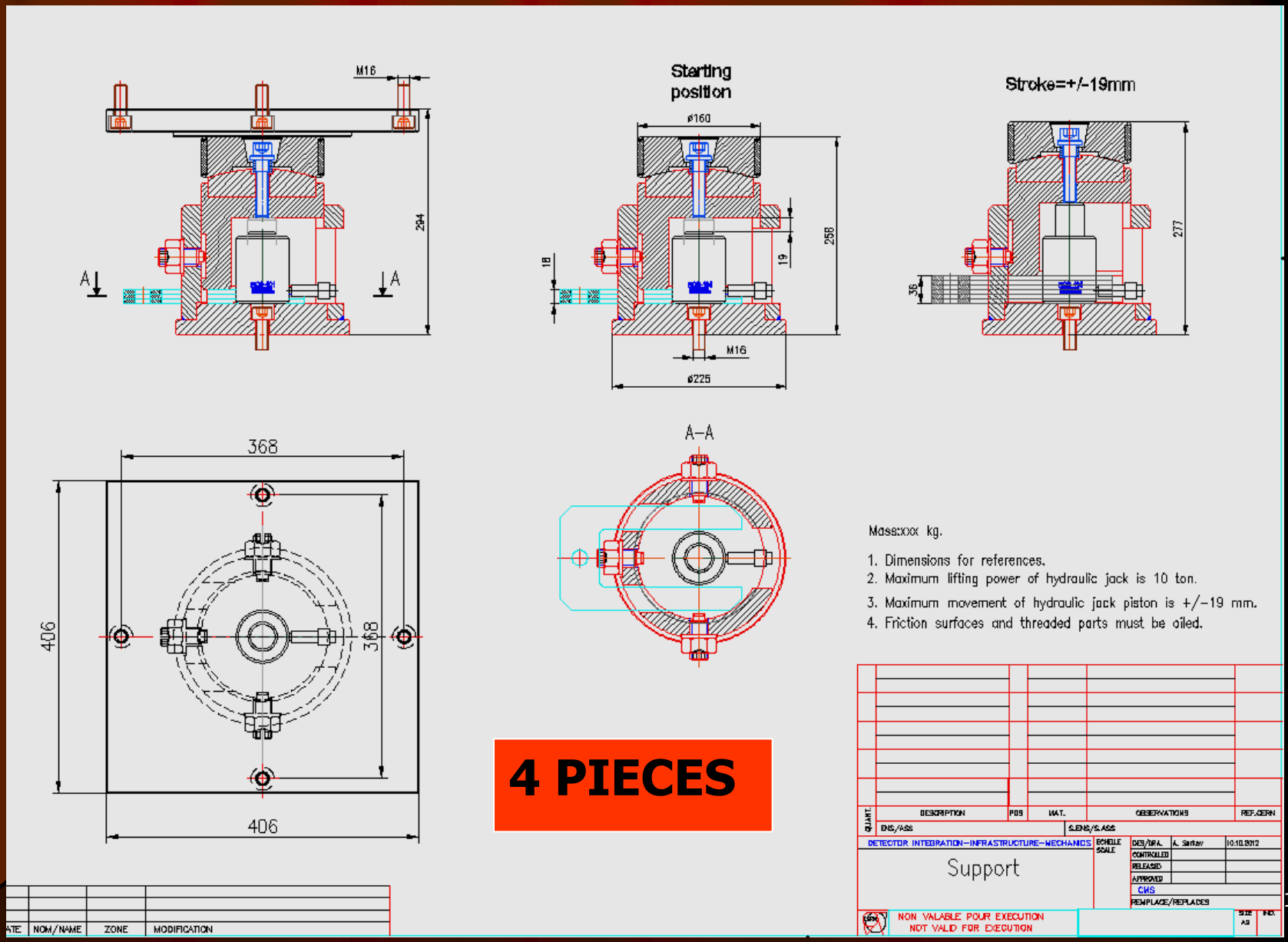
Support

Support for adjustment of main platform (LS1)

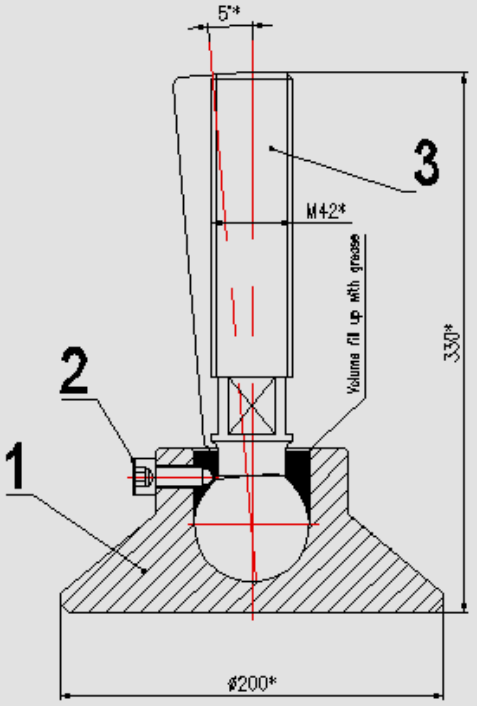


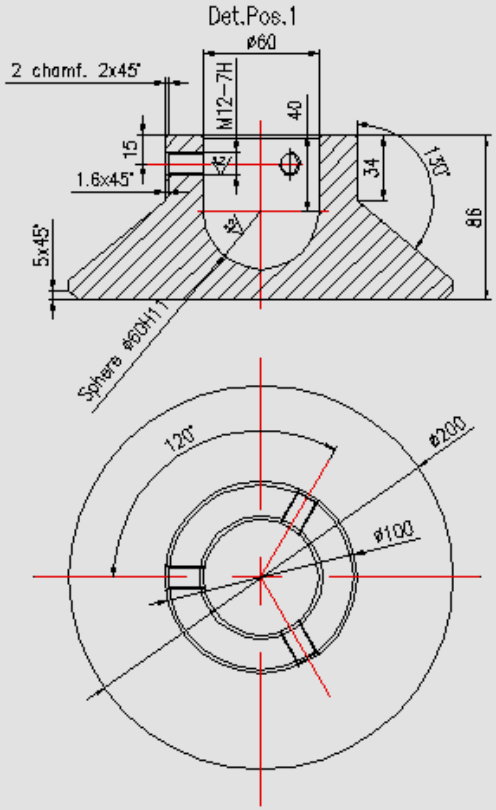


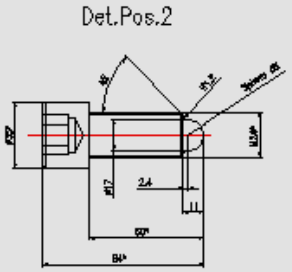
Support for adjustment of main platform (LS1)

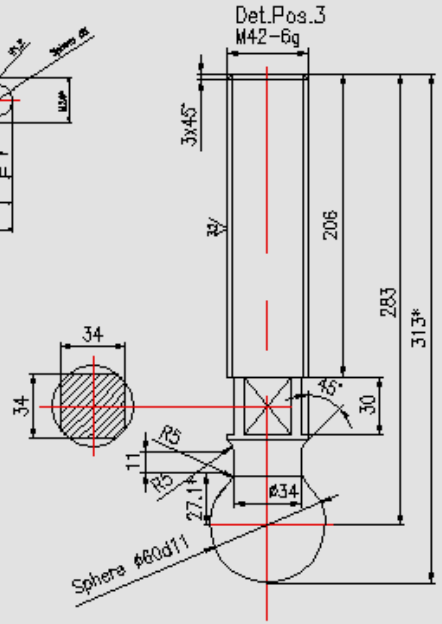


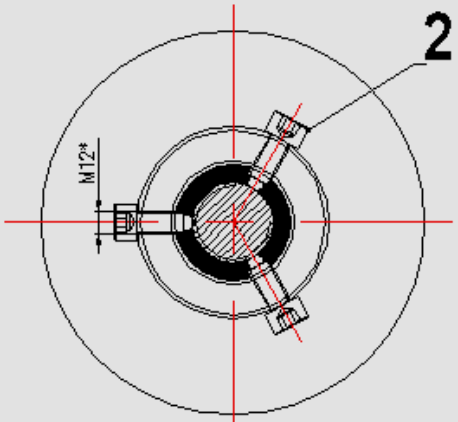
Screw jack support for adjustment of gas prom platform (LS1)





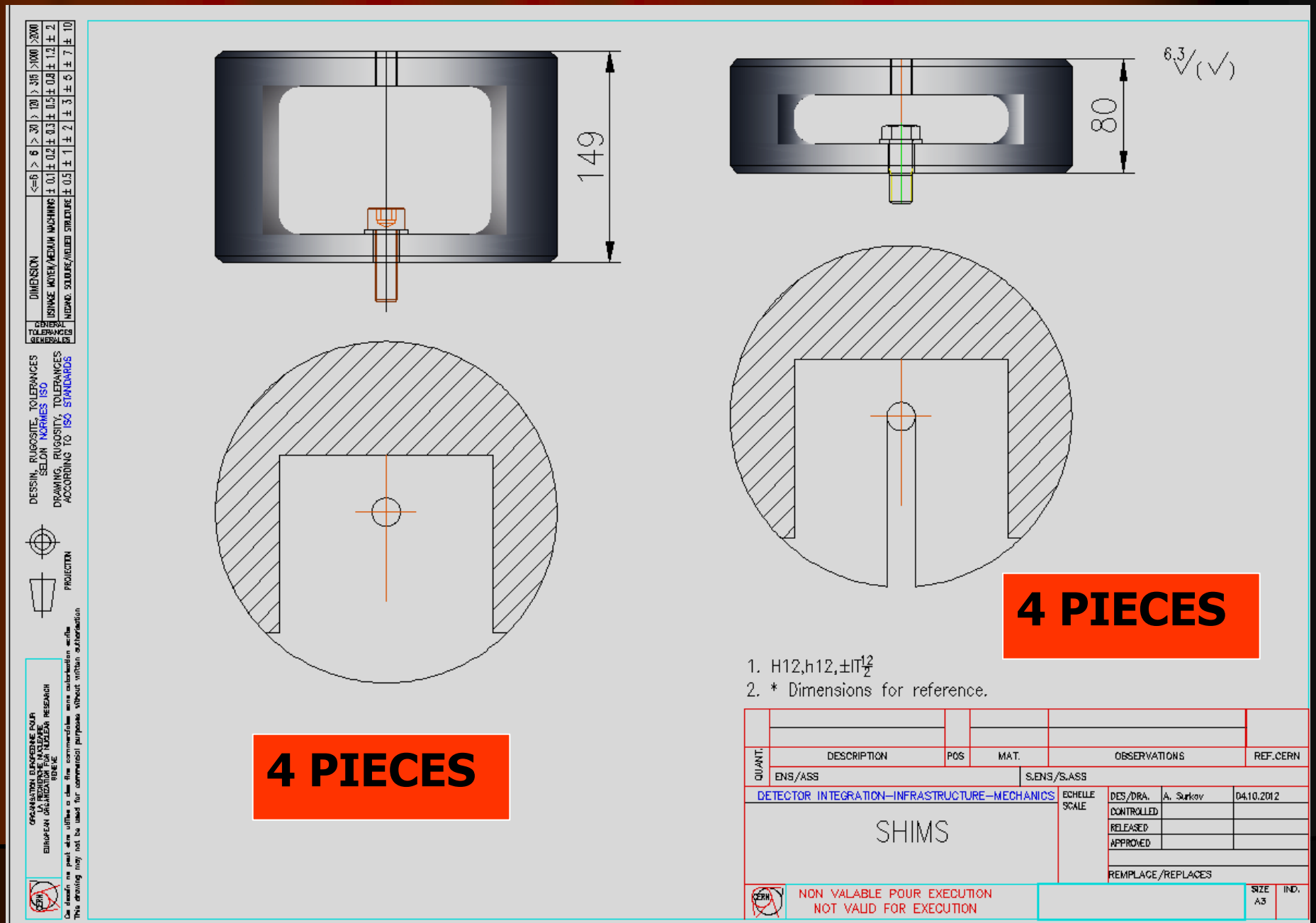




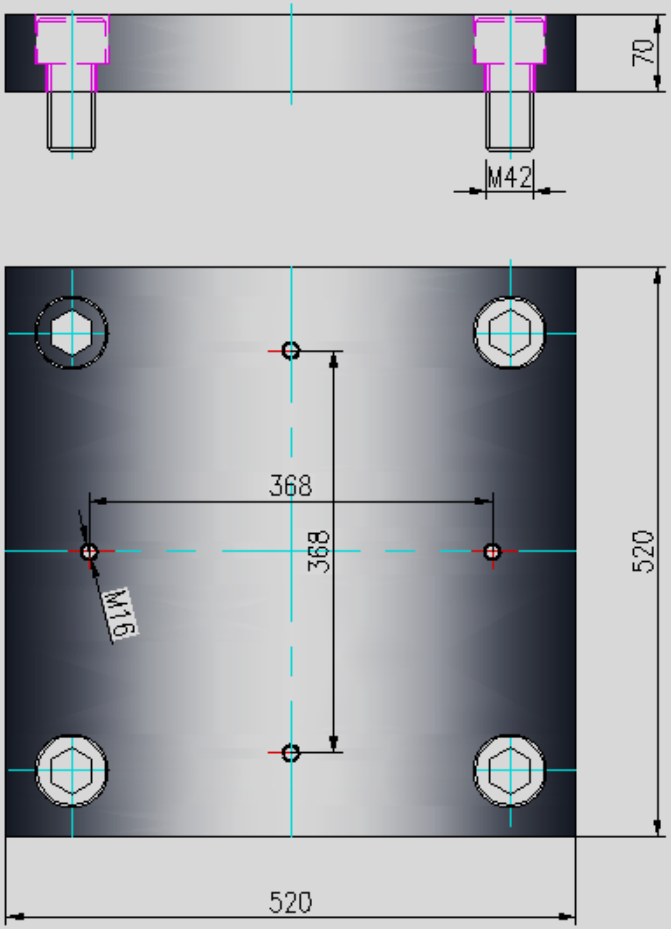


8 PIECES

Shims (between main platform & gasprom pl-m)



Shims (between main platform & support)



8 PIECES

1. H12,h12,±IT12/2
2. * Dimensions for reference.

	Plate 520×520×40		STEEL S235JRG2		44.43.32 030.7
QUANT.	DESCRIPTION	POS	MAT.	OBSERVATIONS	REF.CERN
	ENS/ASS		S.ENS/S.ASS		

DETECTOR INTEGRATION-INFRASTRUCTURE-MECHANICS

PLATE

ECHELLE SCALE

DES/DRA.	A. Surkov	04.10.2012
CONTROLLED		
RELEASED		
APPROVED		

CMS\SYE4MO\SYE4M

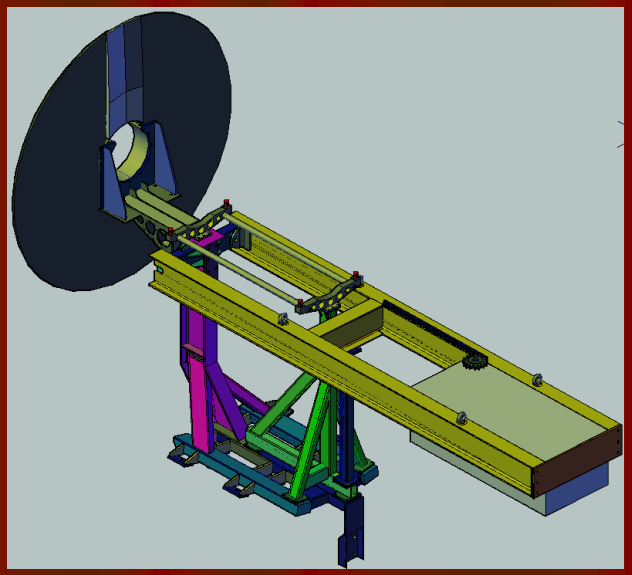
REMPLACE/REPLACES

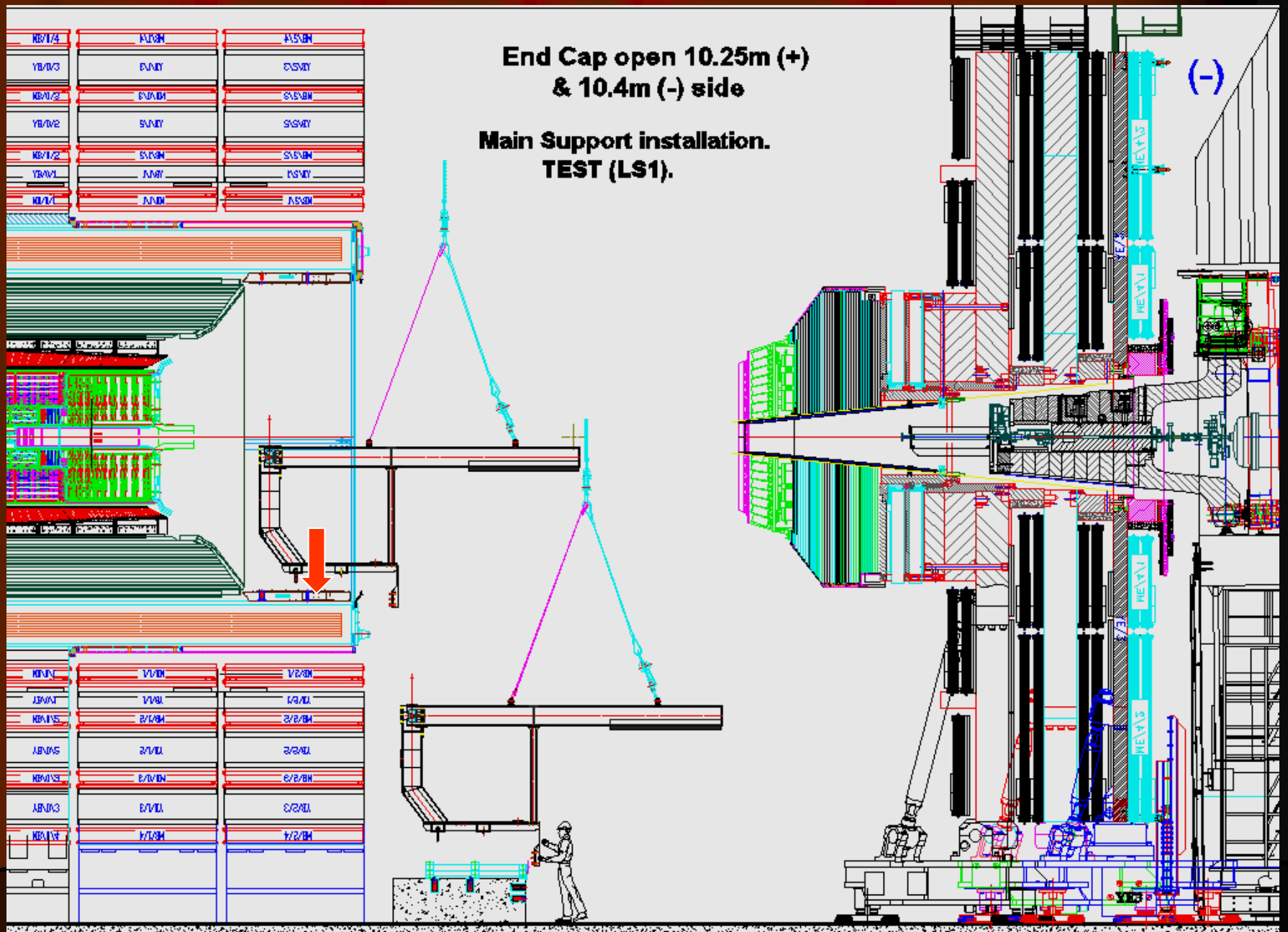
NON VALABLE POUR EXECUTION
NOT VALID FOR EXECUTION

SIZE A3 | IND.

MAIN SUPPORT (for radiation shielding) INSTALLATION onto PP1 posts

(LS1 TEST)

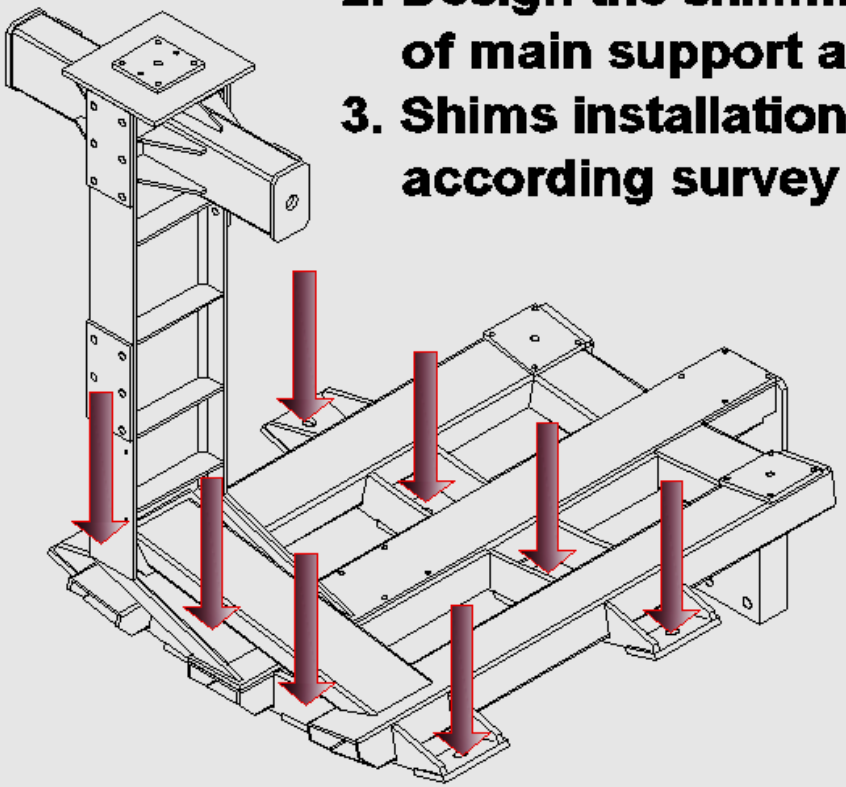


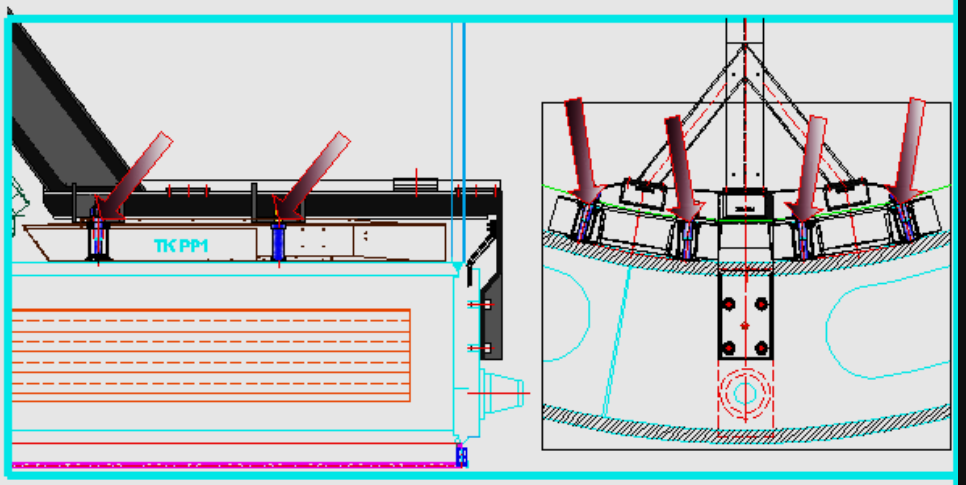

End Cap open 10.25m (+)
& 10.4m (-) side
Main Support installation.
TEST (LS1).
(-)

MAIN SUPPORT INSTALLATION

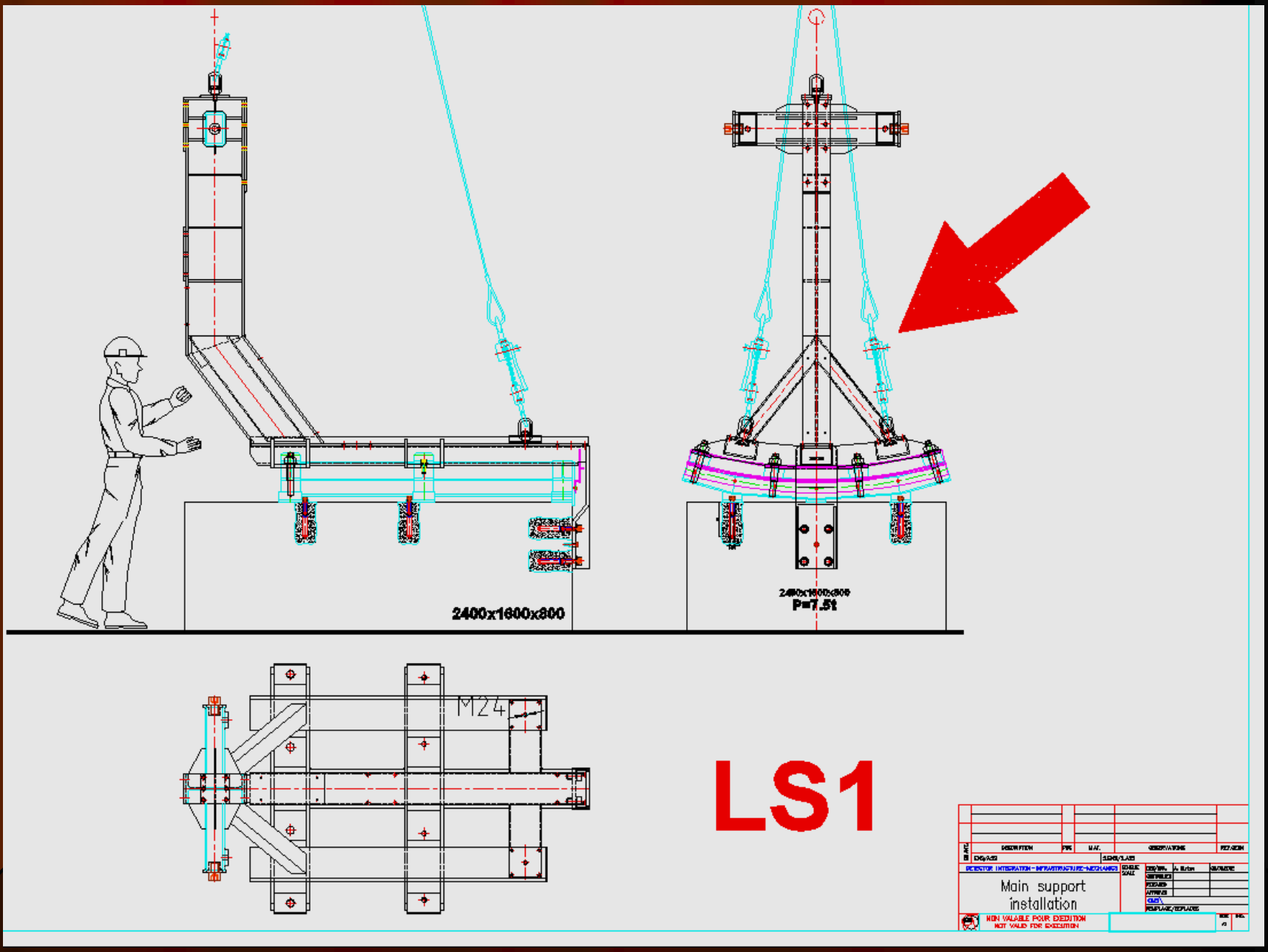
Main support installation (Test LS1)
Sequence installation

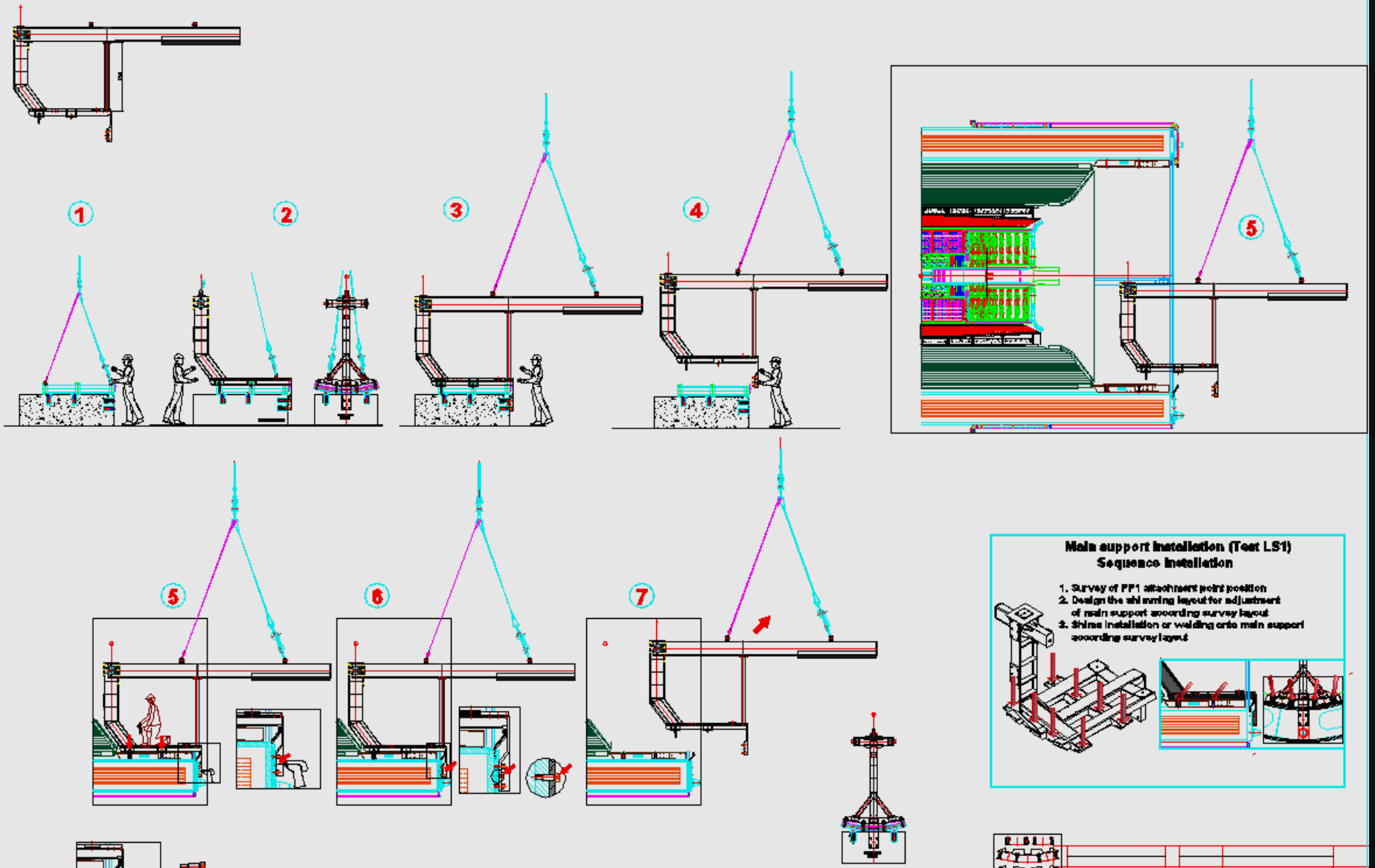
1. Survey of PP1 attachment point position
2. Design the shimming layout for adjustment of main support according survey layout
3. Shims installation or welding onto main support according survey layout



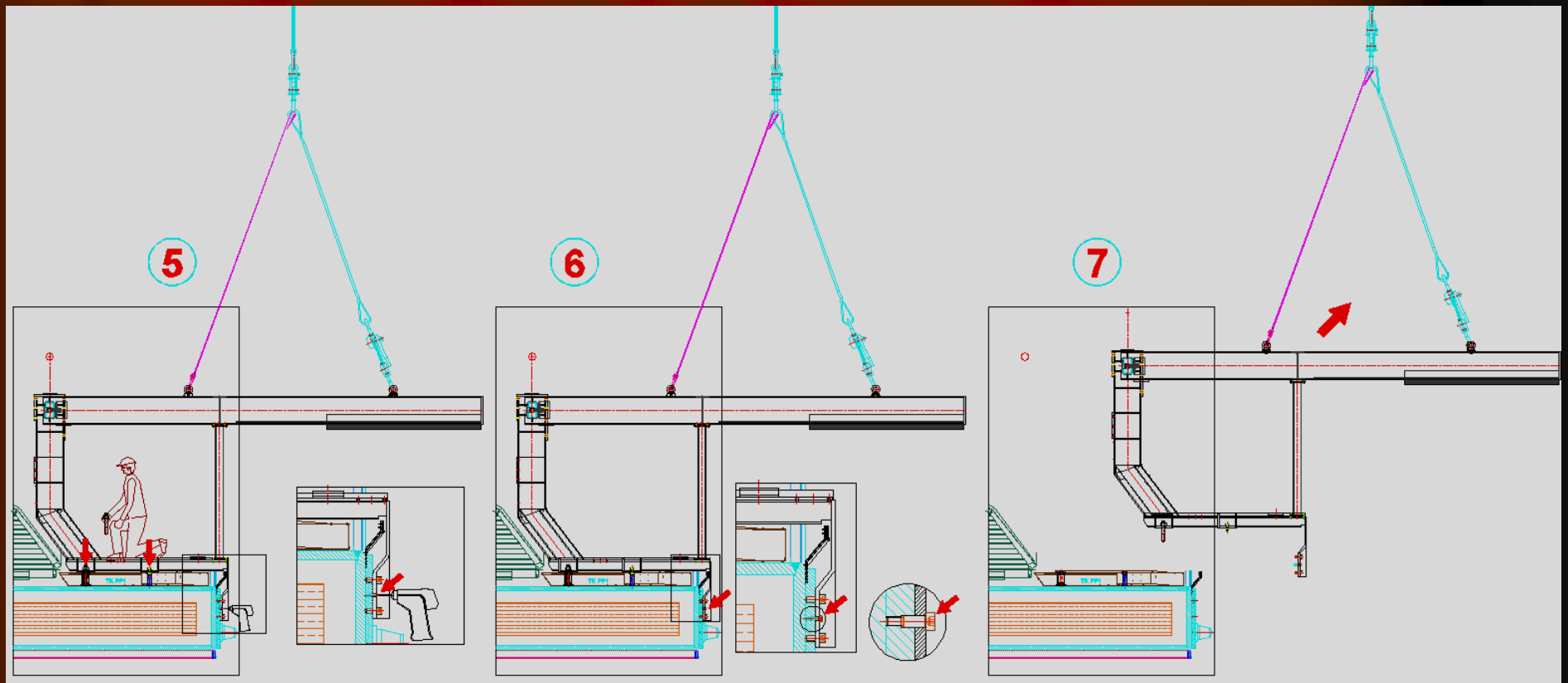


Main support installation onto concrete block



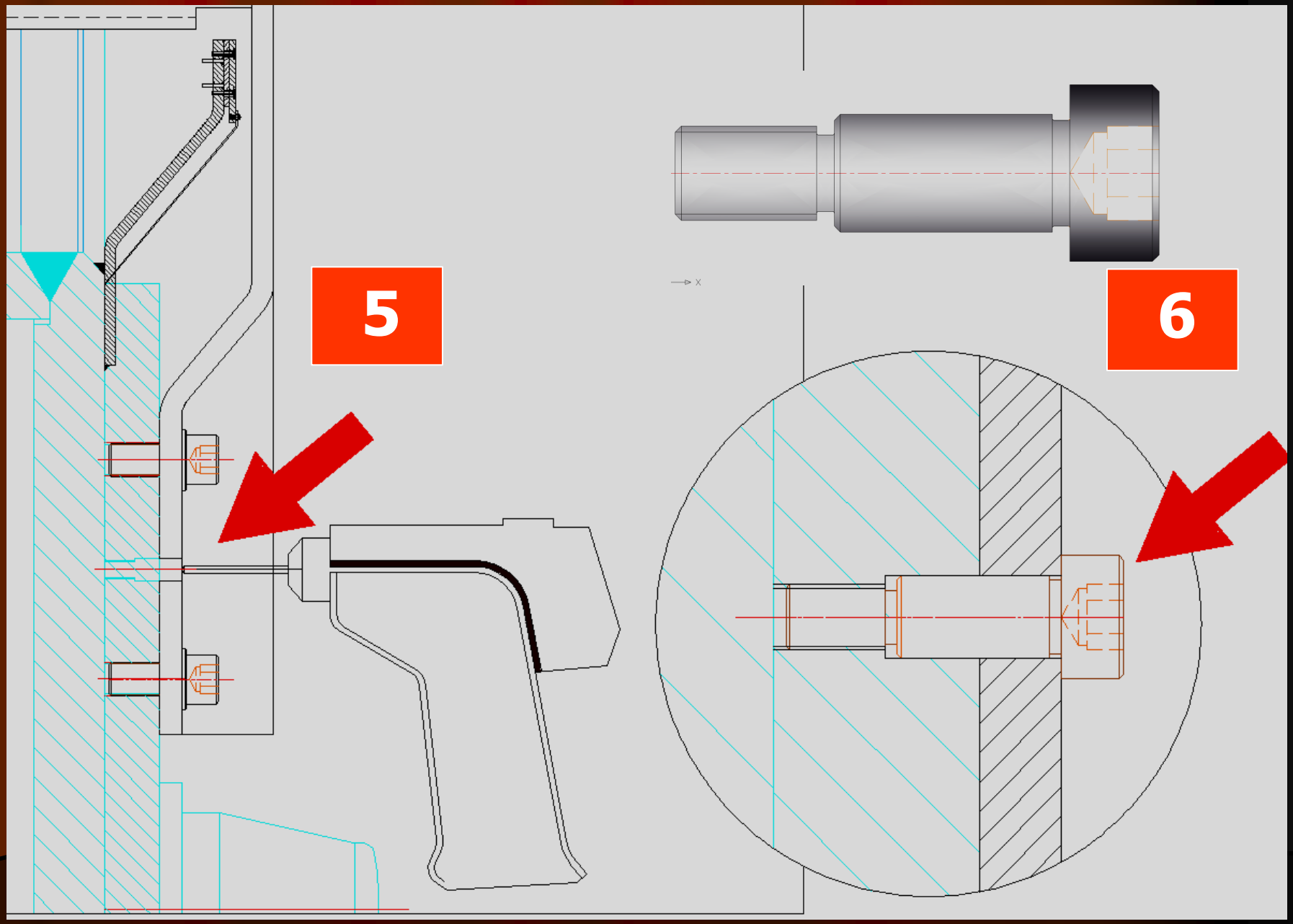

1
2
3
4
5
5
6
7
Main support installation (Test LS1)
Sequence installation
1. Survey of FF1 attachment point position
2. Design the shimming layout for adjustment of main support according survey layout
3. Shims installation or welding onto main support according survey layout
Main Support installation. TEST (LS1).
Sequence operations
17.09.2012
Main support installation
TEST (LS1)

Main support installation (Test LS1)



Main Support installation (LS1 test).
Sequence operations

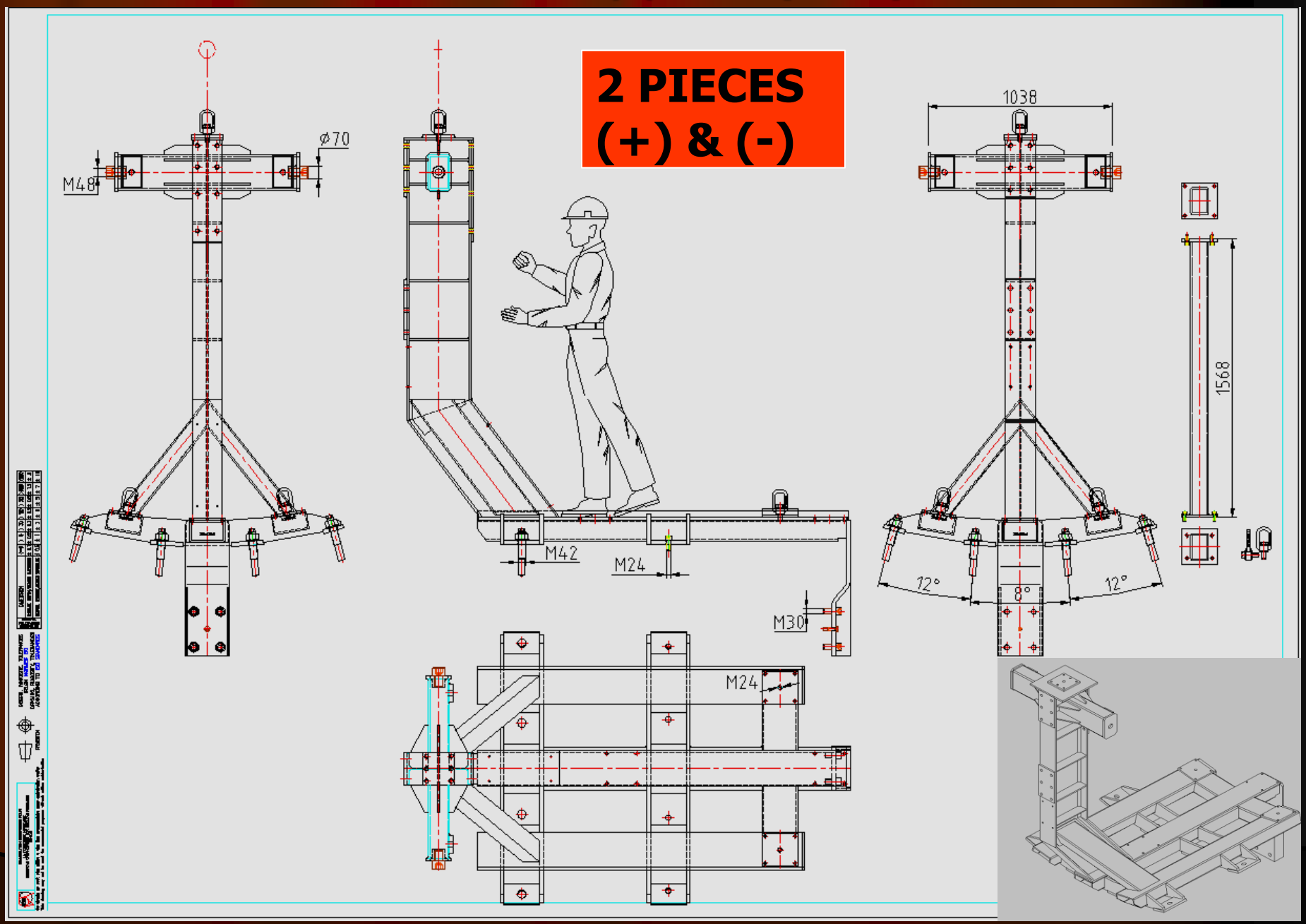
Machining of attachment holes



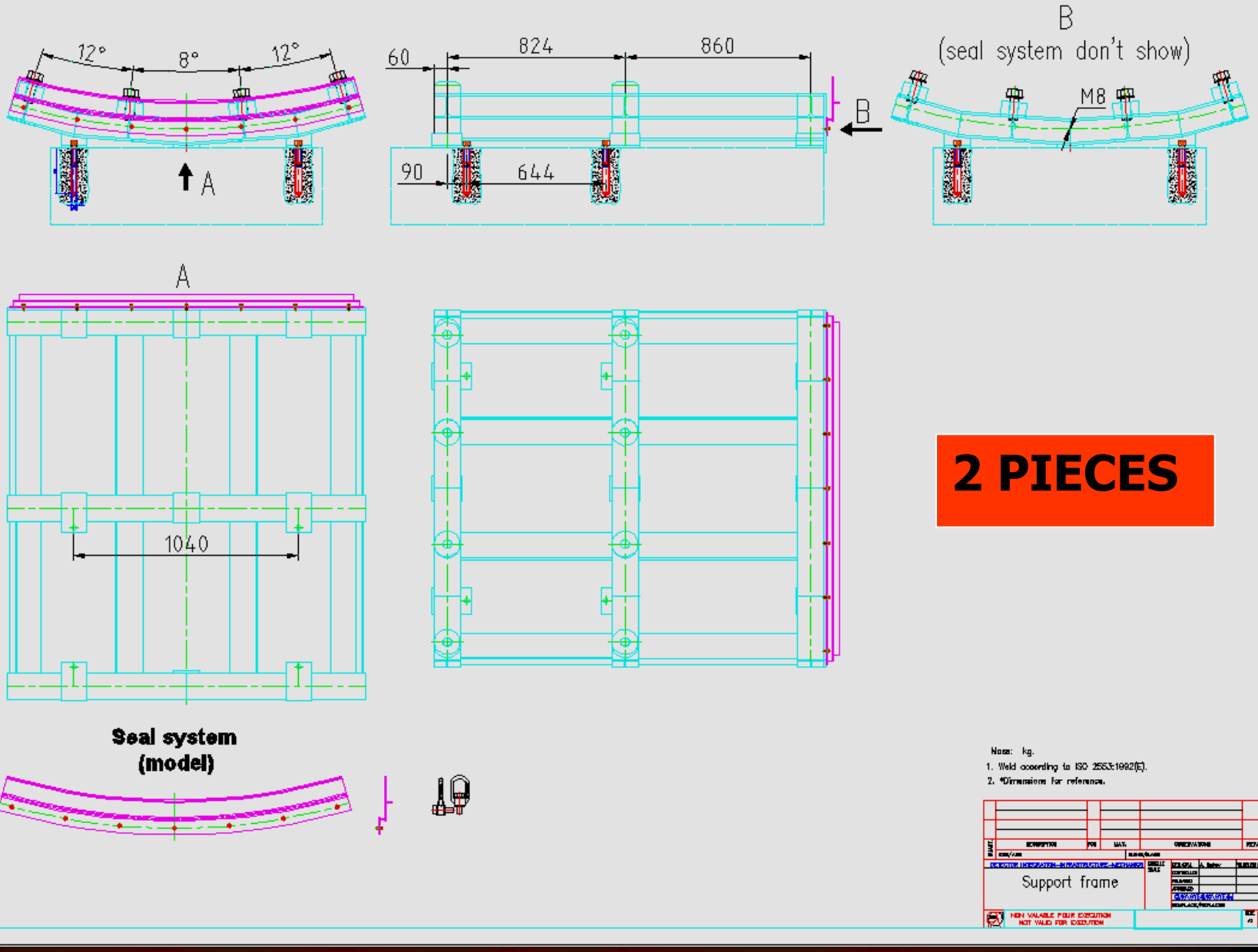
What is necessary for performance of main support installation ?

1. Main support
2. Support frame
3. Traverse

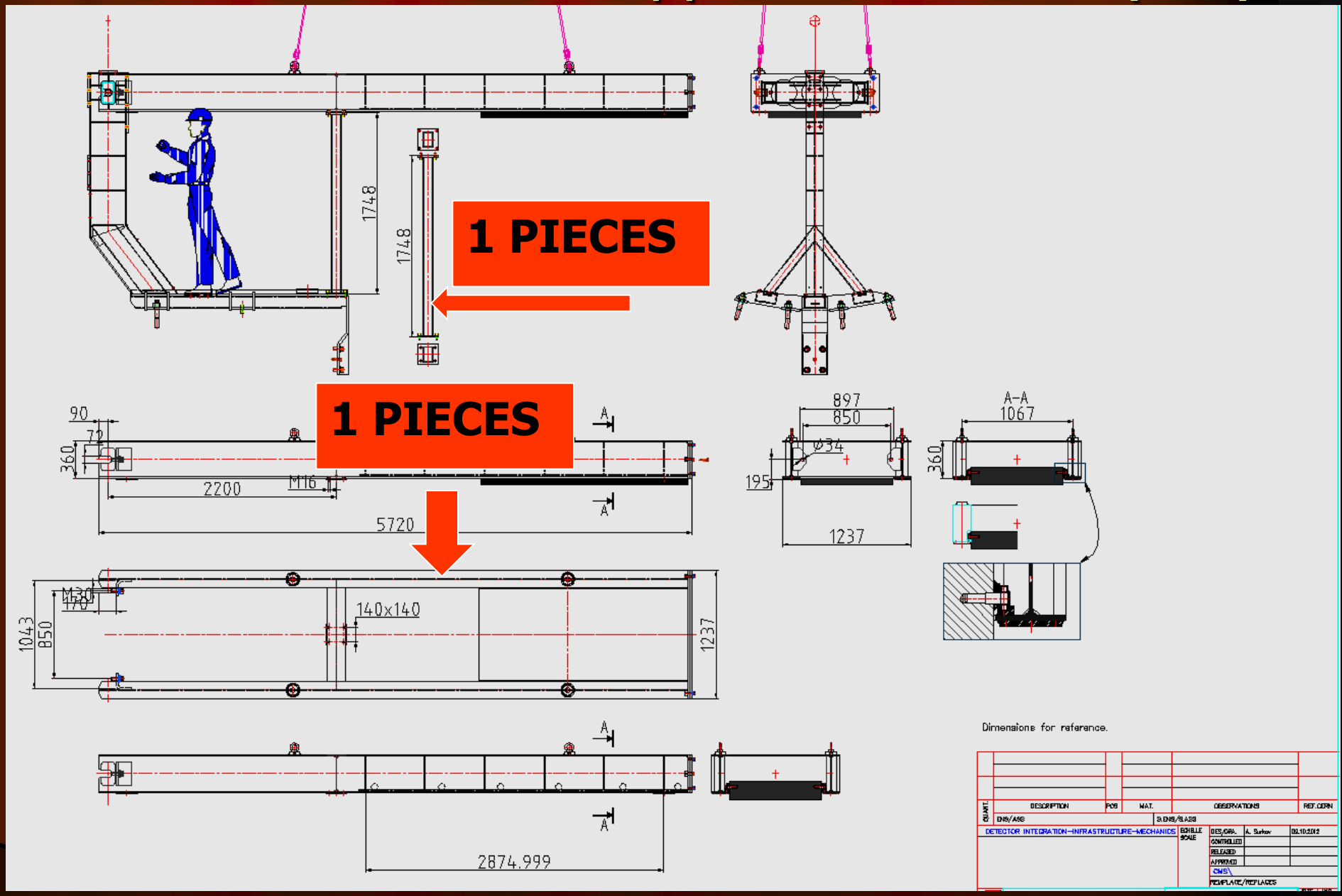
Main support (LS1)



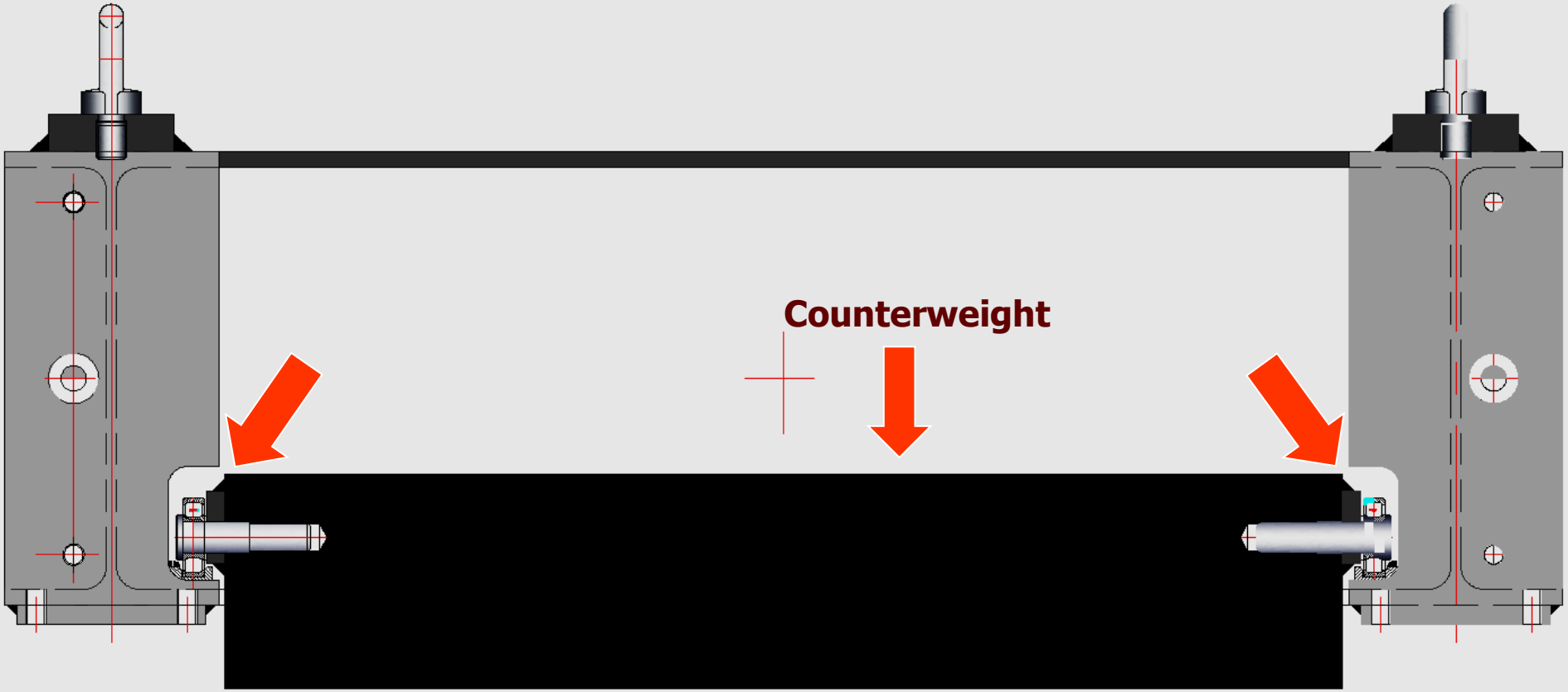
Support frame



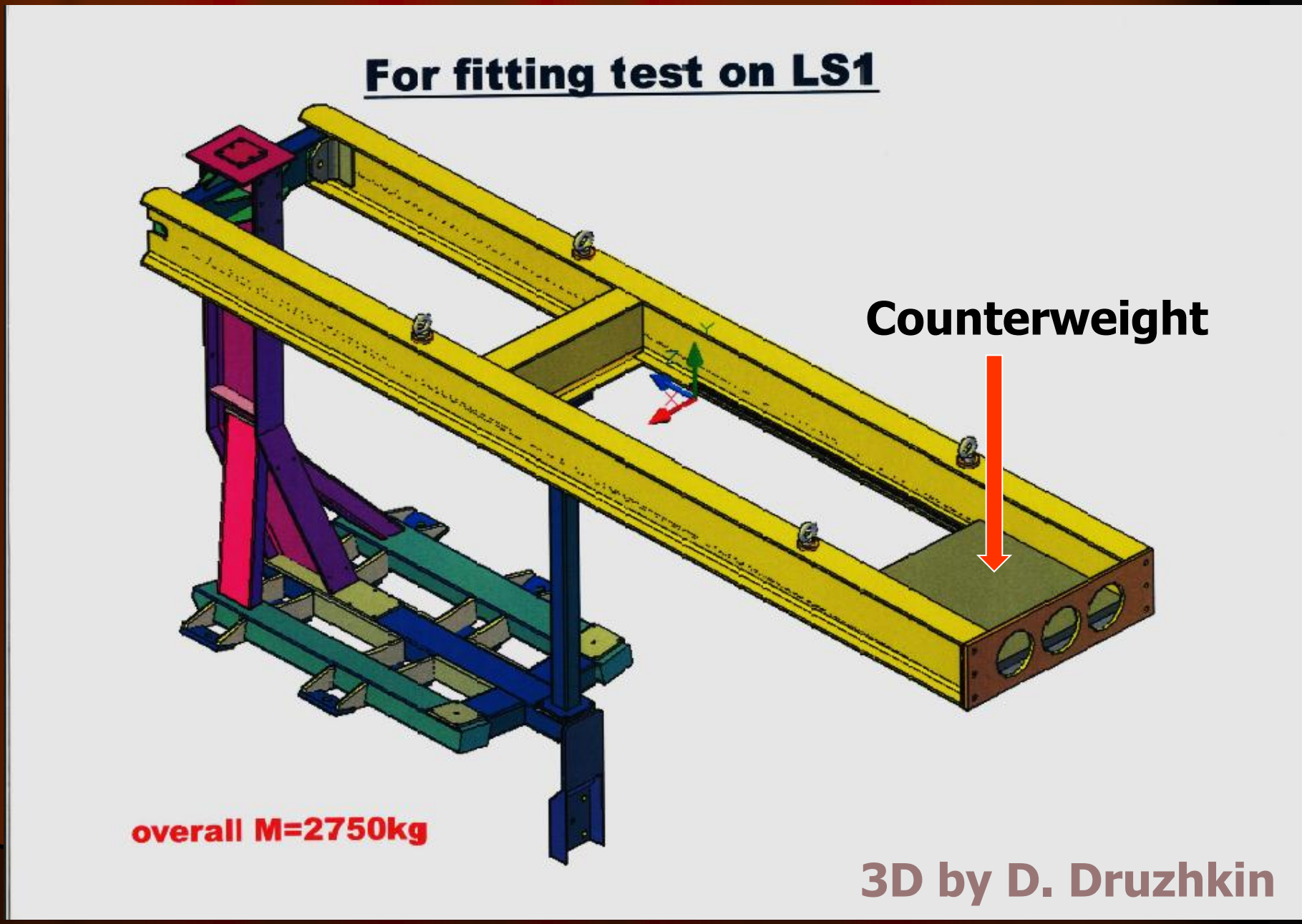
Traverse for main support installation (LS1)



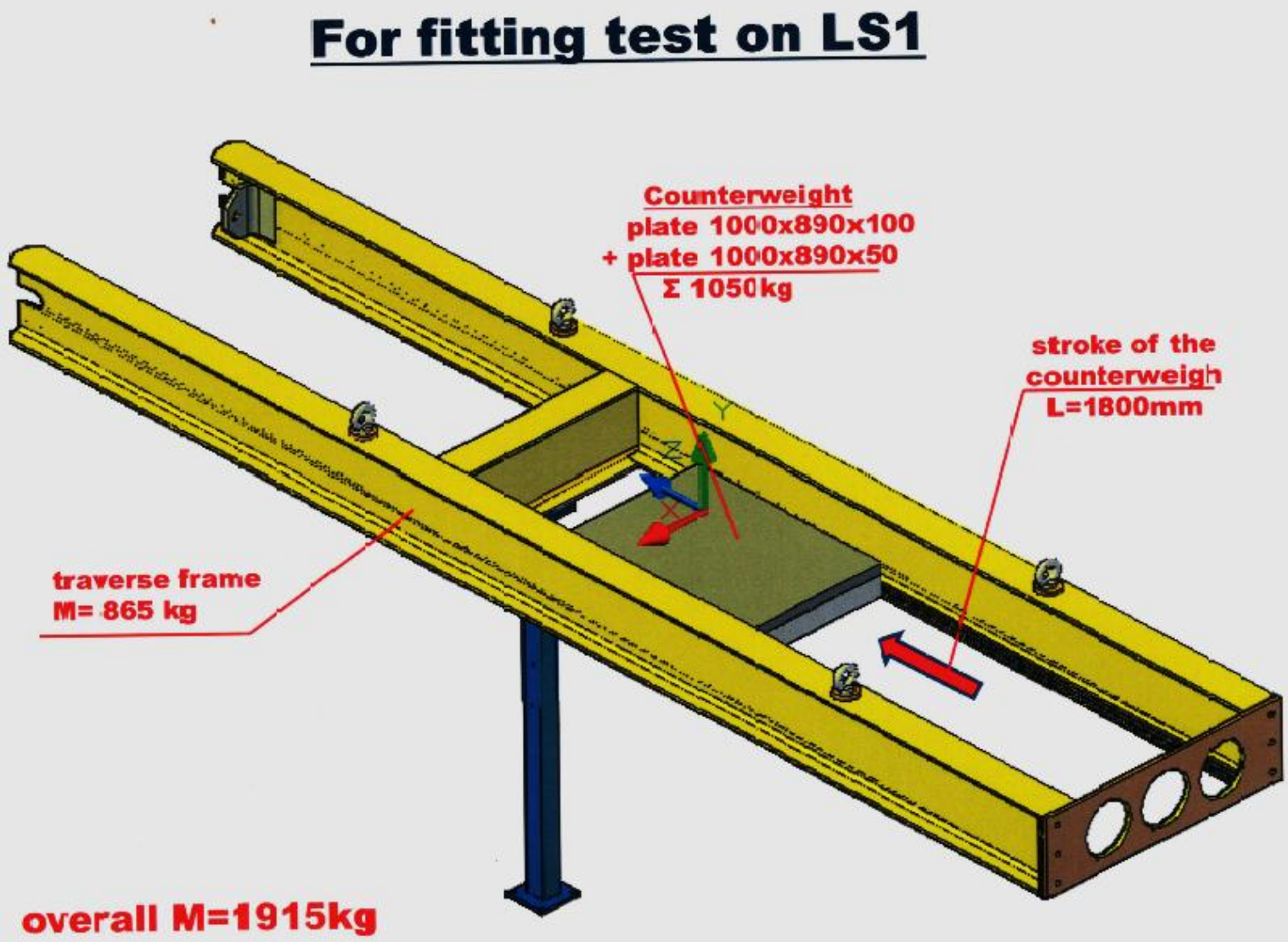
TRAVERSE
(Counterweight guide)



Traverse with main support (LS1)



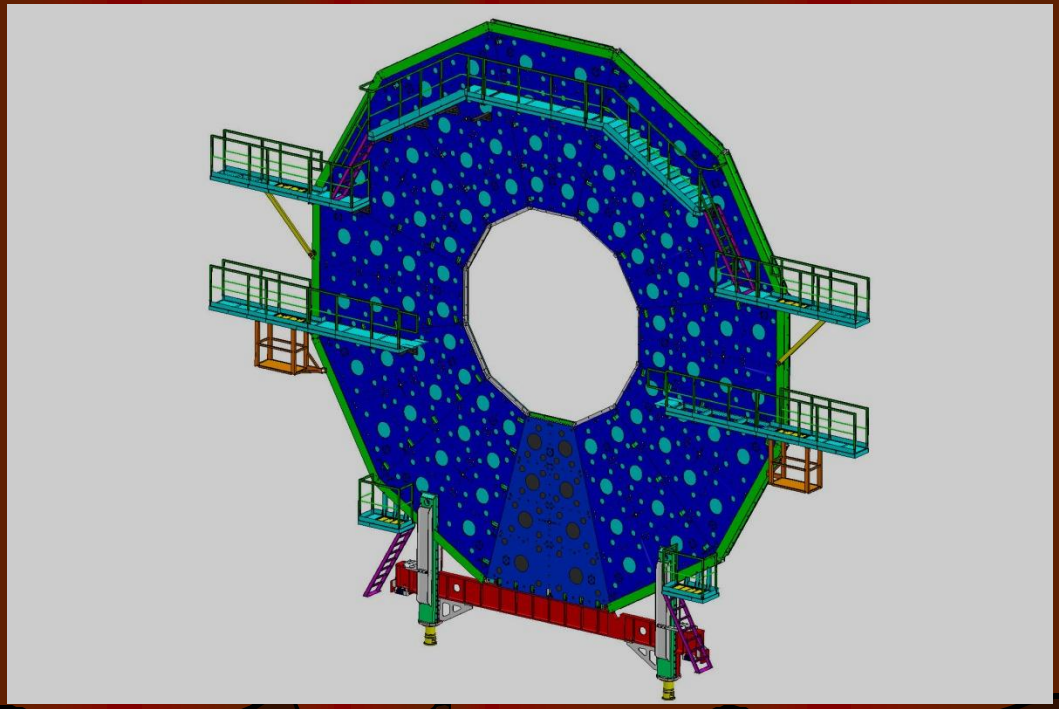
TRAVERSE (LS1)



3D & calculation by D. Druzhkin

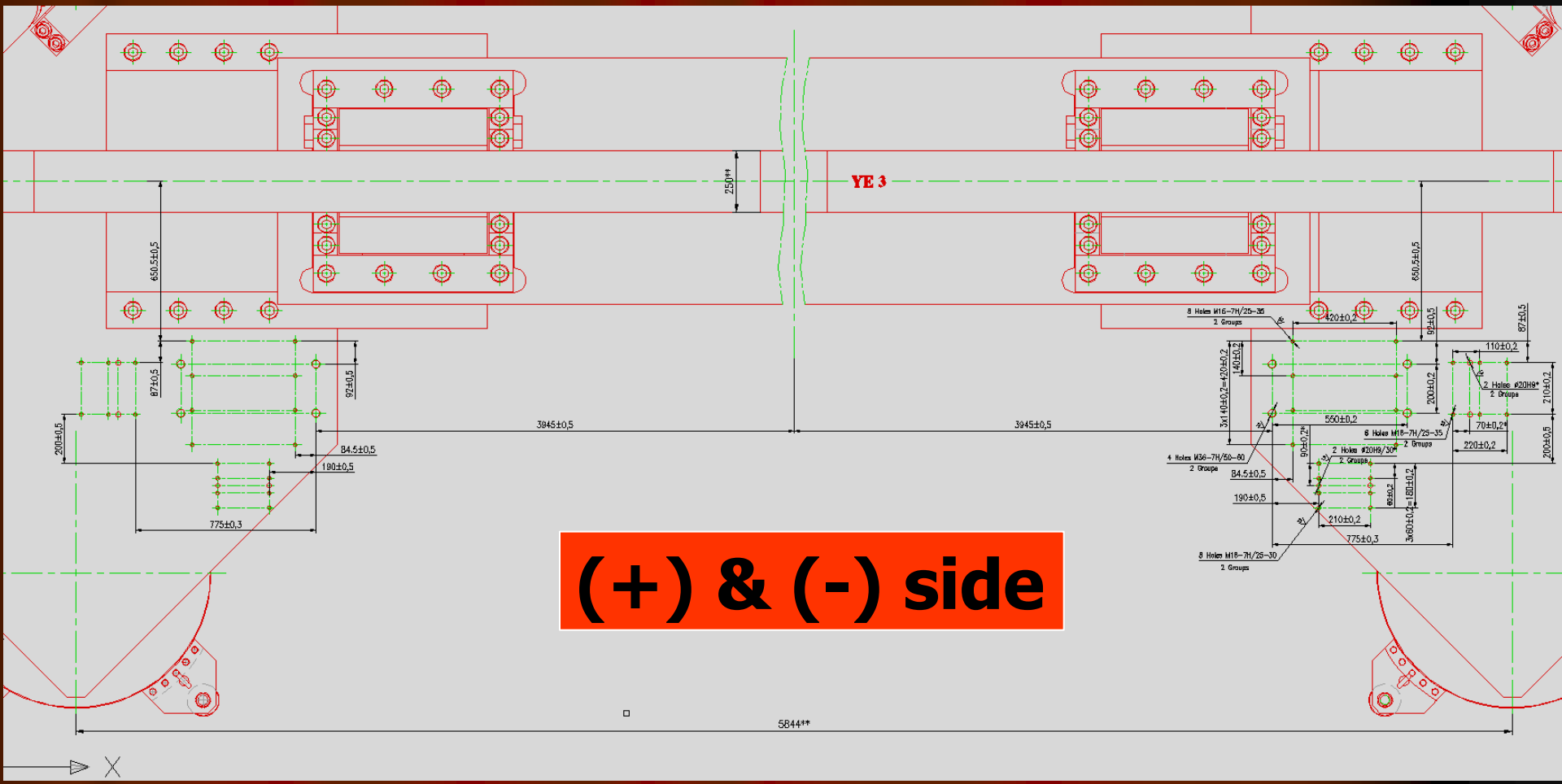
YE4 (+)
INSTALLATION

(MAJOR ASSEMBLY STEPS)



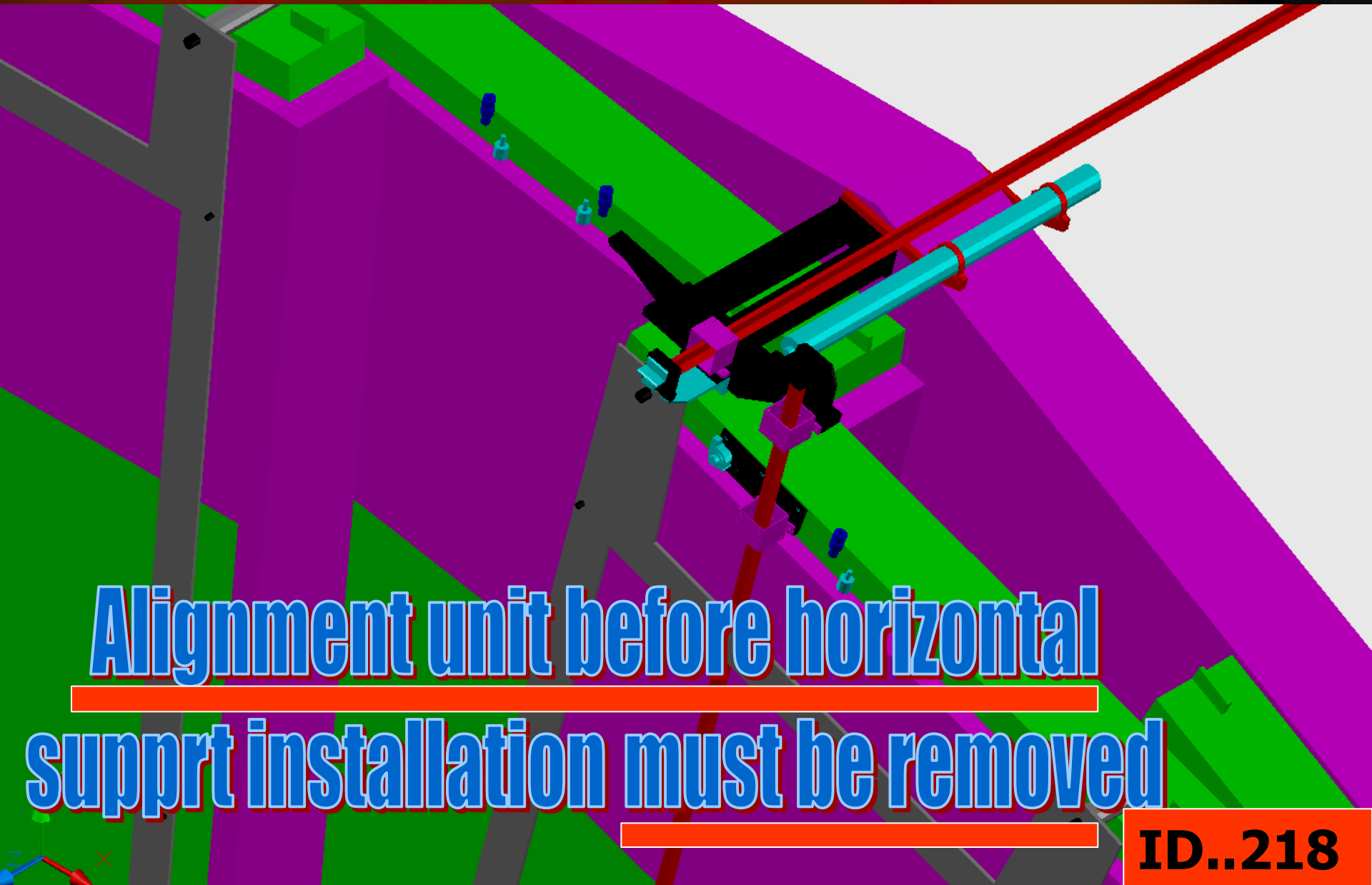
ID..218

YE3 Cart.
YE4 Support system attachment points machining

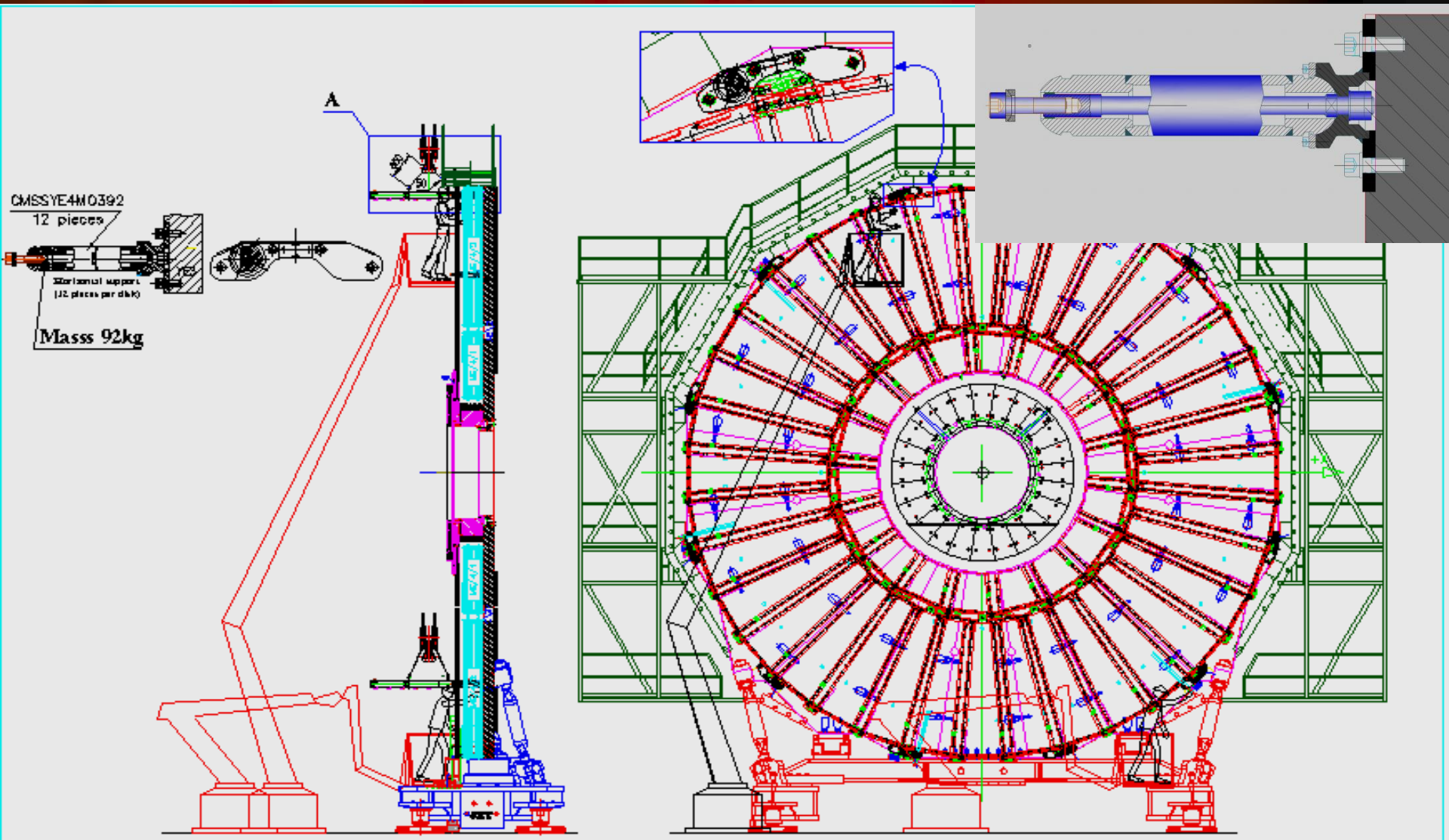


ID..218

YE3 with alignment unit (YE4 horizontal support position)



YE4 horizontal supports installation



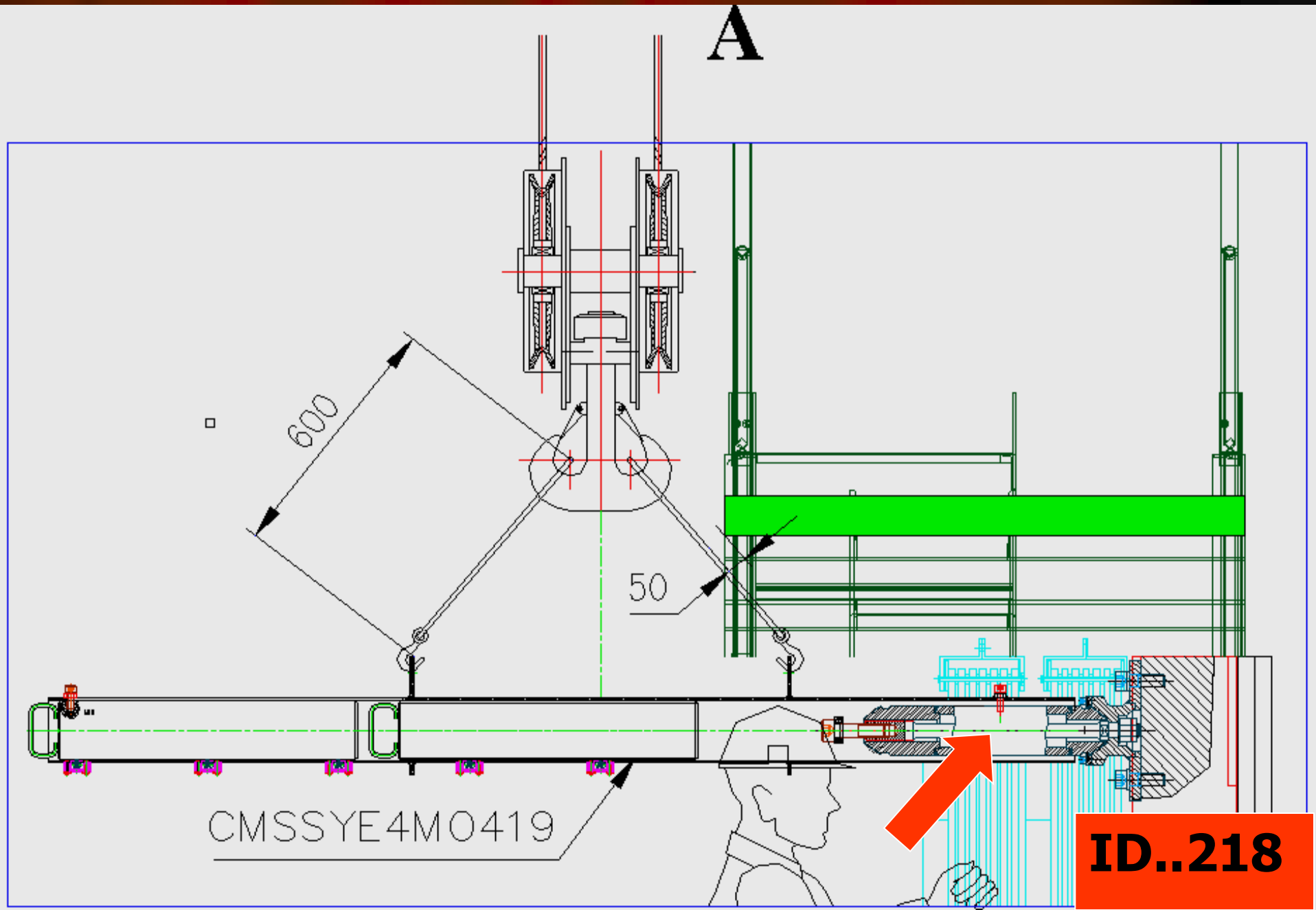
SEQUENCE OPERATIONS:

YE3 must be in vertical position !!!

1. Alignment units & services removing
2. Horizontal supports installation
3. Alignment units reinstallation

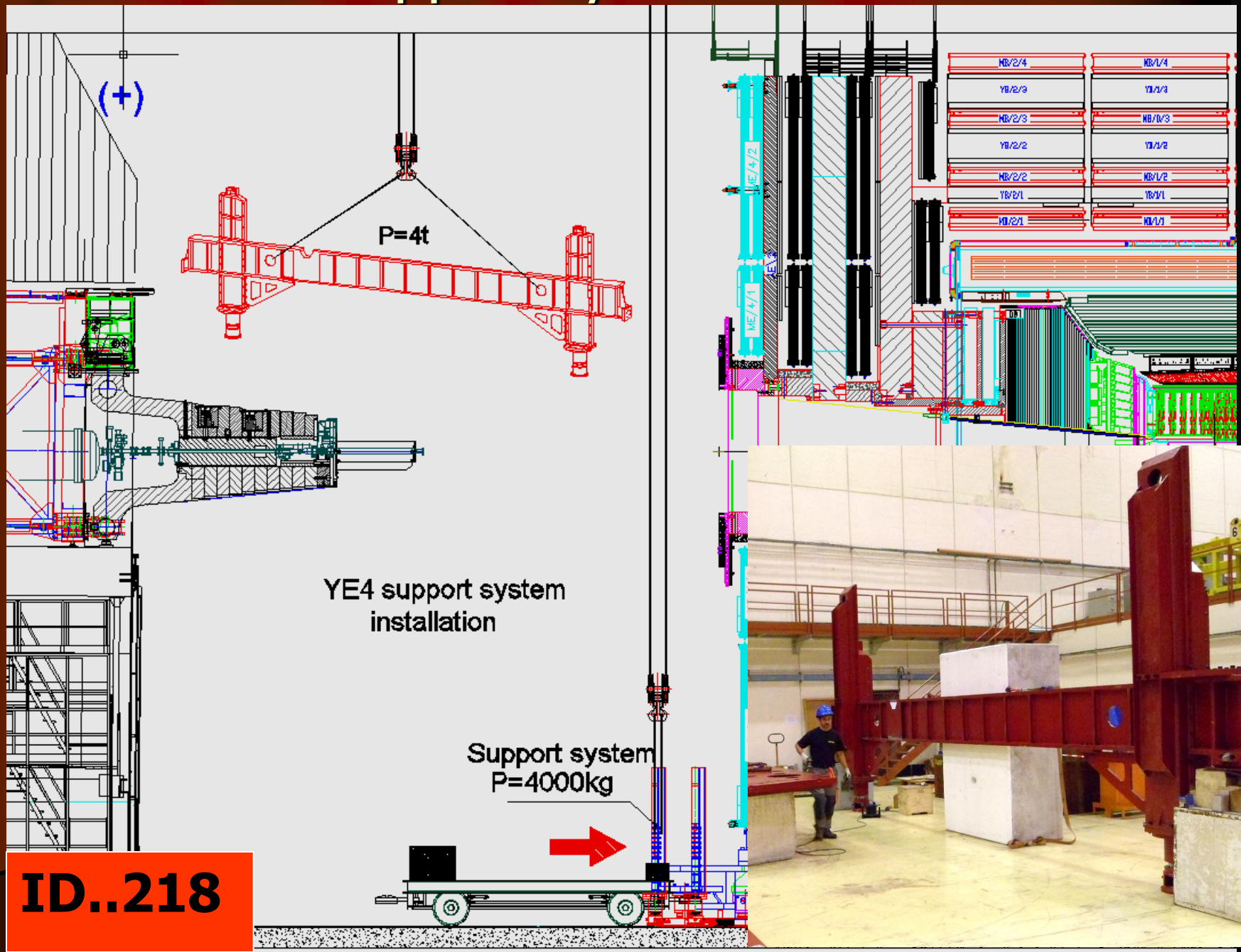
ID..218

YE4 horizontal support installation

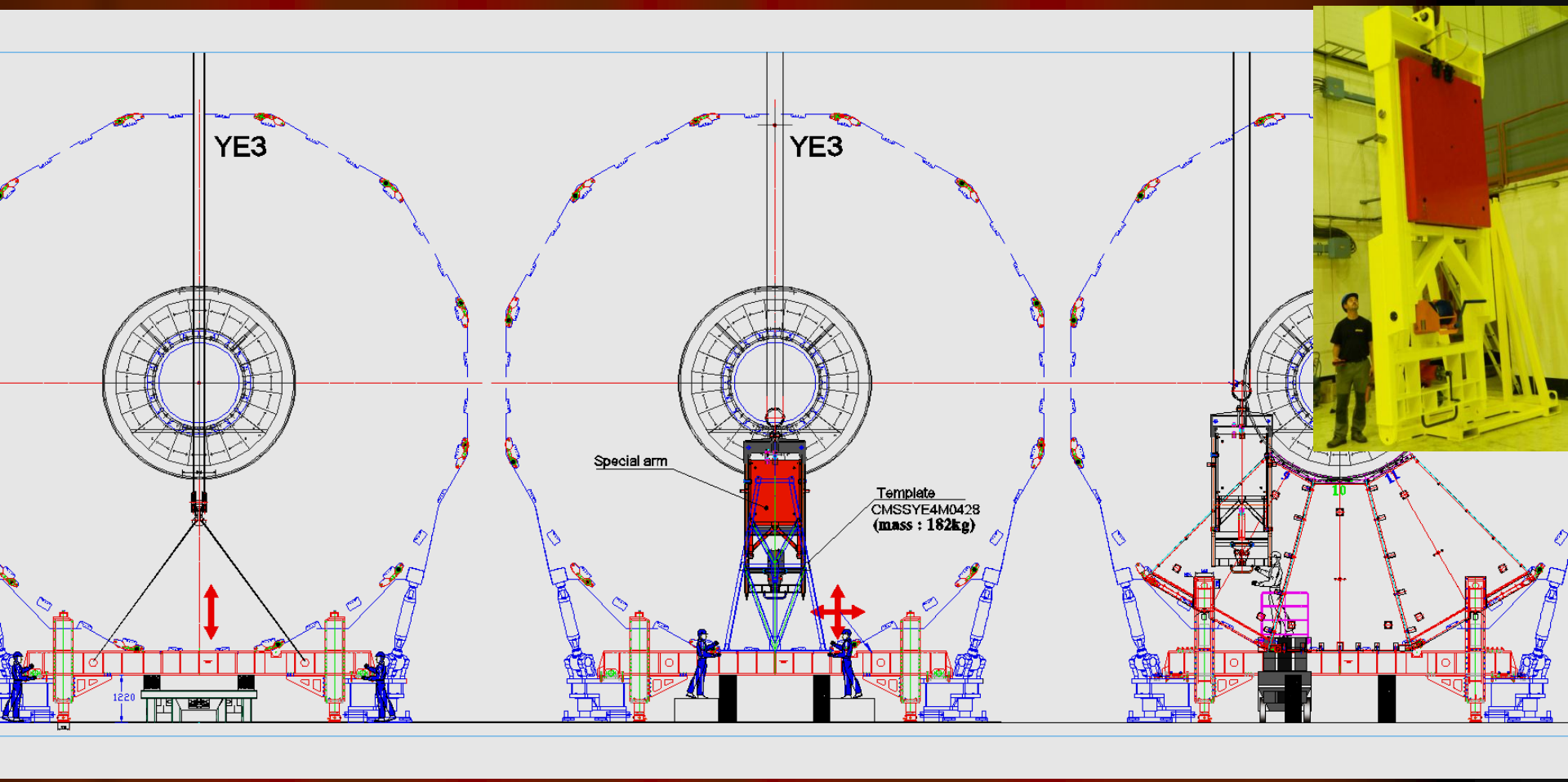


ID..218

YE4 support system installation



YE4 Support system & sectors N10, N11, N9 installation

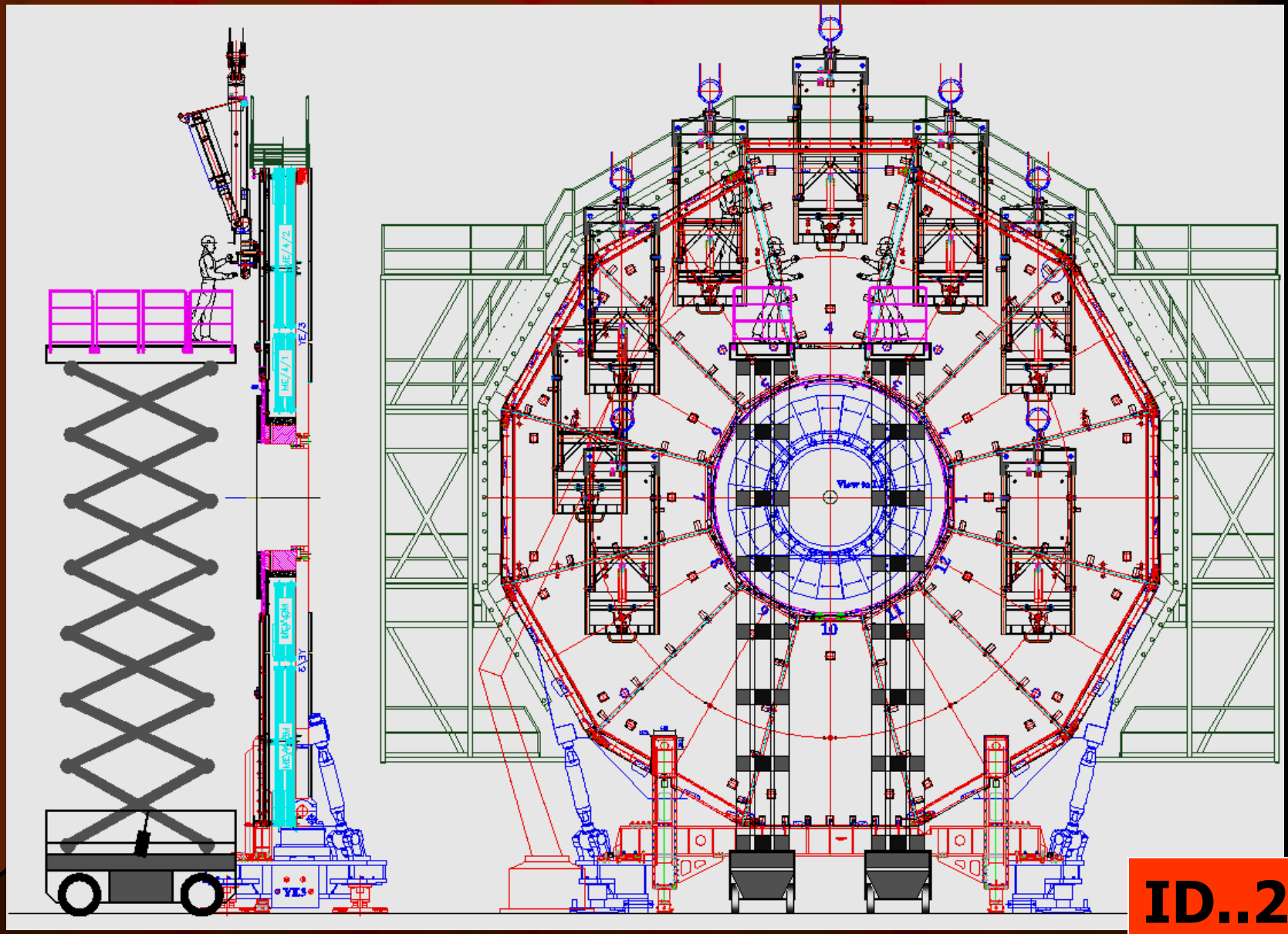


ID..218

TOOLING ACCORDING of YE4 EDR

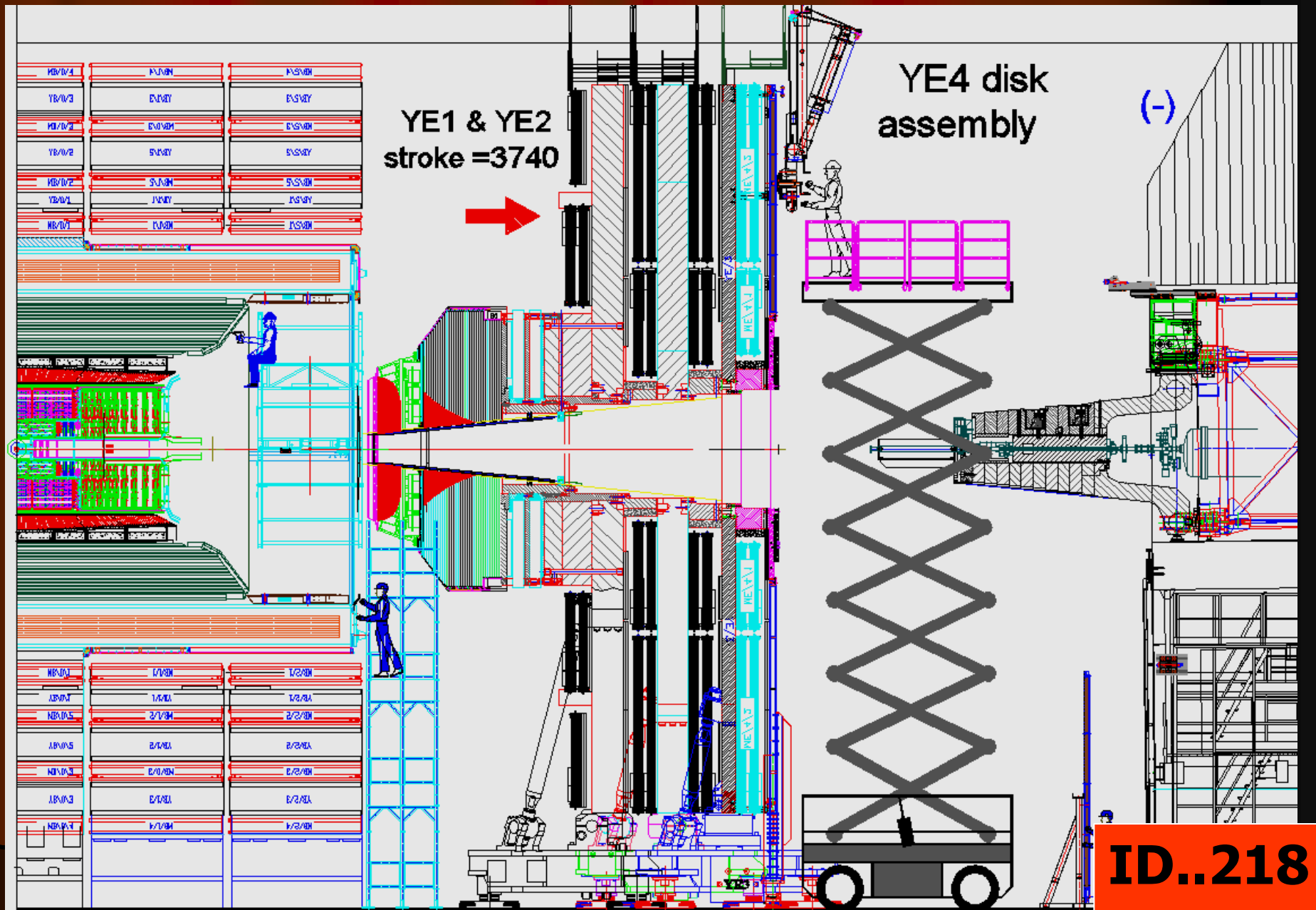
YE4 sector installation

YE4 installation



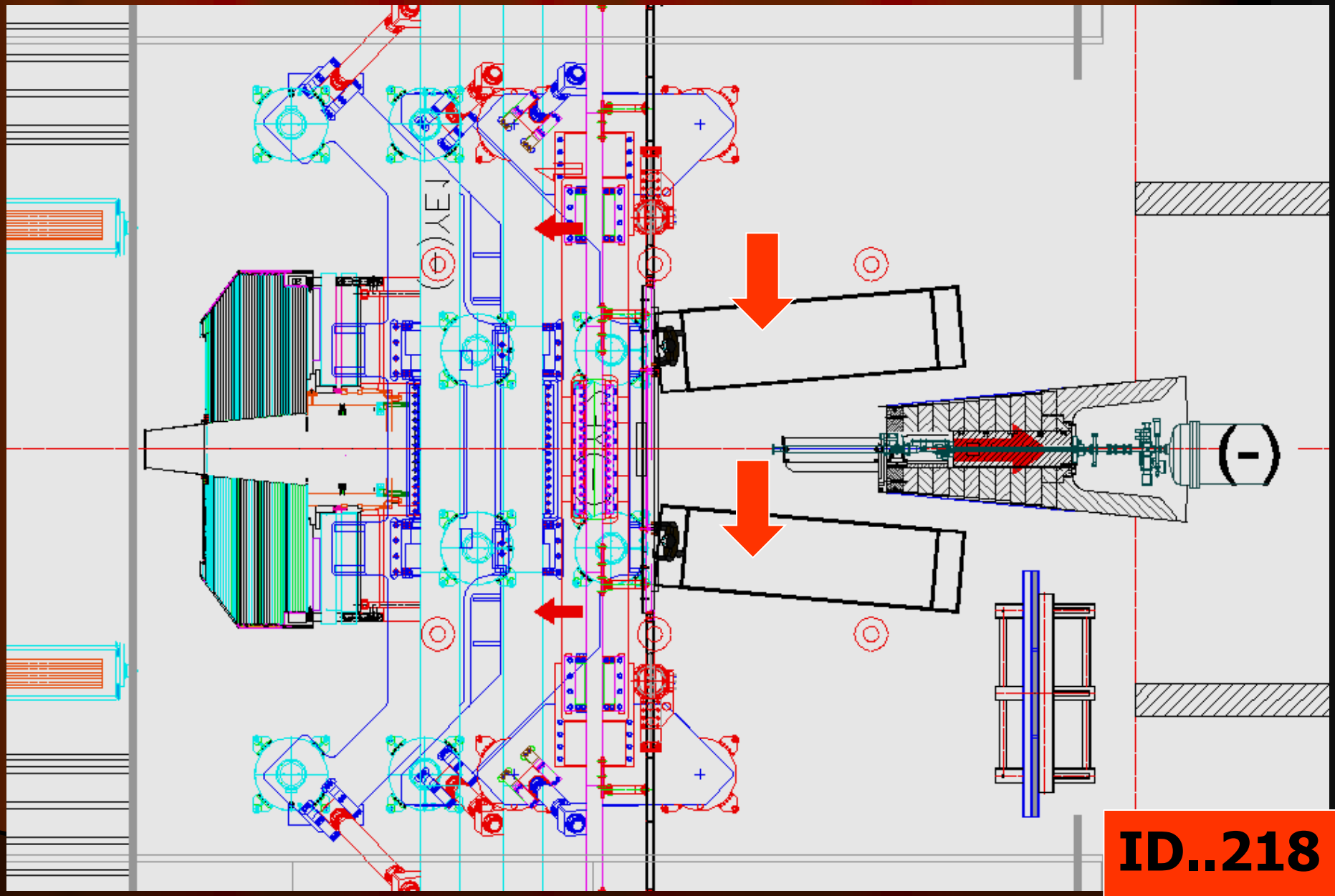
ID..218

YE4 installation (Endcap open 3.74m)



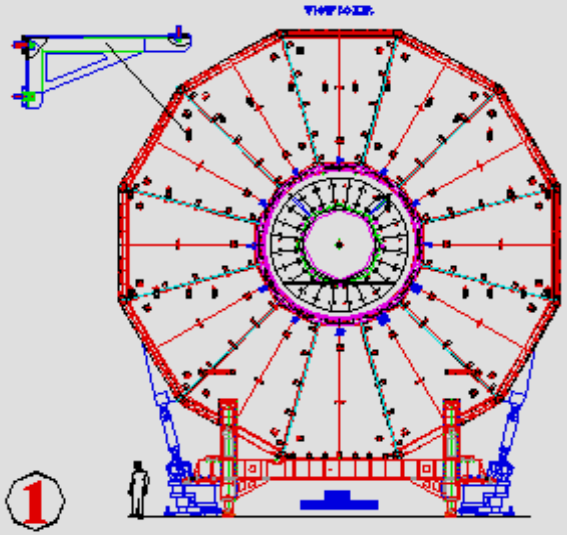
ID..218

YE4 Installation. Nacelles position. Top view



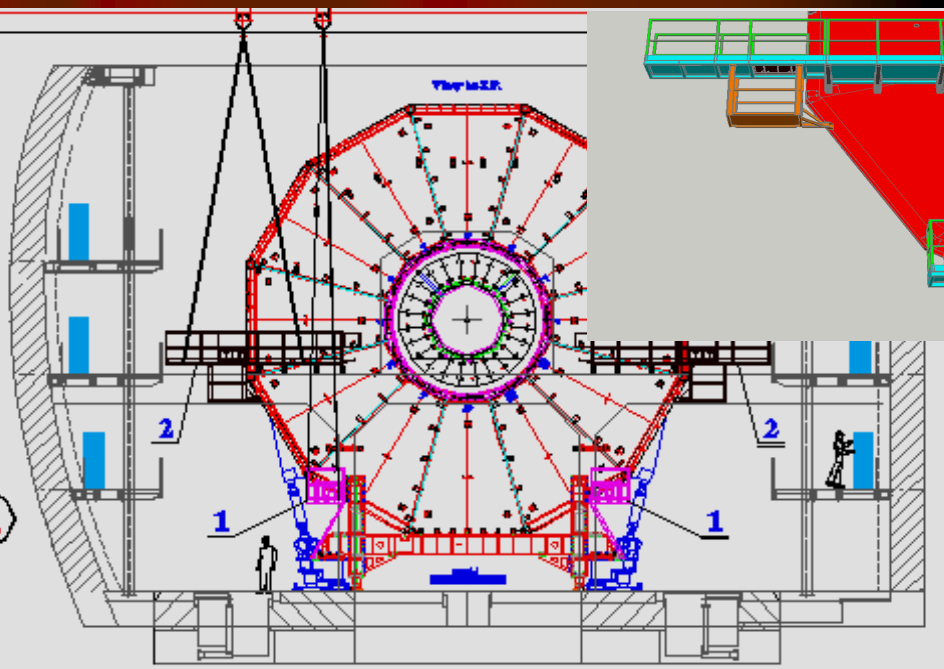
ID..218

YE4 Walkways Installation

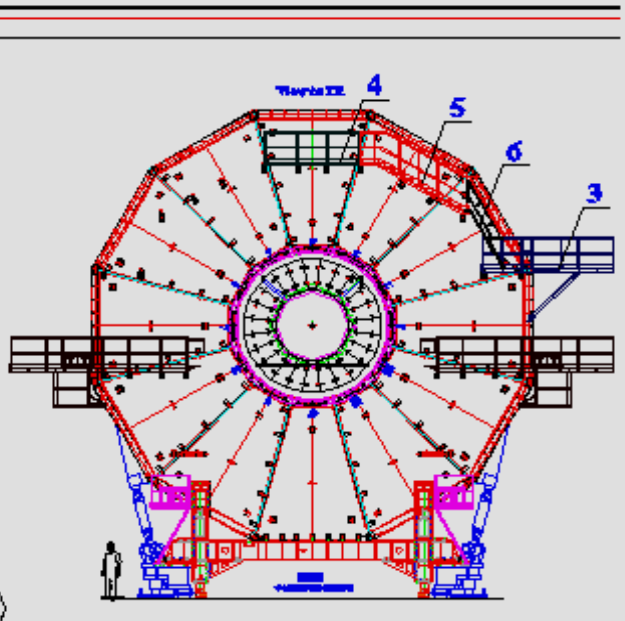


1

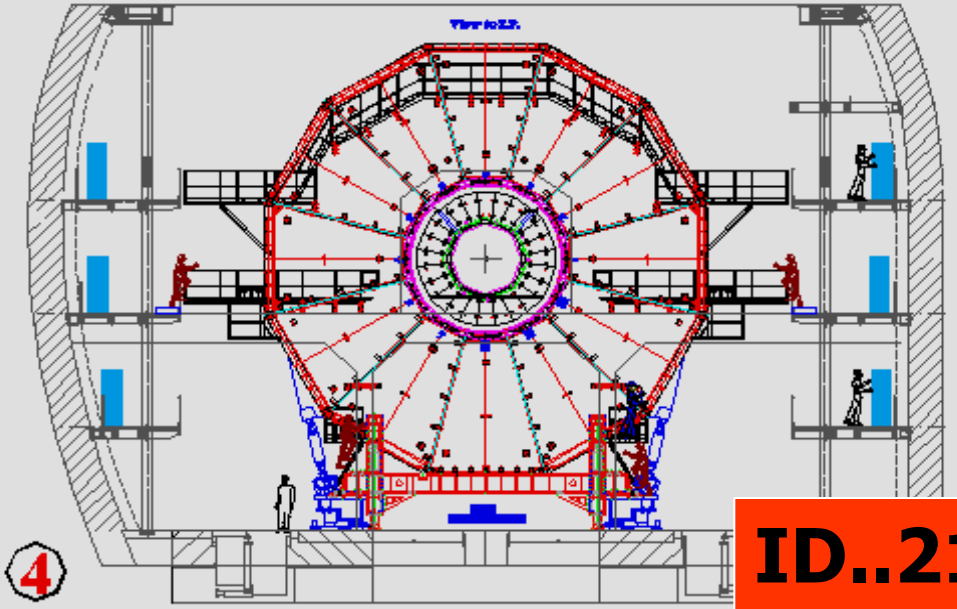
Brackets installation. 22 position



2



3

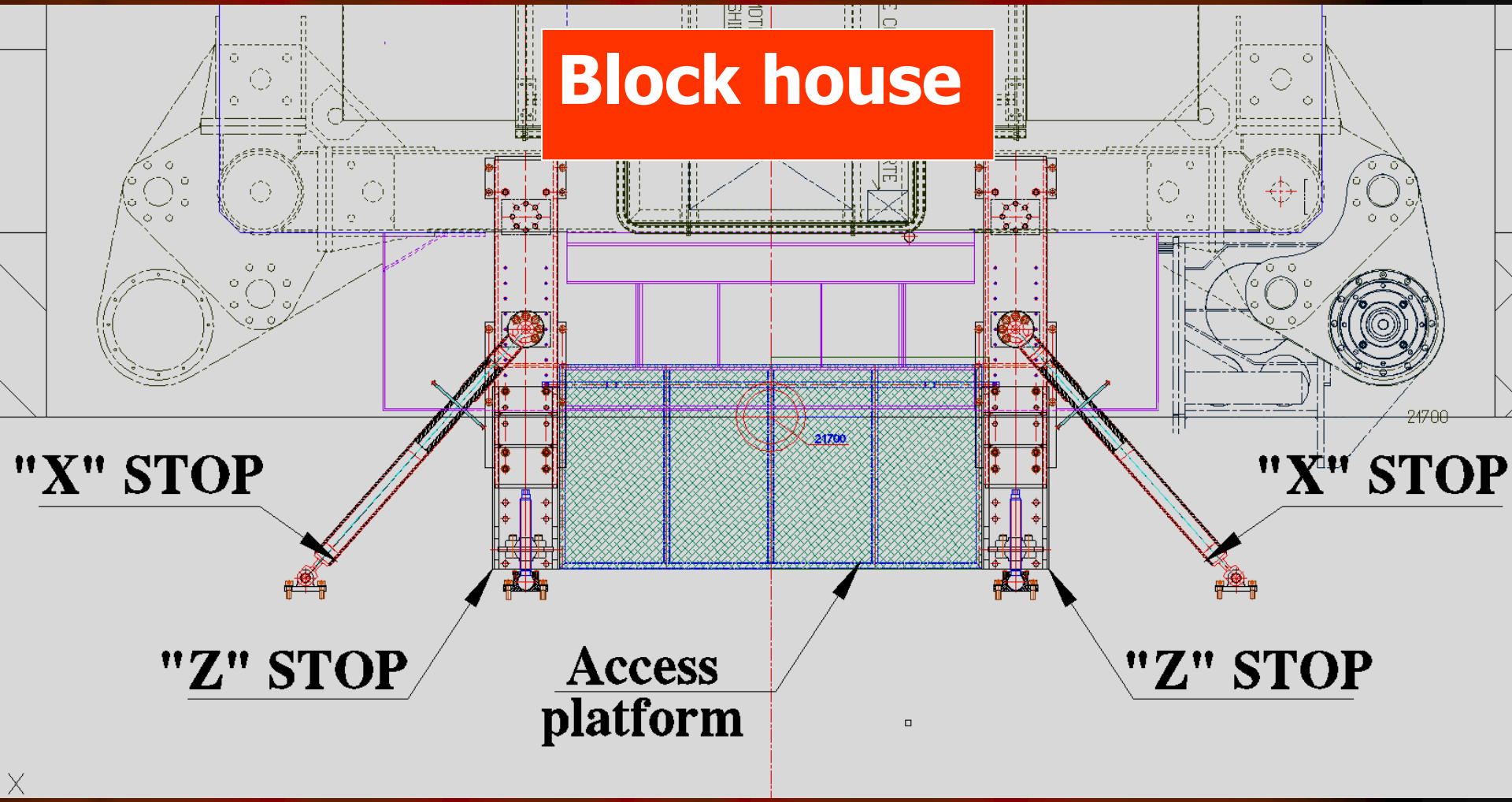


4

ID..218

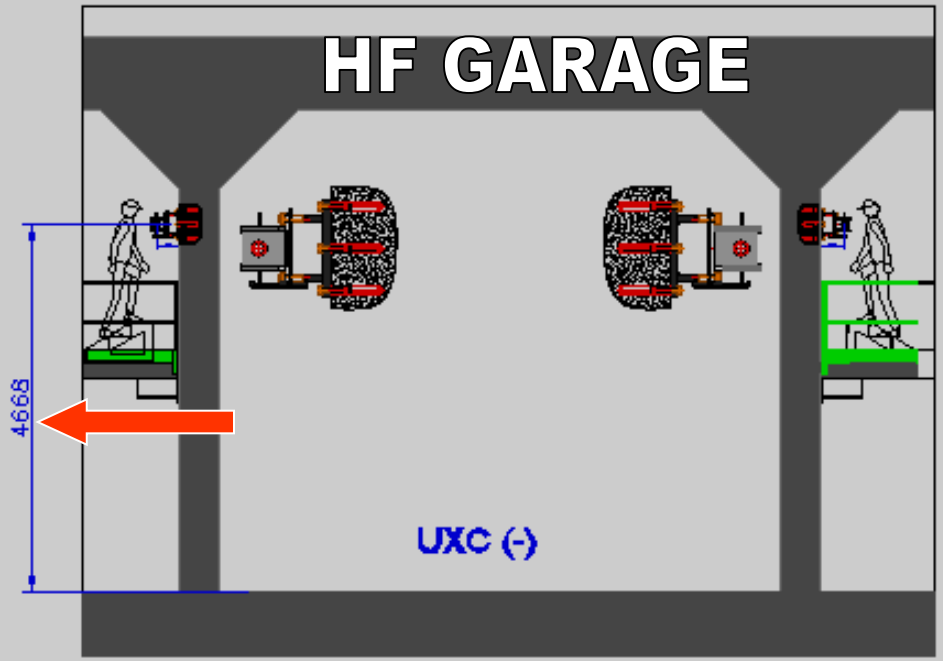
YE4 walkways installation. Step by step (additional information see CMSSYE4M0291)

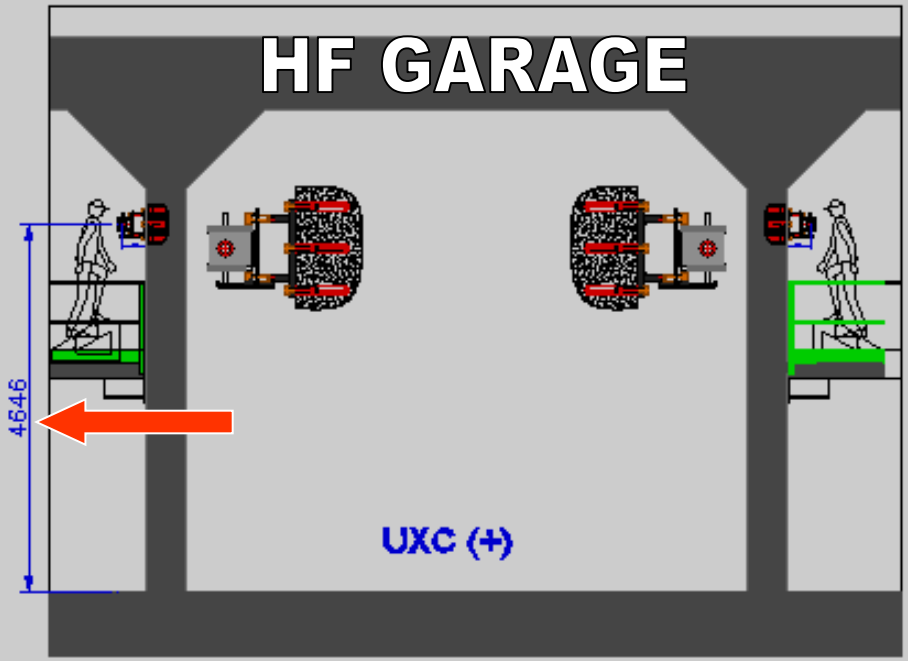
“Z” & “X” stop installation-top level (LS1)

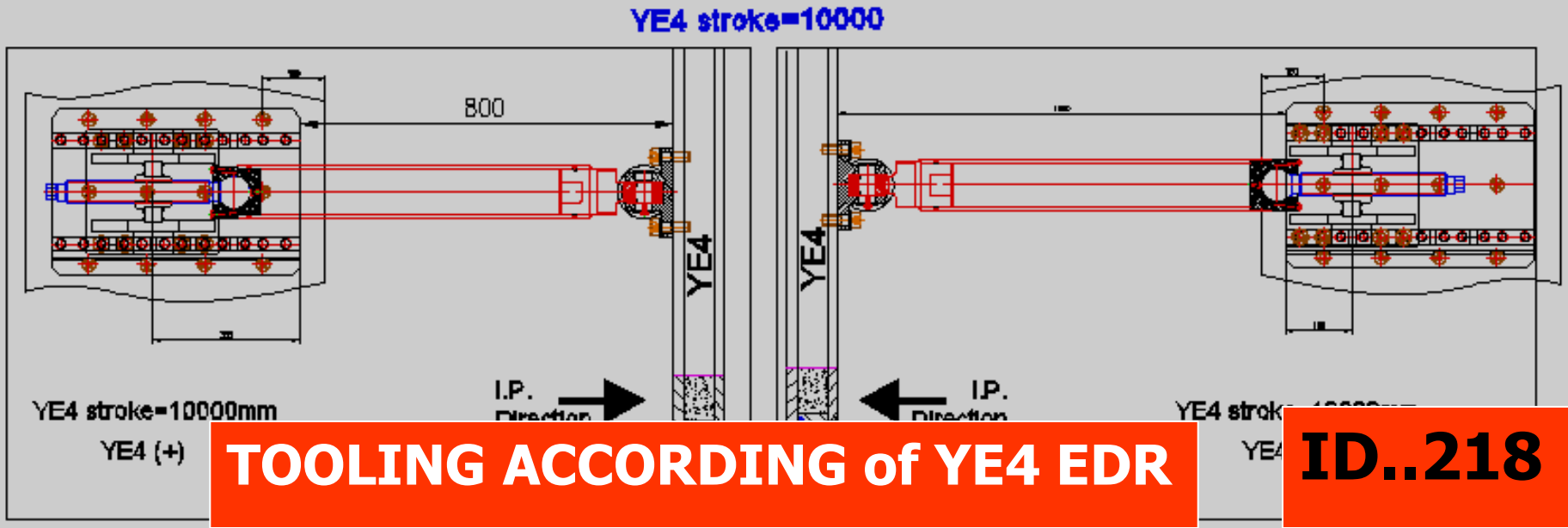


ID..218

"Z"- stops installation-bottom level. (LS1)





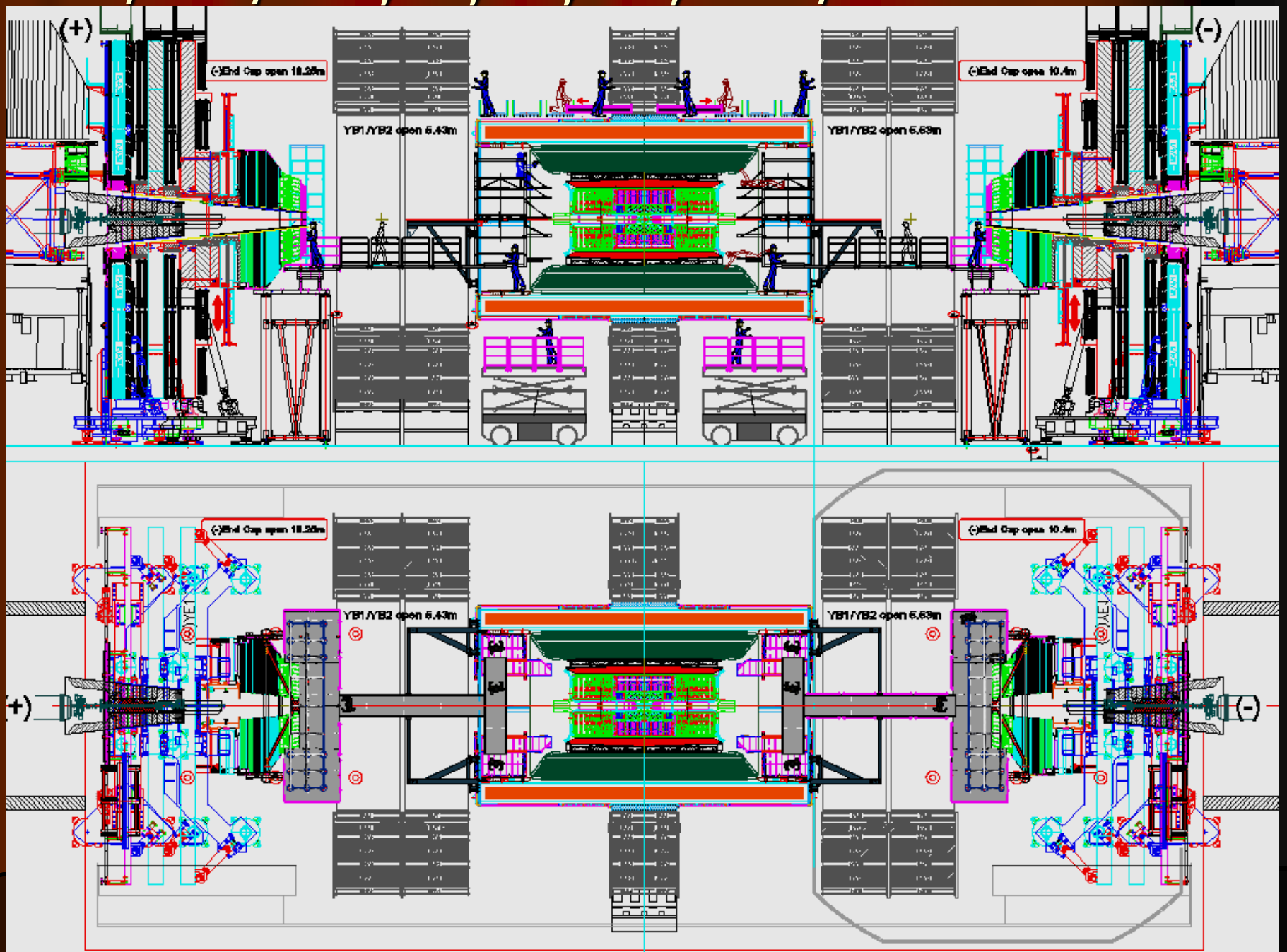


TOOLING ACCORDING of YE4 EDR

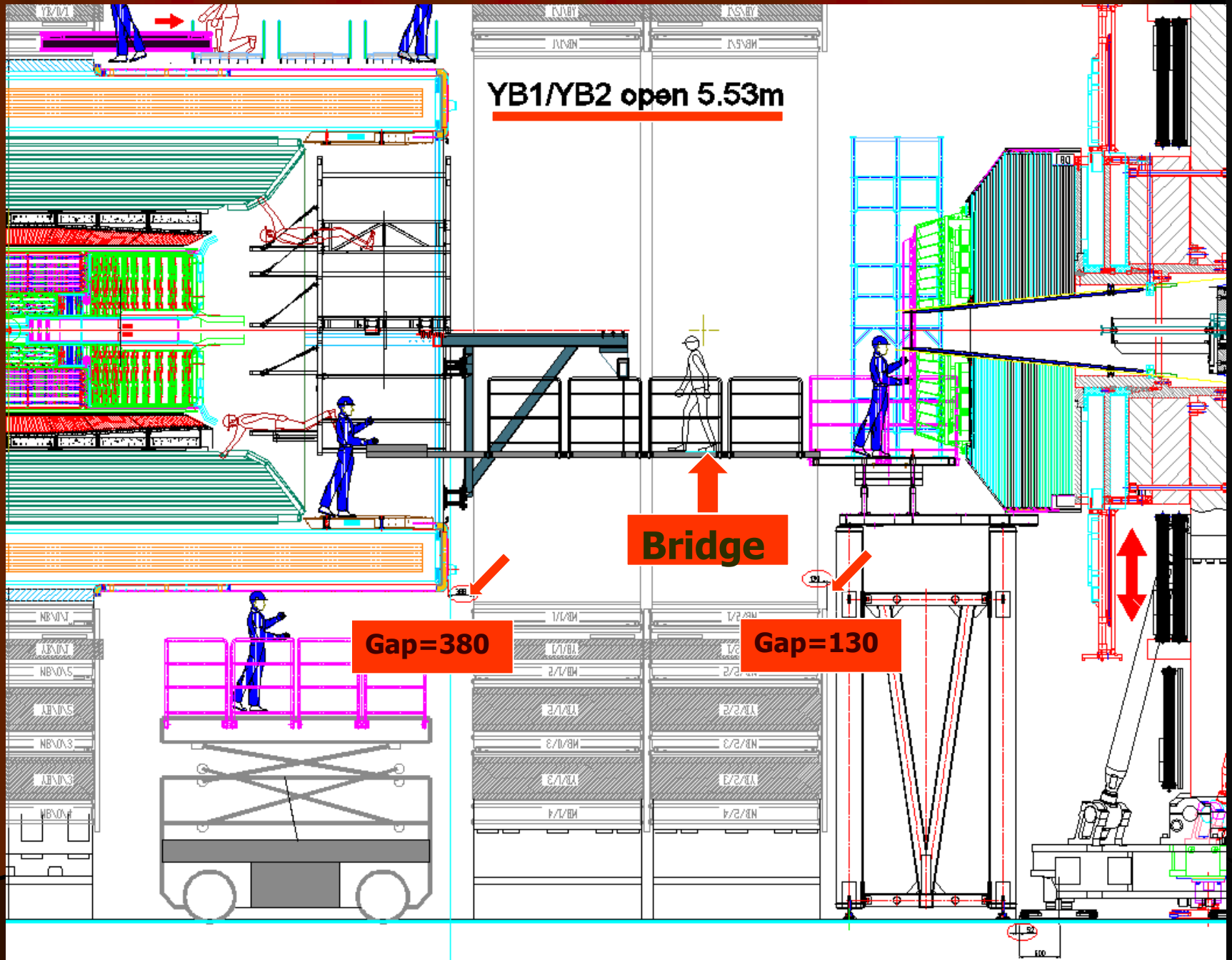
ID..218

YB0, YB1, YB2 MAINTENANCE

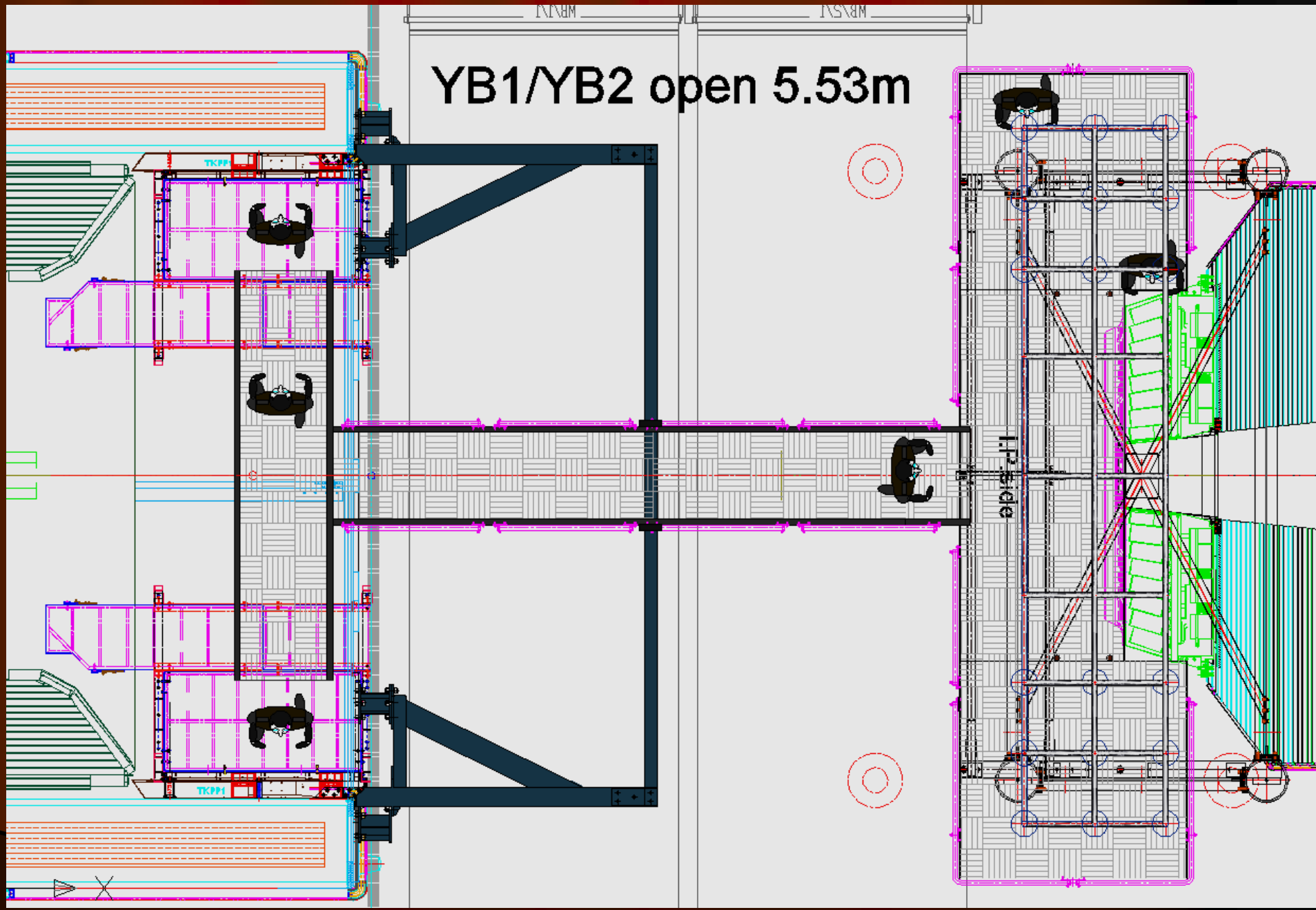
YB0/YB1/YB2,TK,HB, EE, ME1/1 maintenance



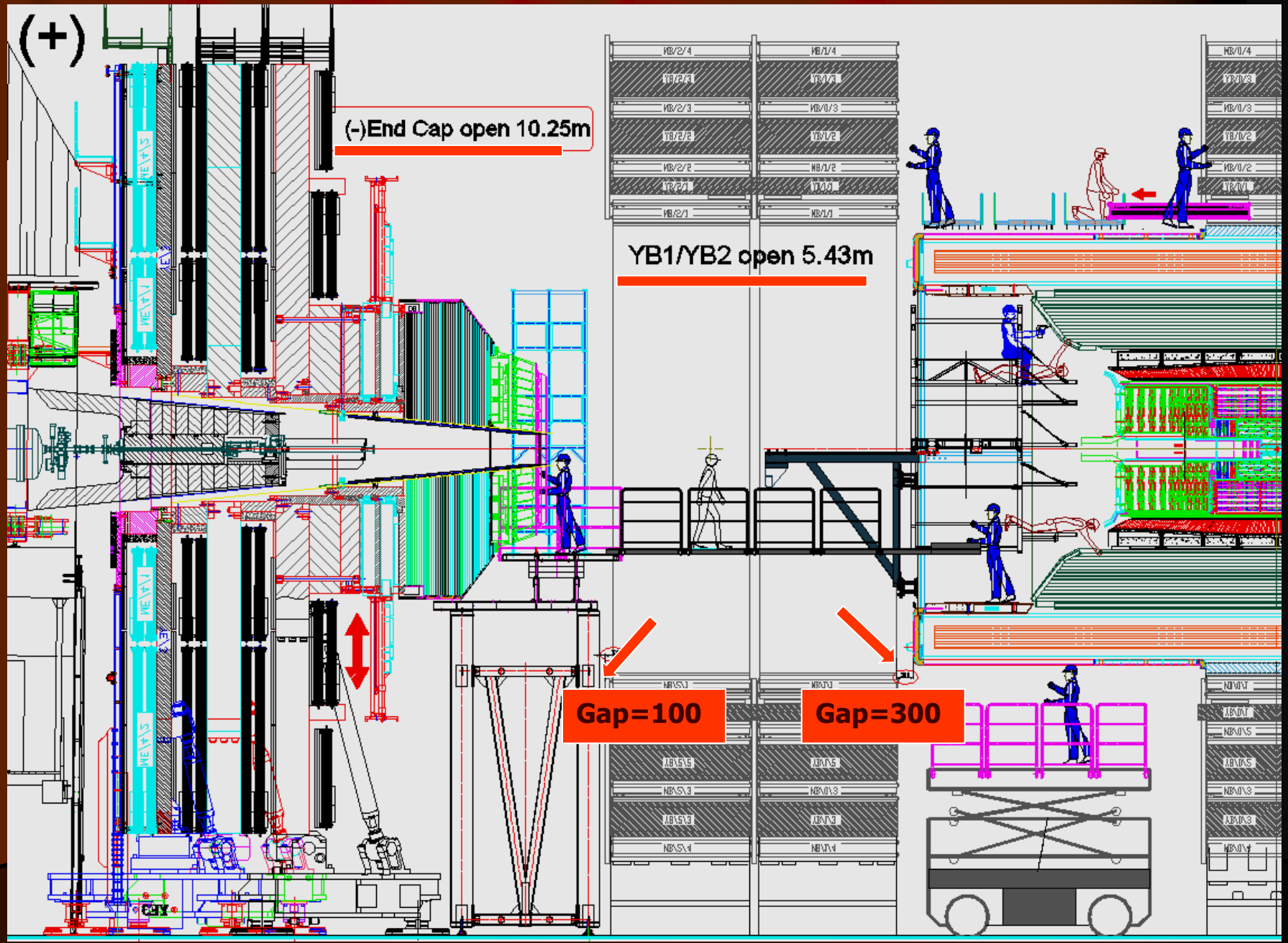
YB0-YB1, HB, EE, ME1/1 maintenance. Endcap(-) open 10.4m



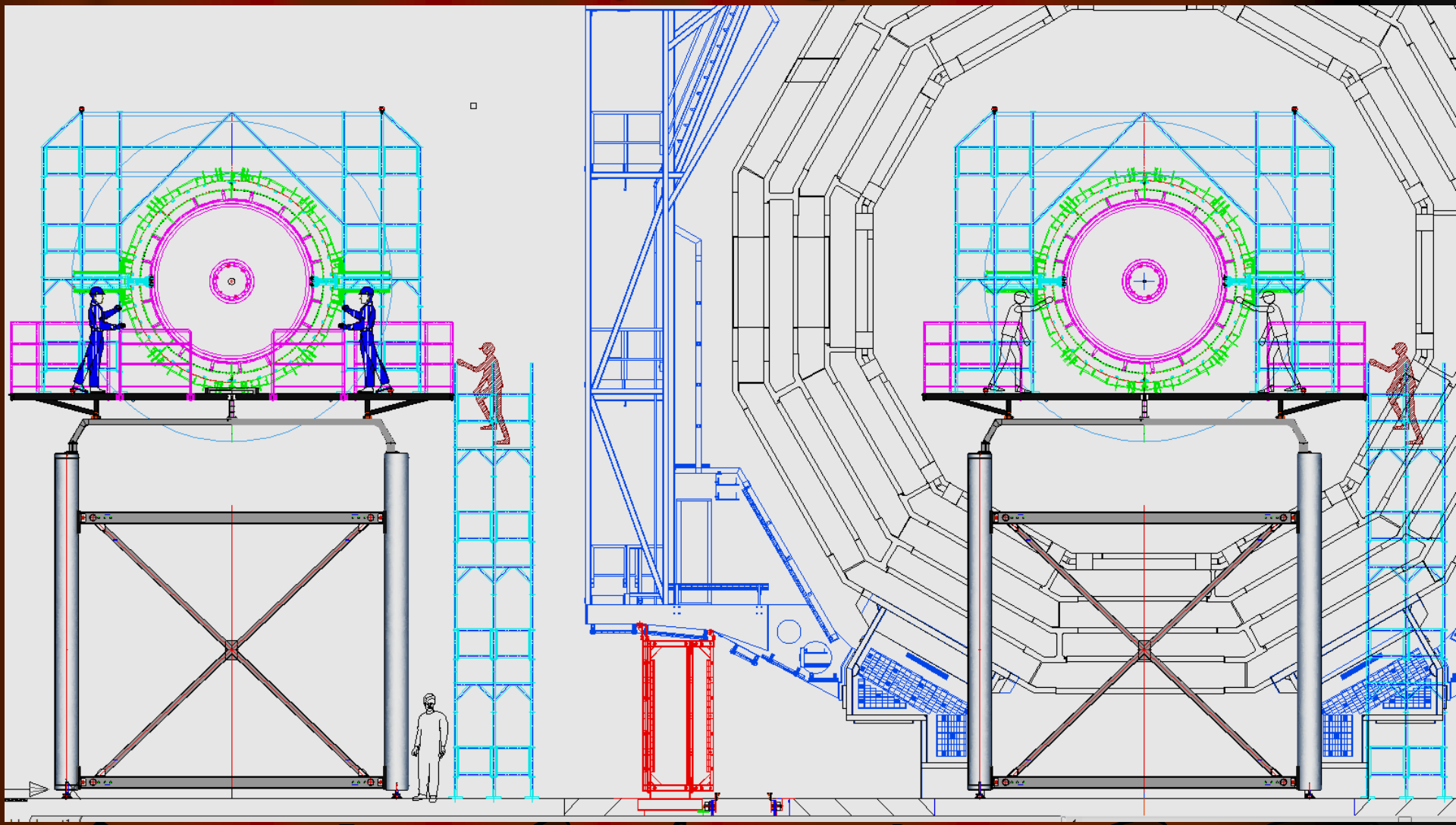
TK,EB,HB,EE maintenance (-)side. Top view



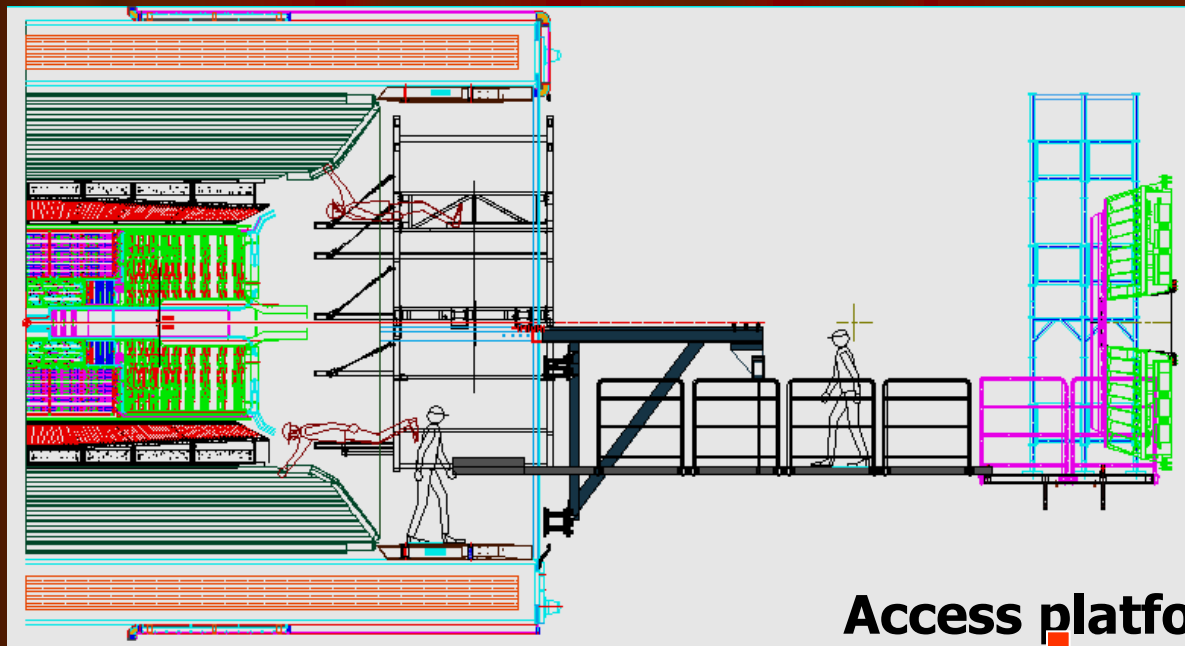
YB0-YB1, HB, EE, ME1/1 maintenance (+)side

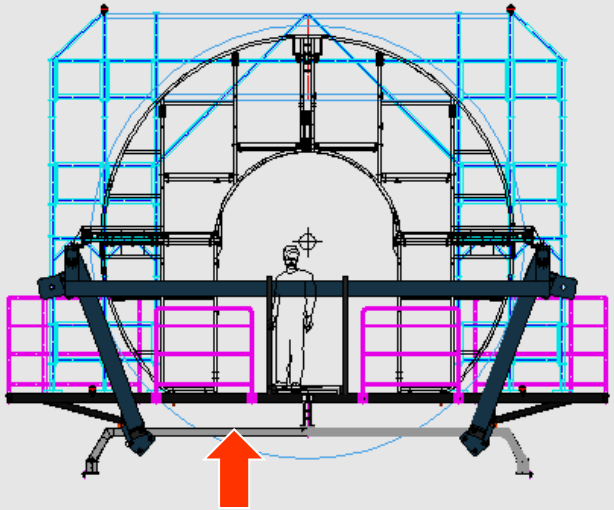


HB/EB/TK/PIXEL, EE/ES maintenance (Tooling)



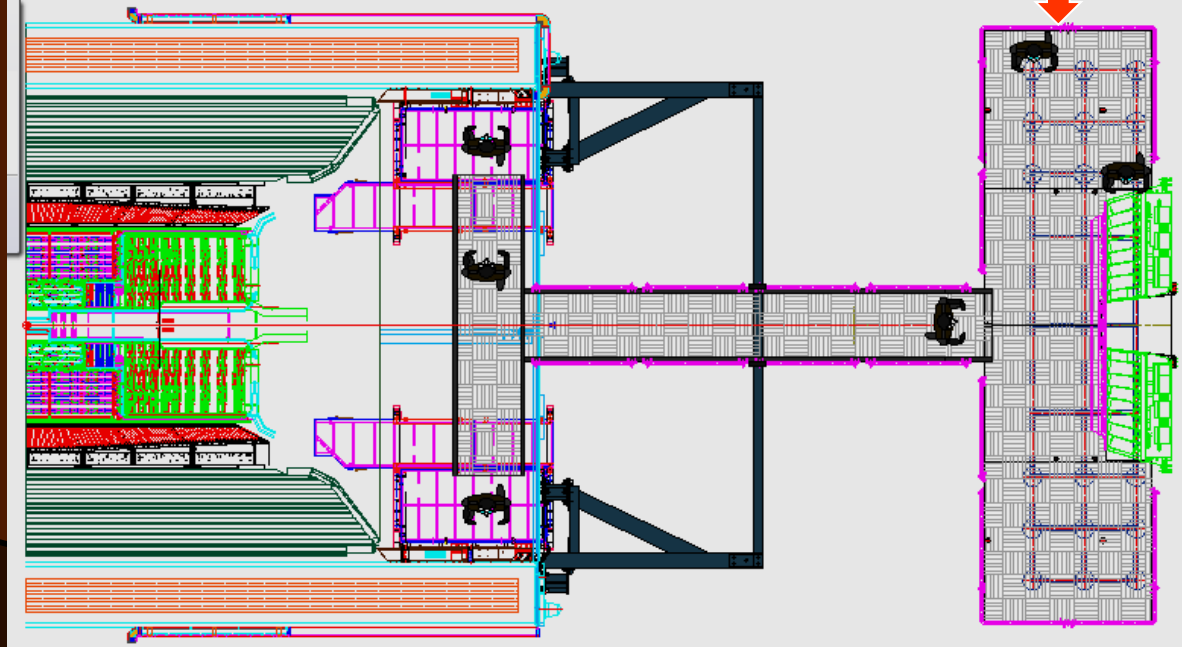
HB/EB/TK/PIXEL,EE/ES maintenance (Tooling)

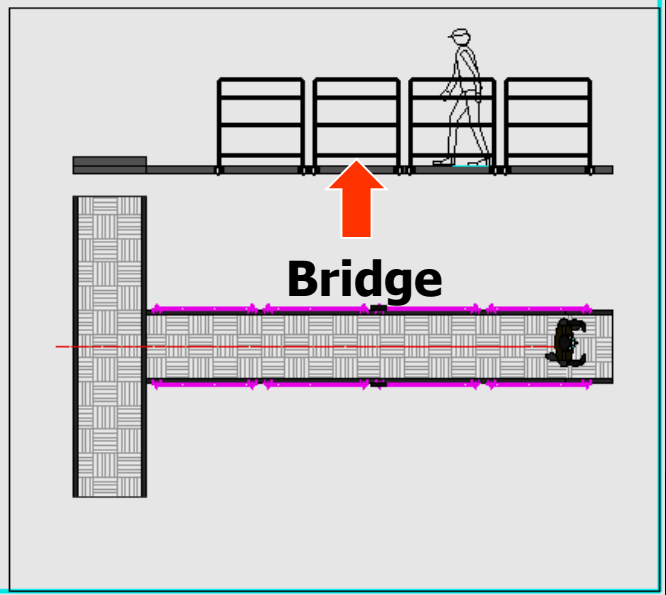




Access platform

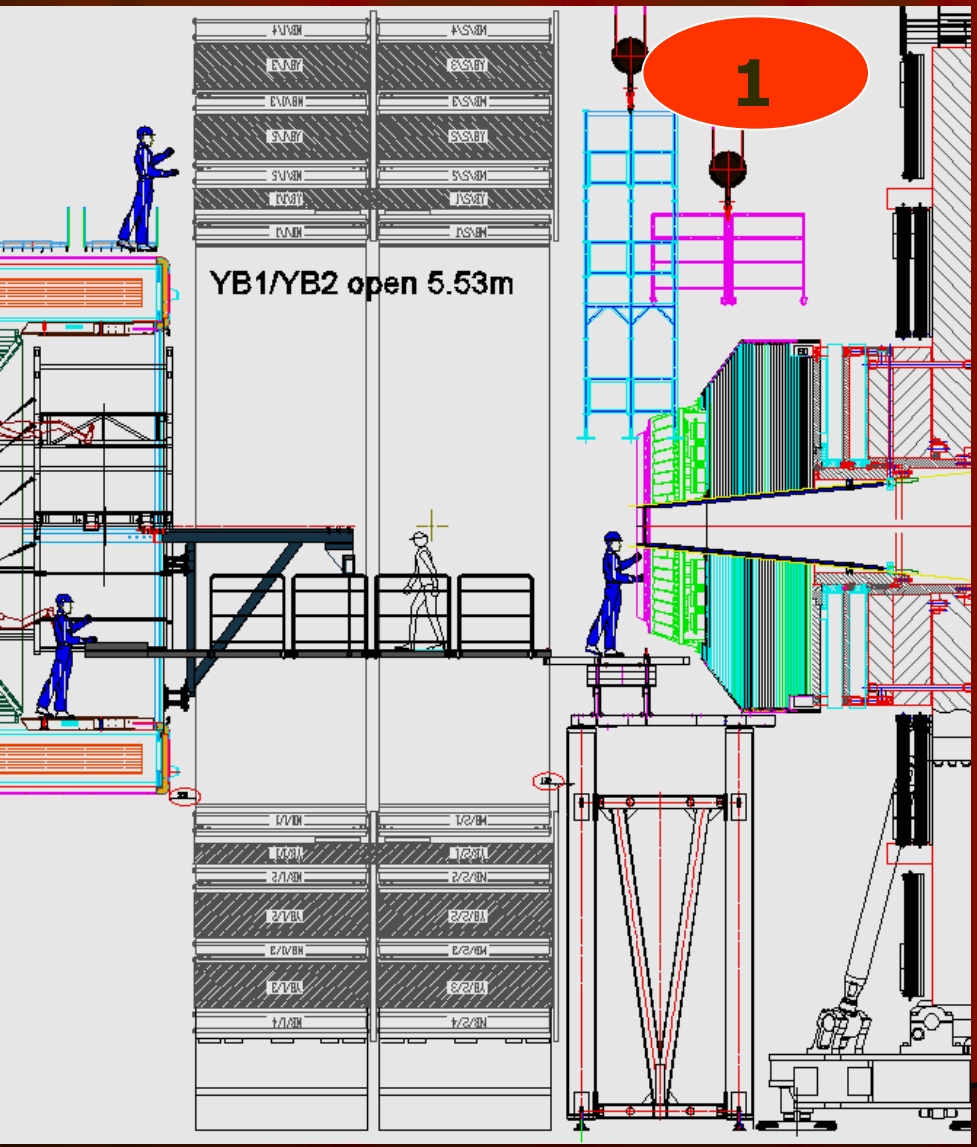
Interface frame

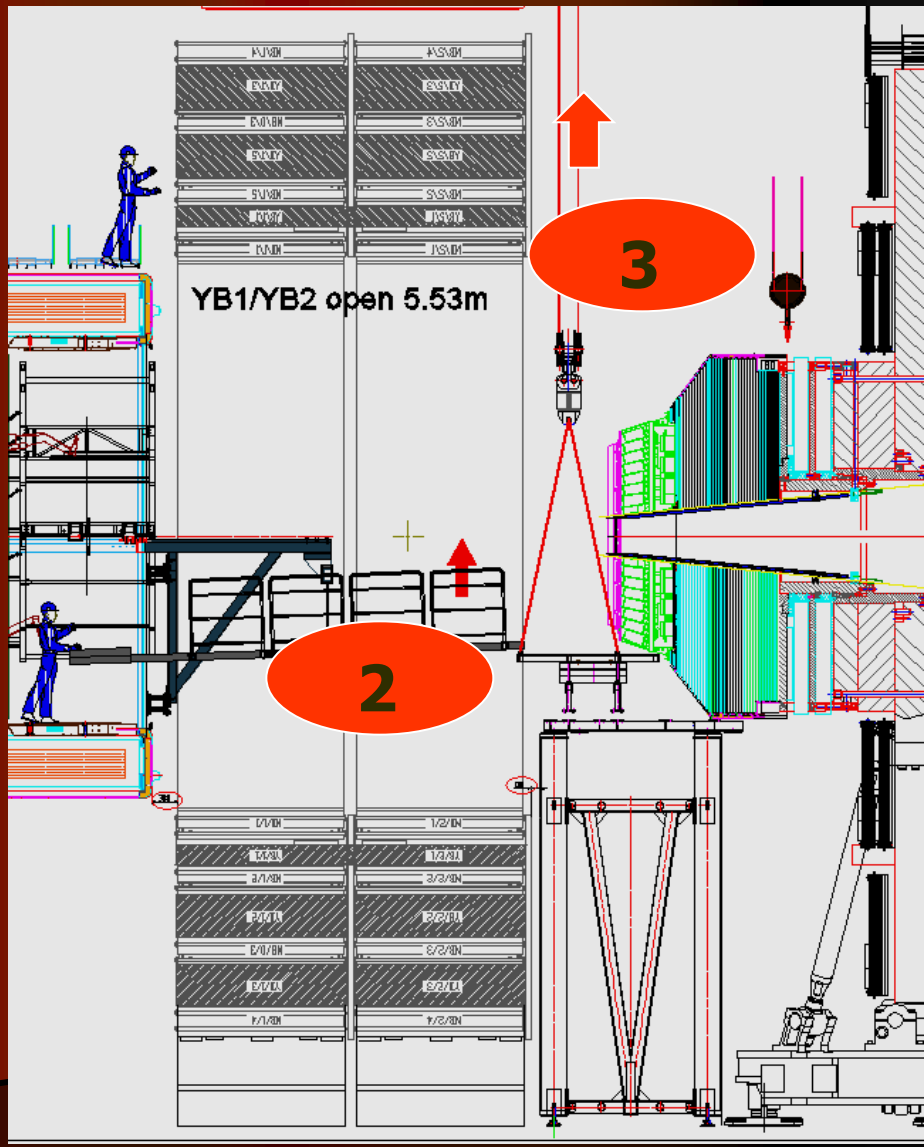




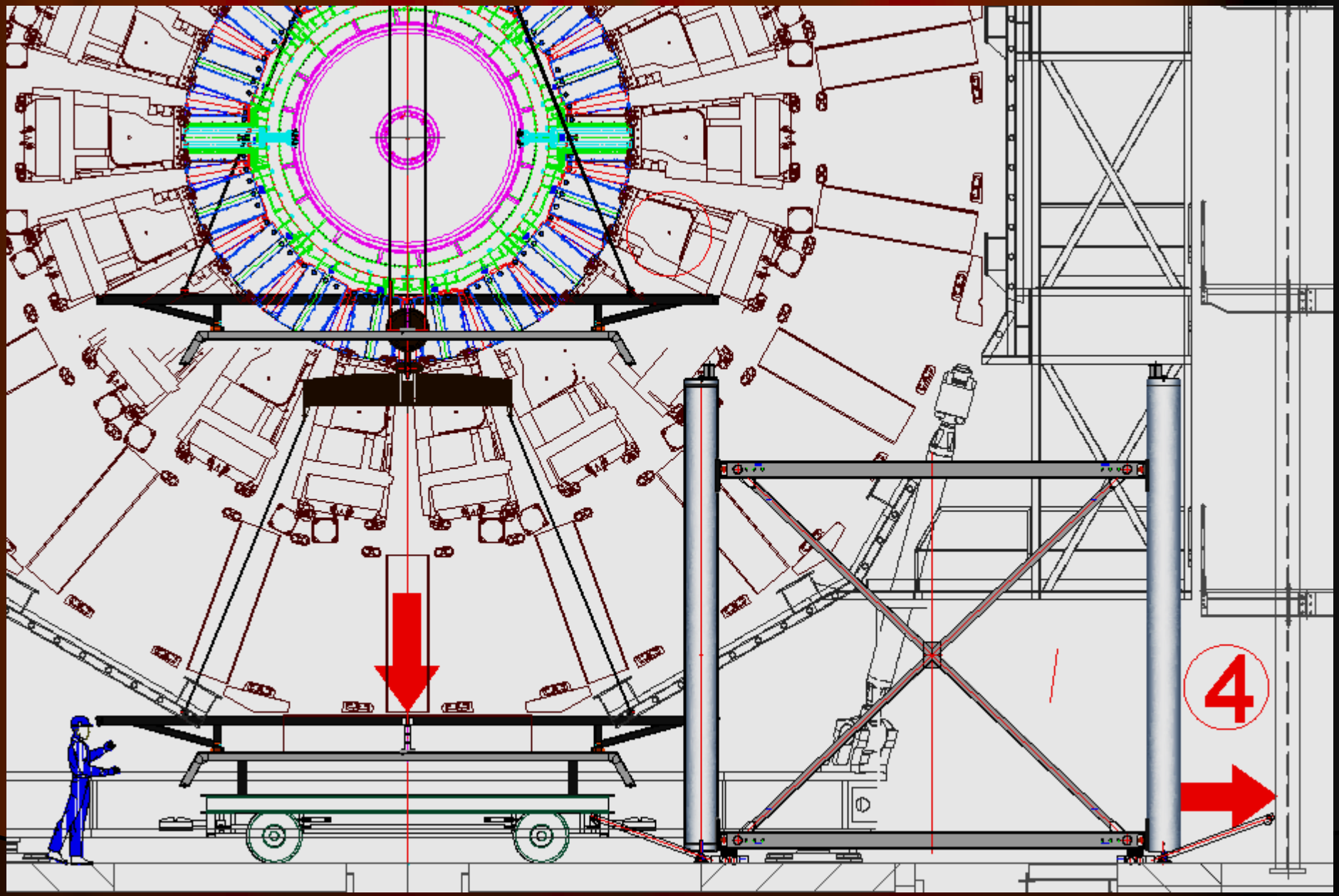
Bridge

“Gasprom” platform remove (sequence operations)

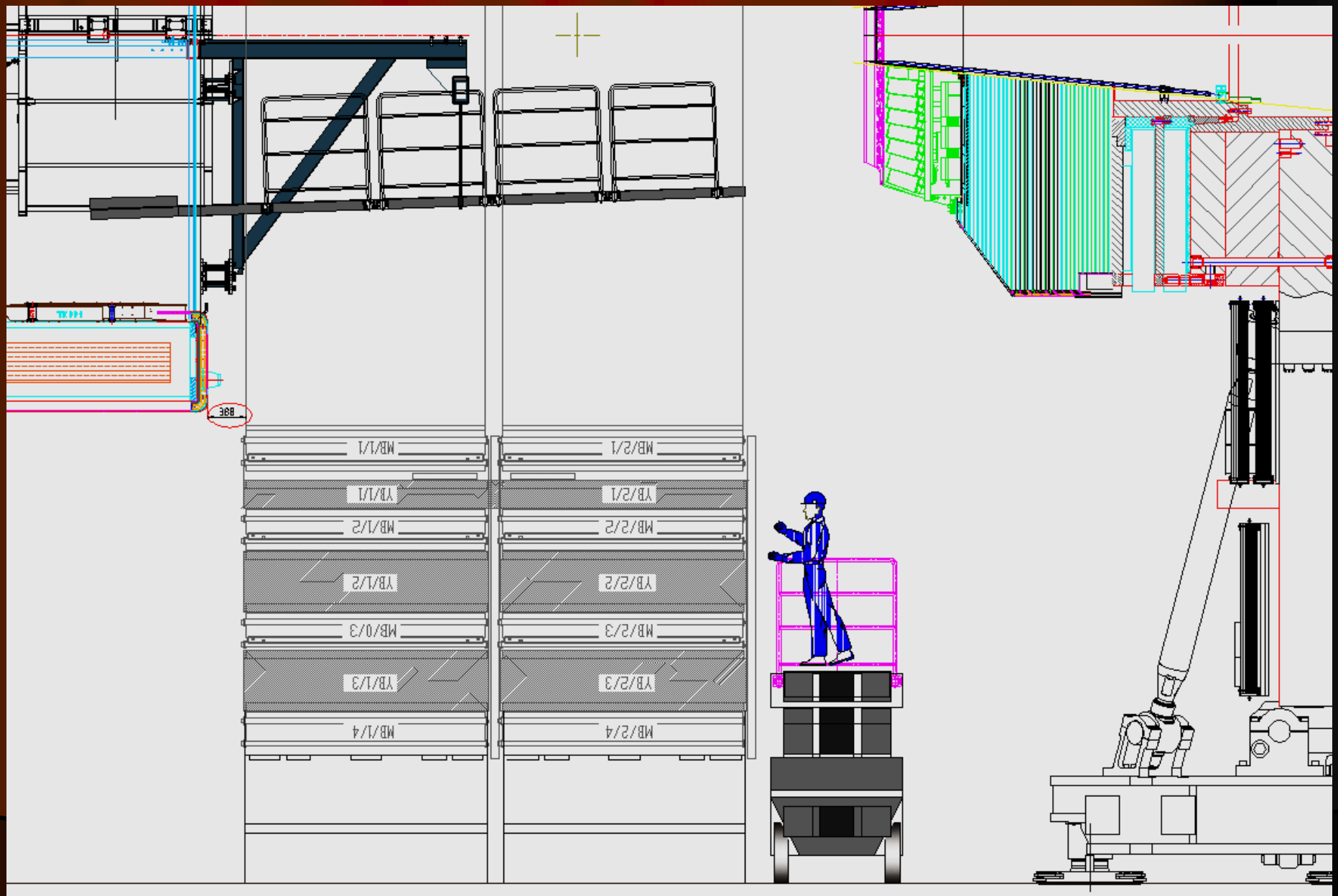




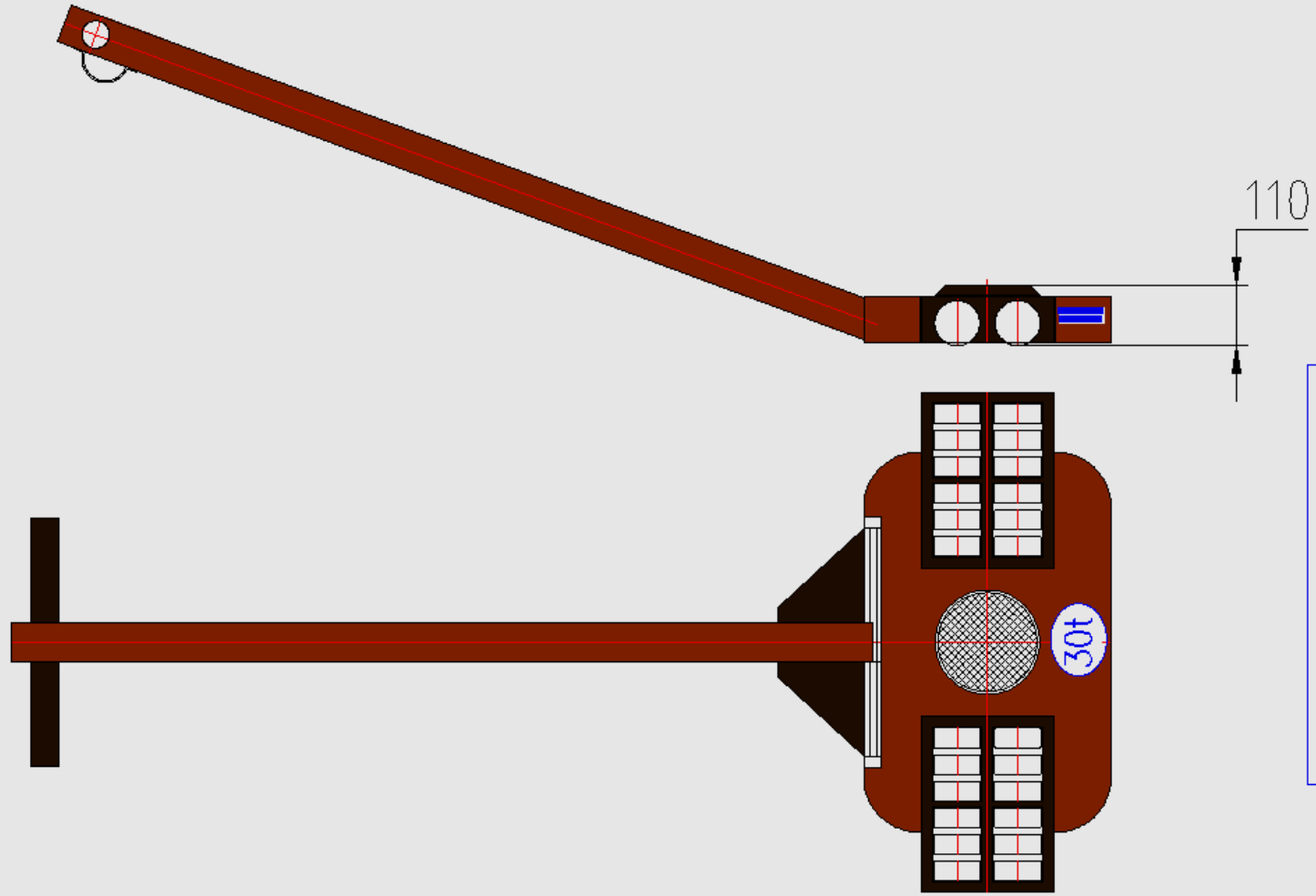
Gasprom” platform remove (sequence operations)

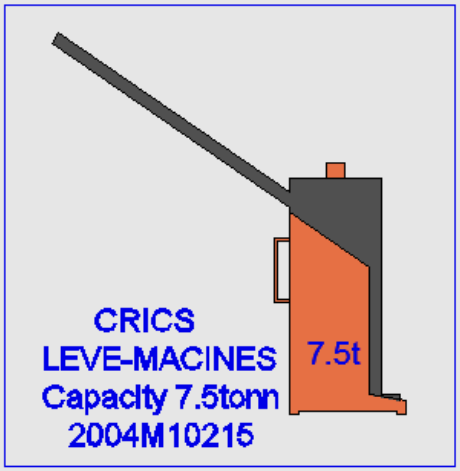


YB2 maintenance

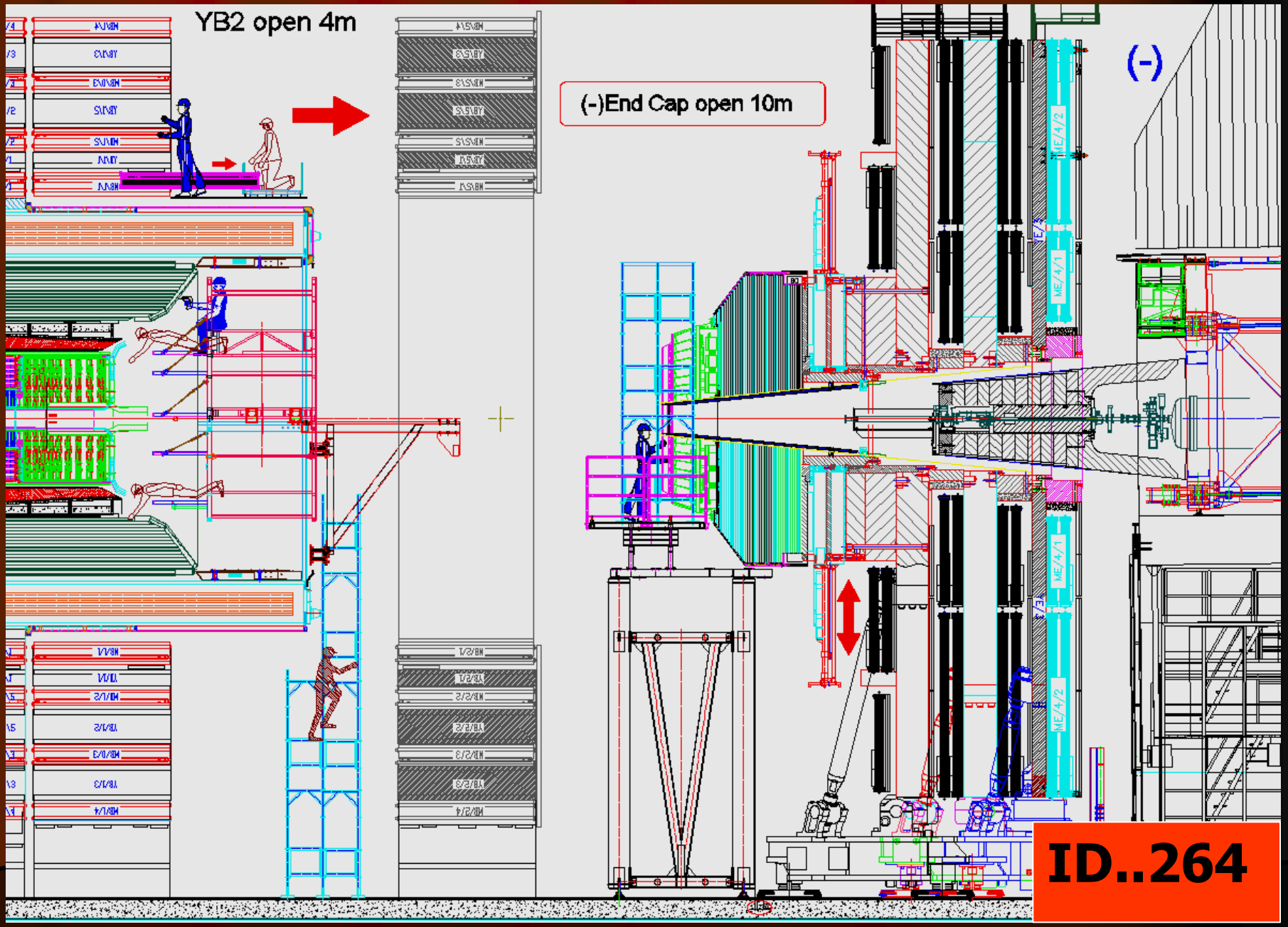


Tooling for lifting & move “Gasprom” platform

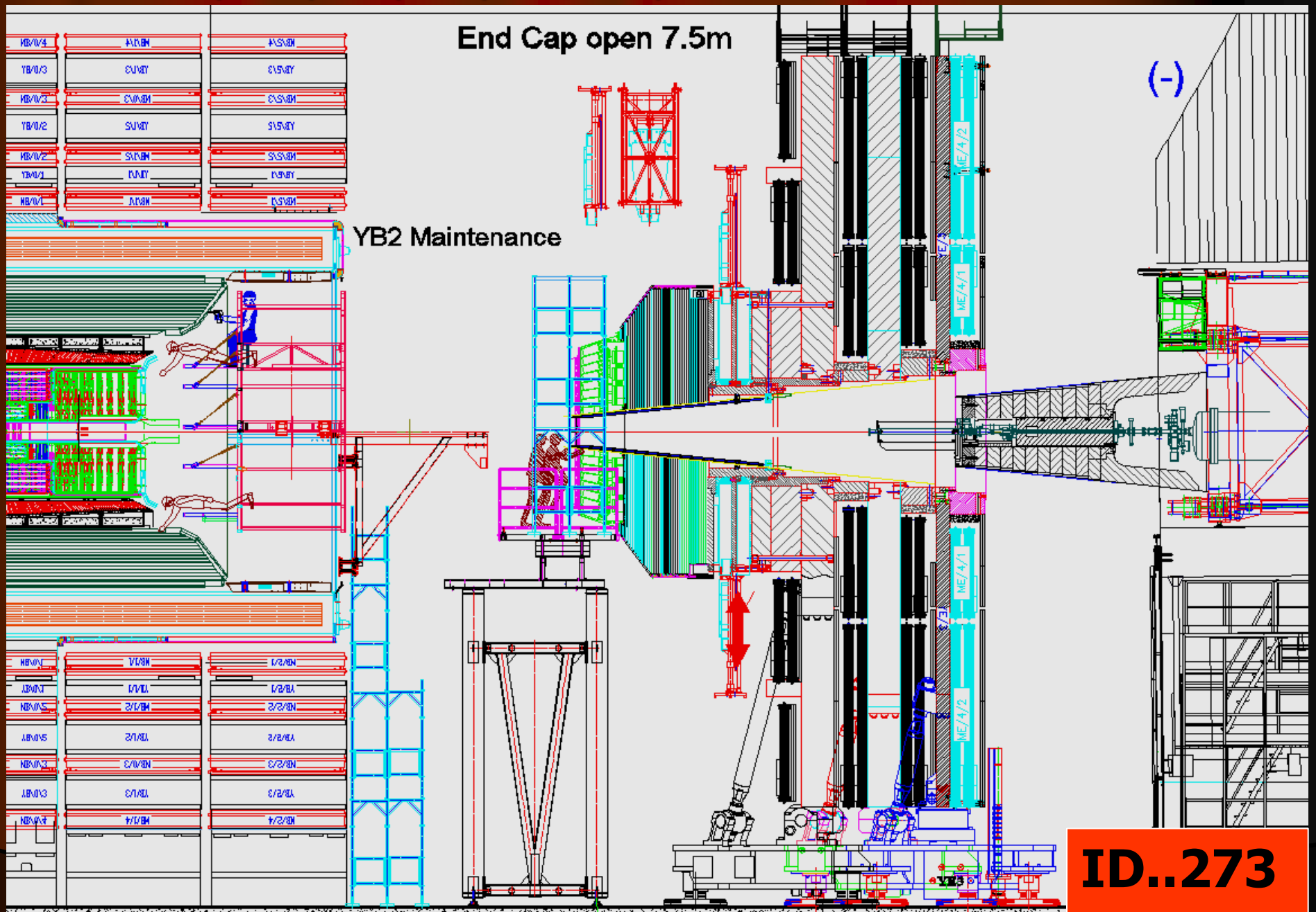




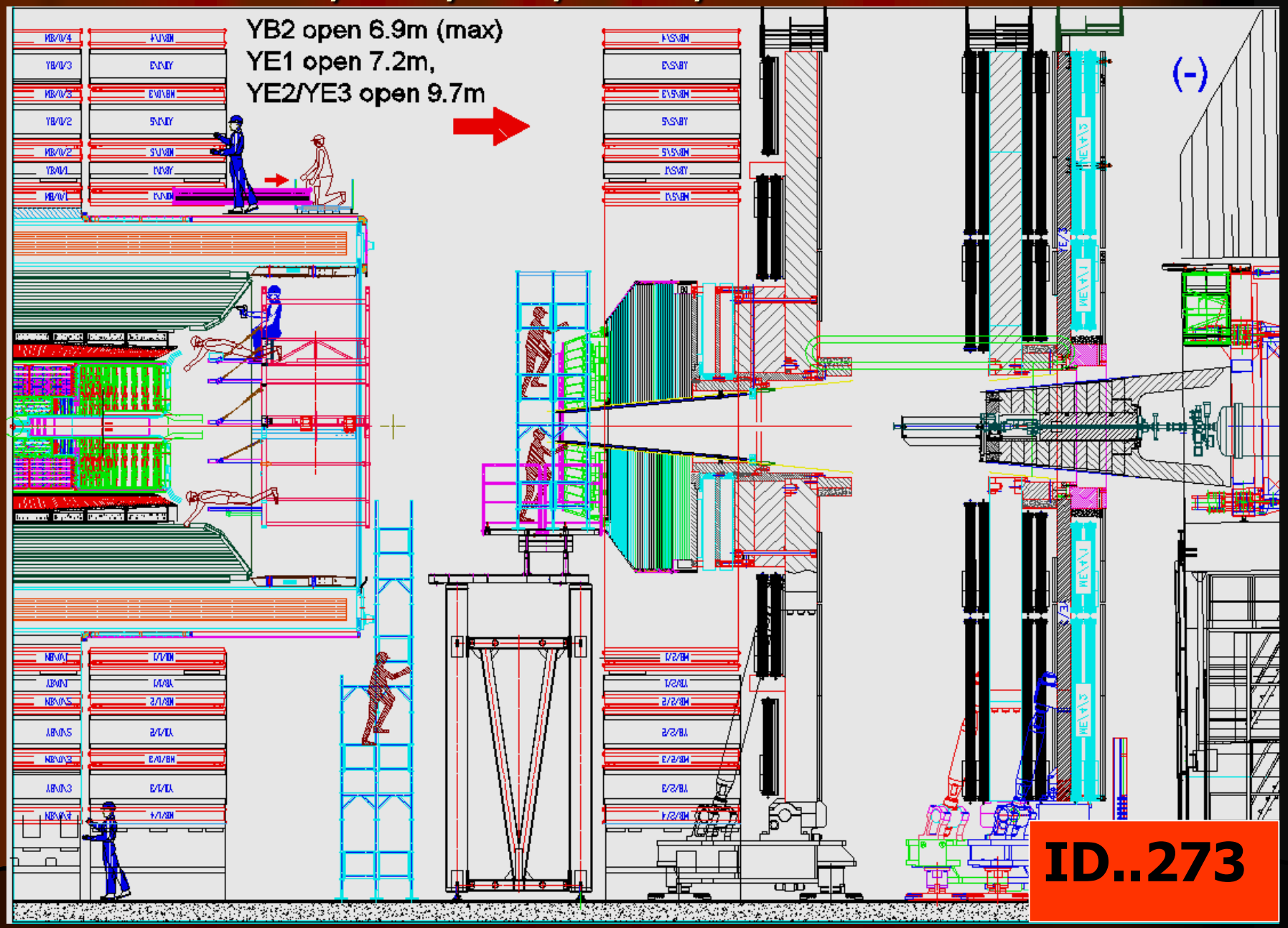
YB1-YB2, HB, EE, ME1/1 maintenance



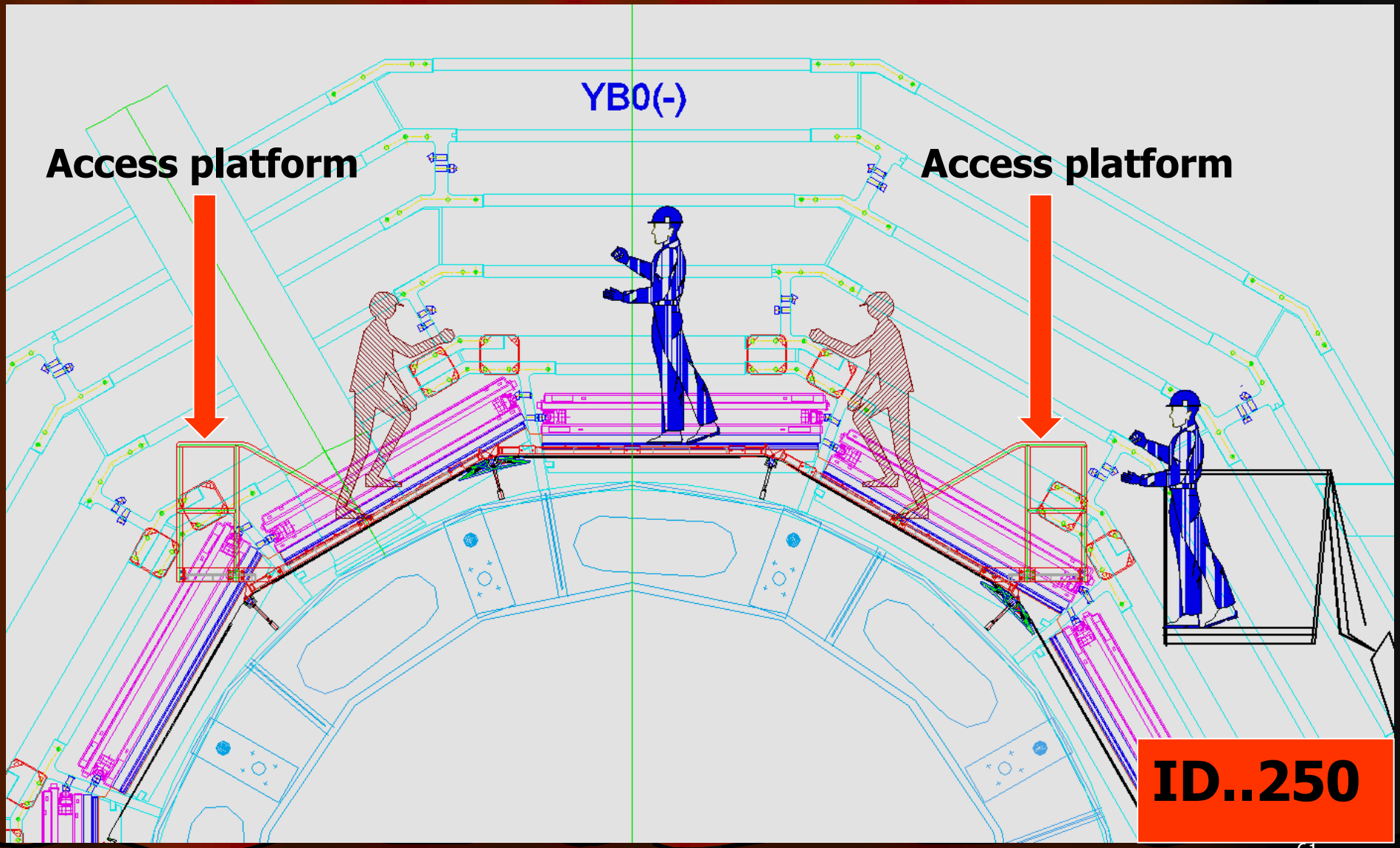
YB2,HB,TK,EB,ES/EE, ME1/1 Maintenance



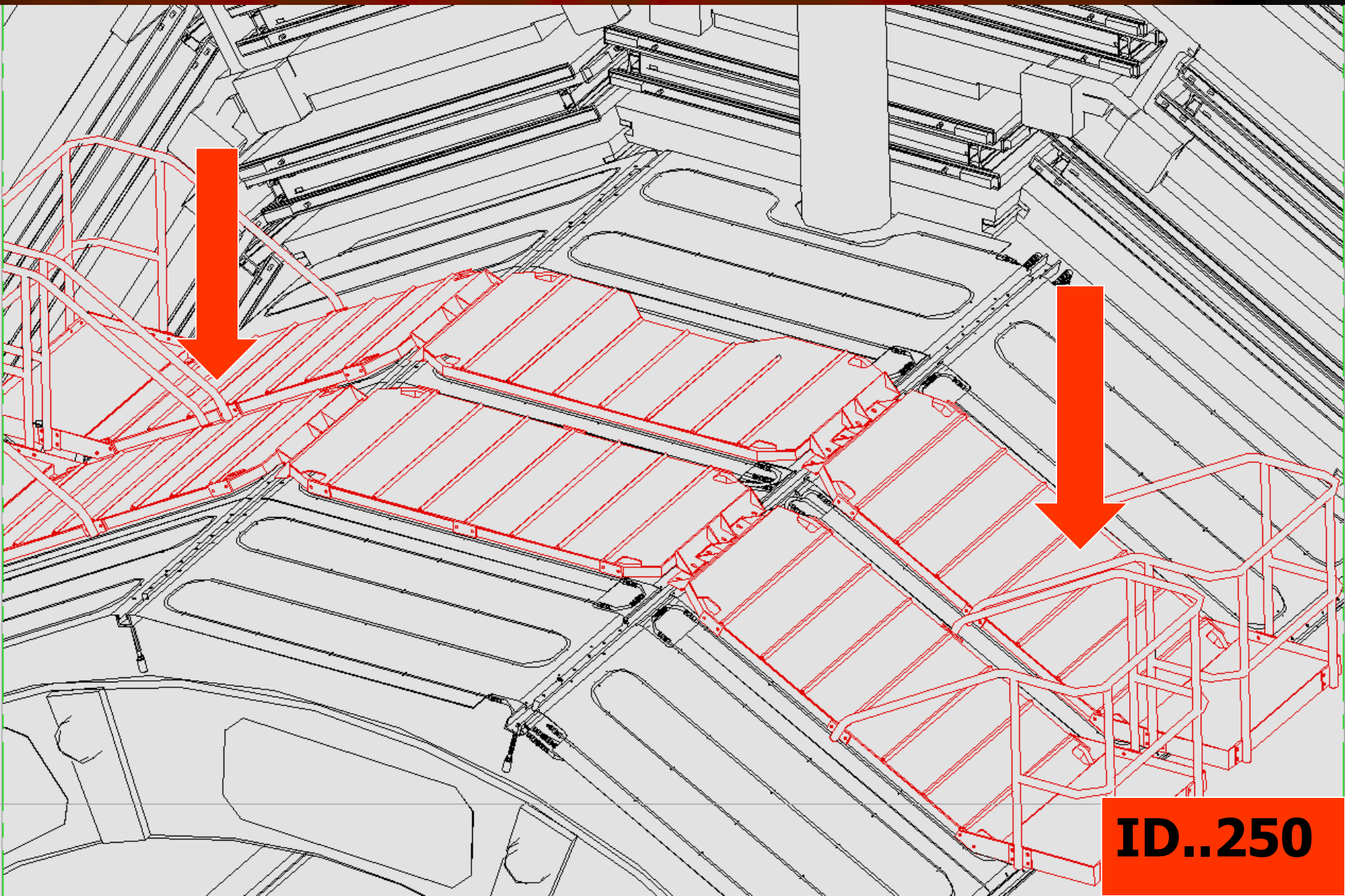
YB1-YB2, HB, EE, YE1, YE2 maintenance



YB0/YB1/YB2/ maintenance (LS1)

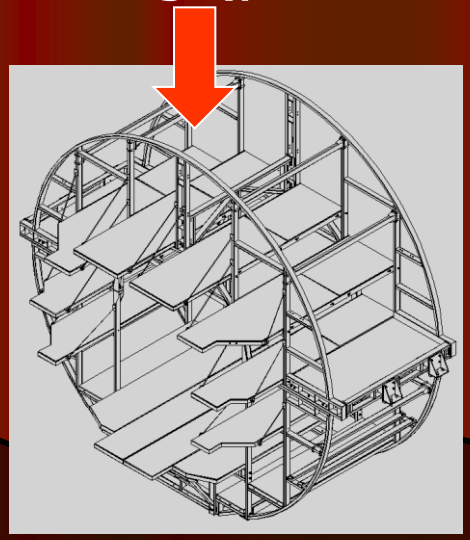


YB0/YB1/YB2 maintenance (LS1)

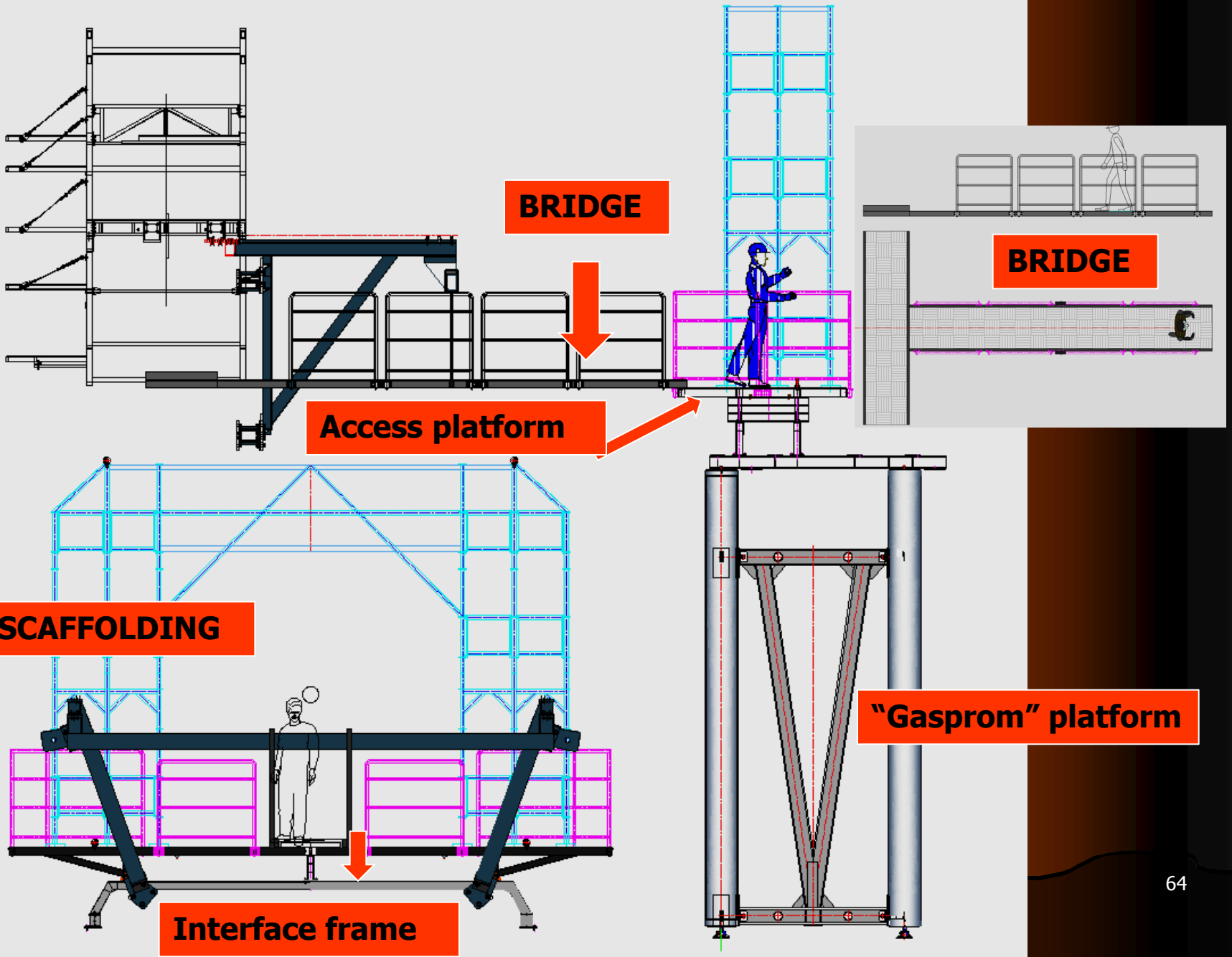


What is necessary for performance of HB, EE, ME1/1 maintenance ?

1. "Gasprom" platform
2. Access platform
3. Interface frame
4. Bridge
5. Standard scaffolding
6. Special scaffolding (yellow structure)



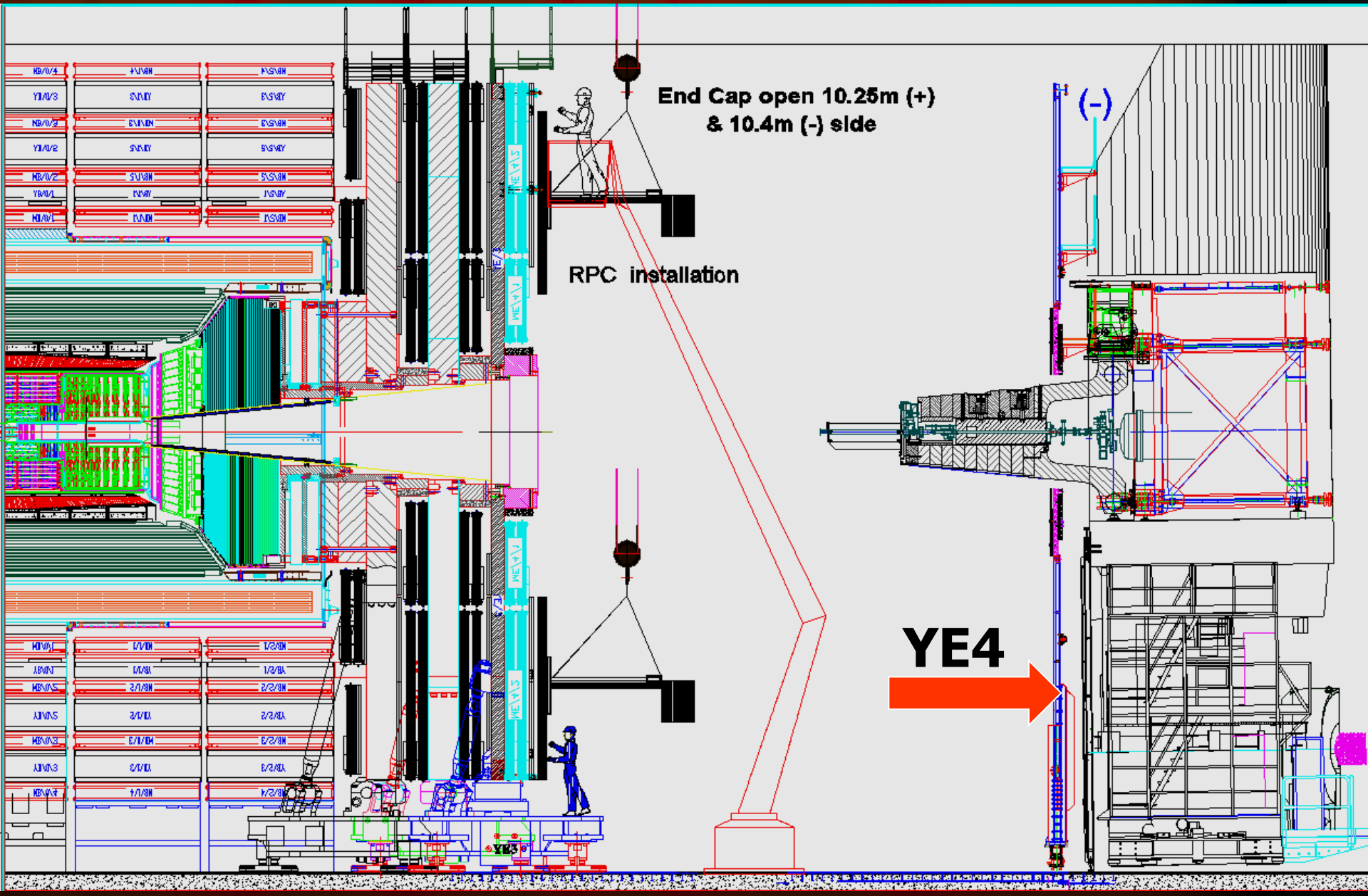
YB0-YB1, HB, EE, ME1/1 maintenance (Tooling)



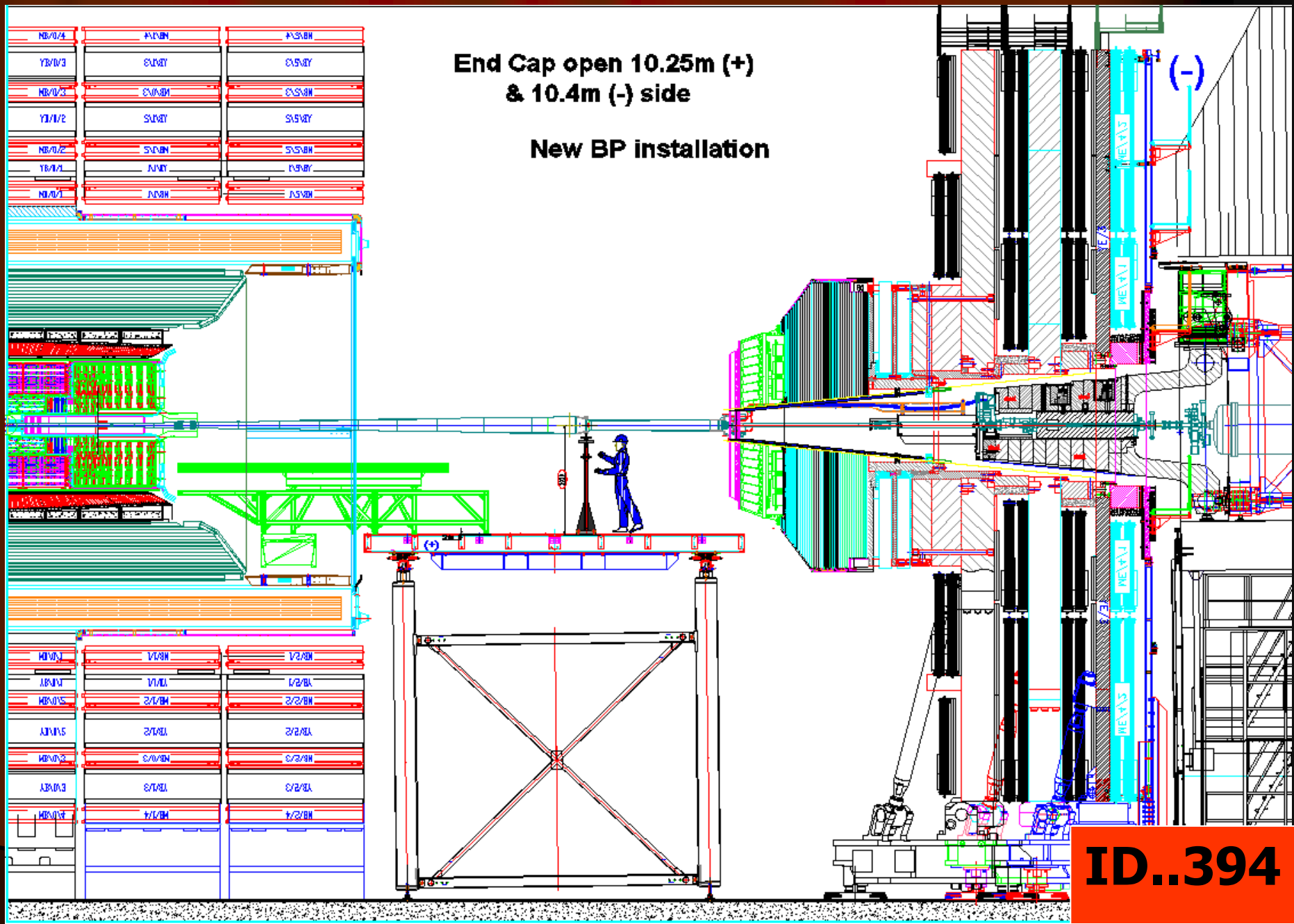
ME, RPC Installation

(LS1)

ME/RPC installation (LS1)



New BP installation



ID..394

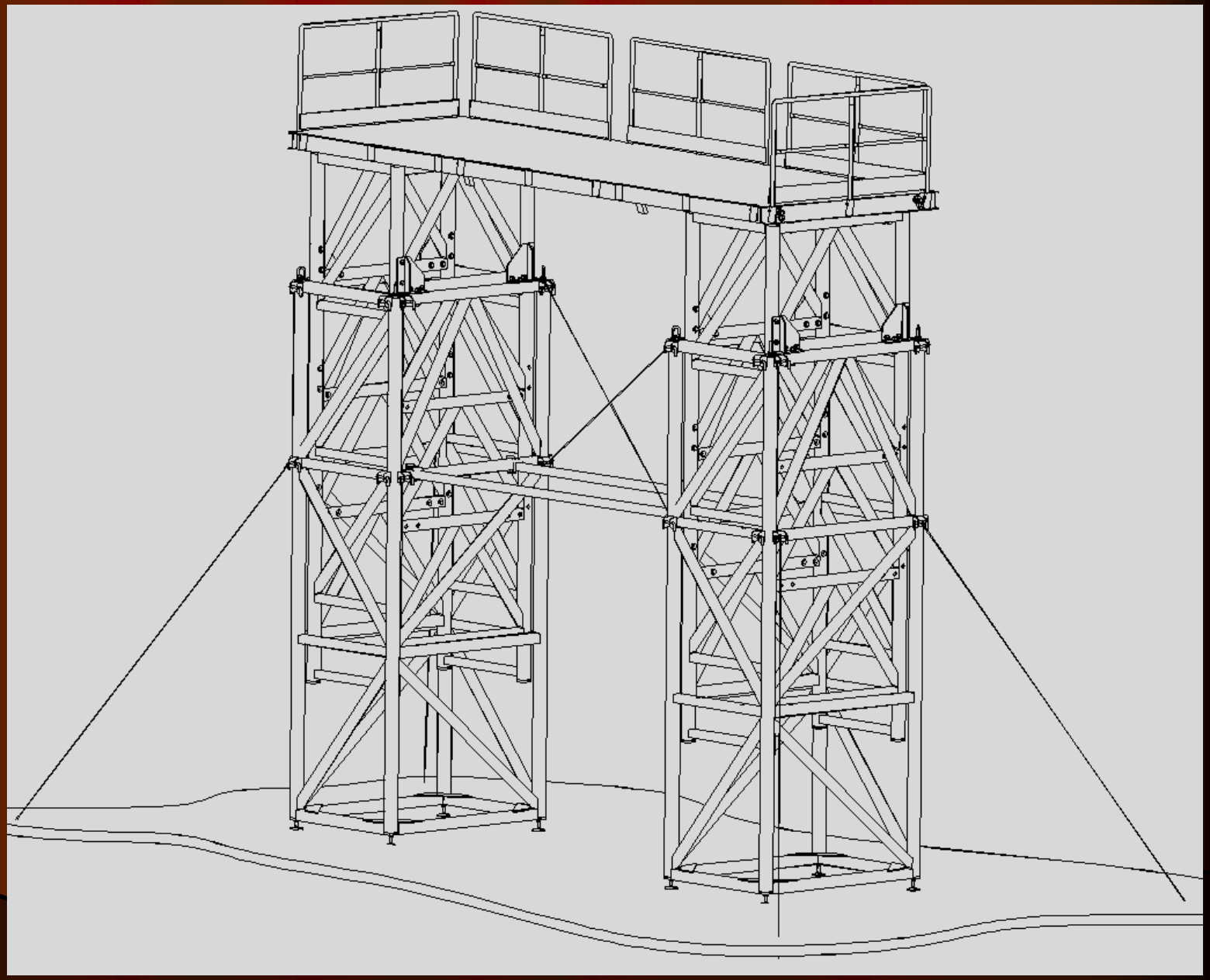
APPENDIX

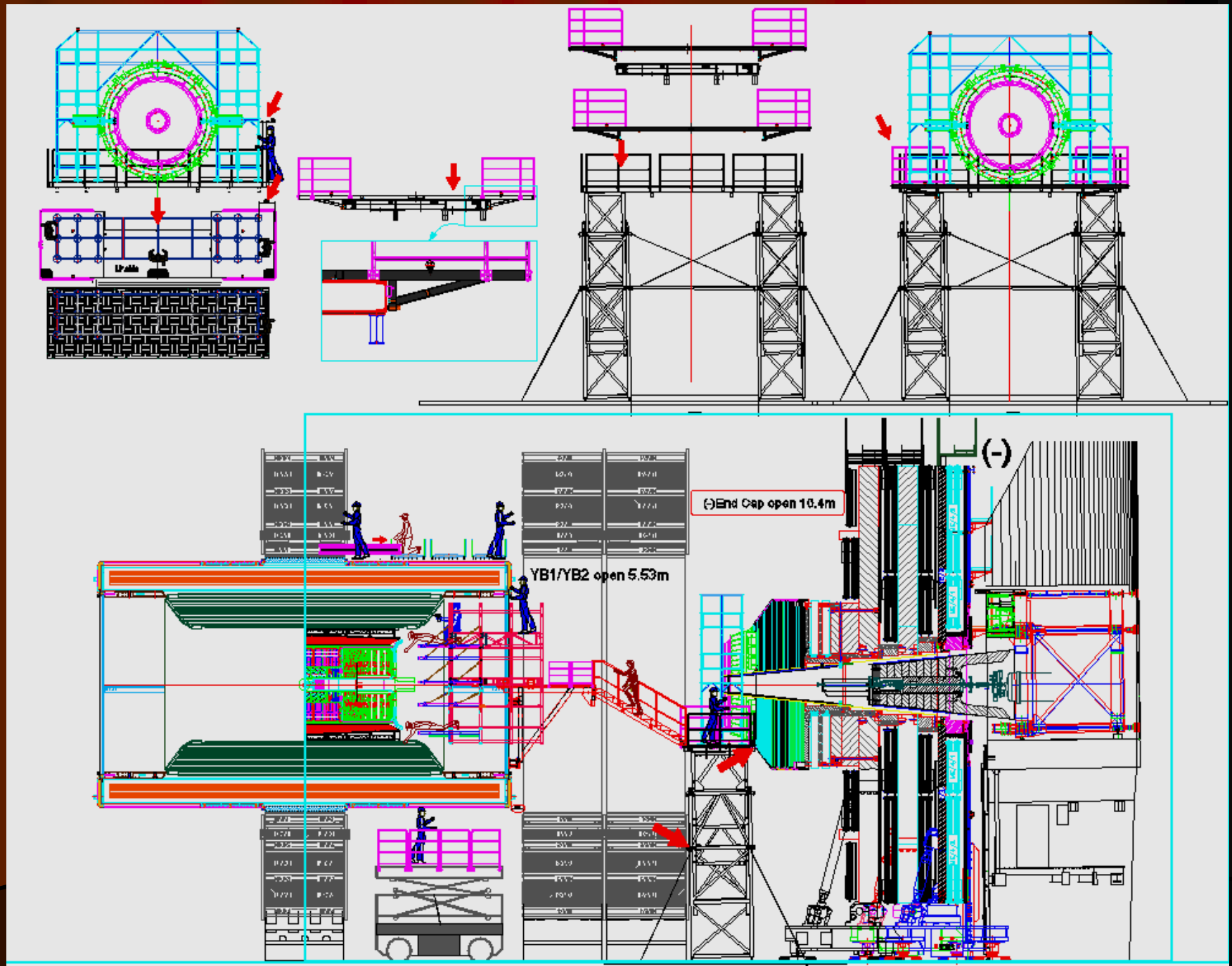
"YELLOW" TOWER SYSTEM USING

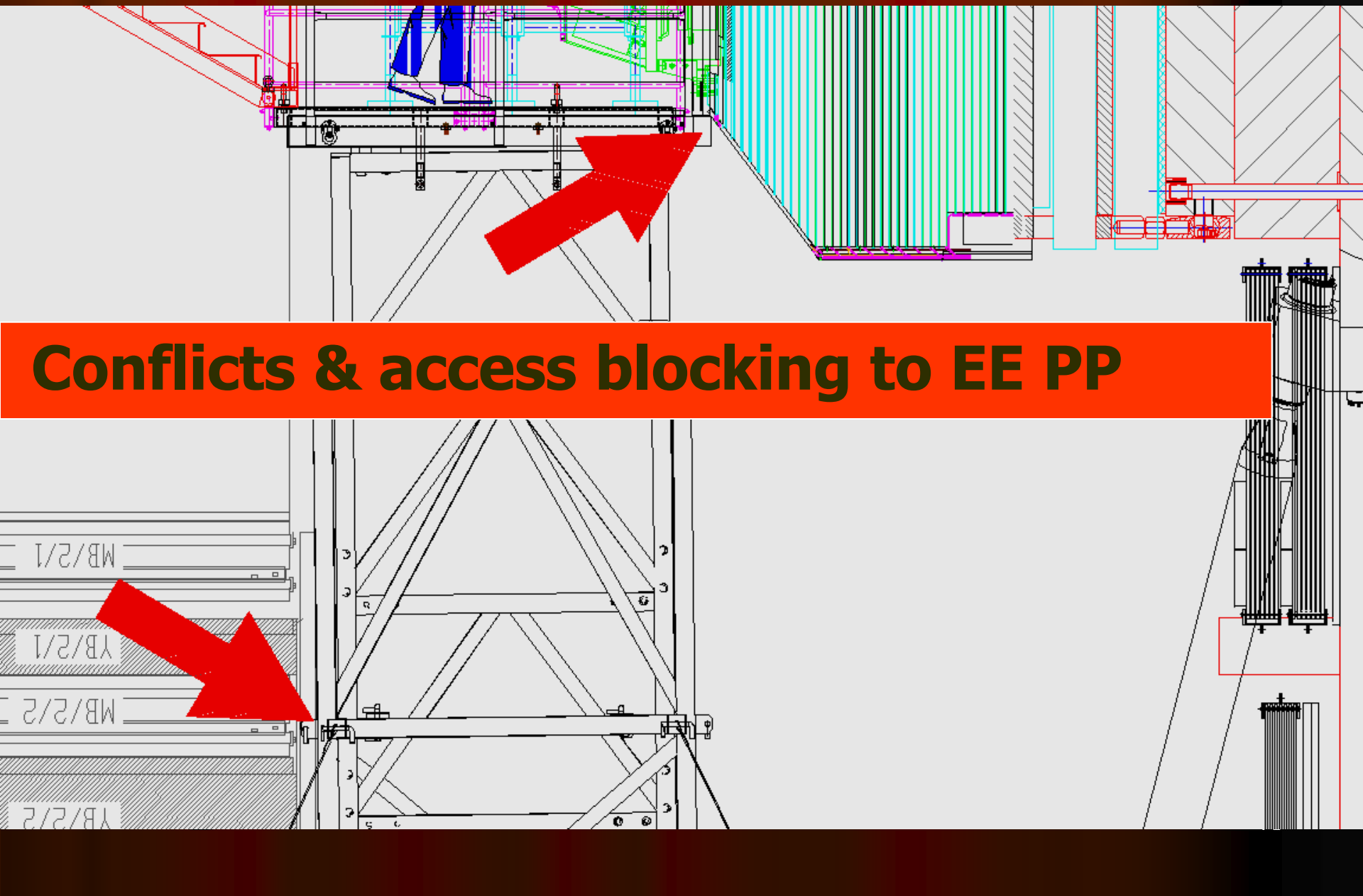
(Boki, J.Boss & G.Faber proposal)

It's reasonable or not?

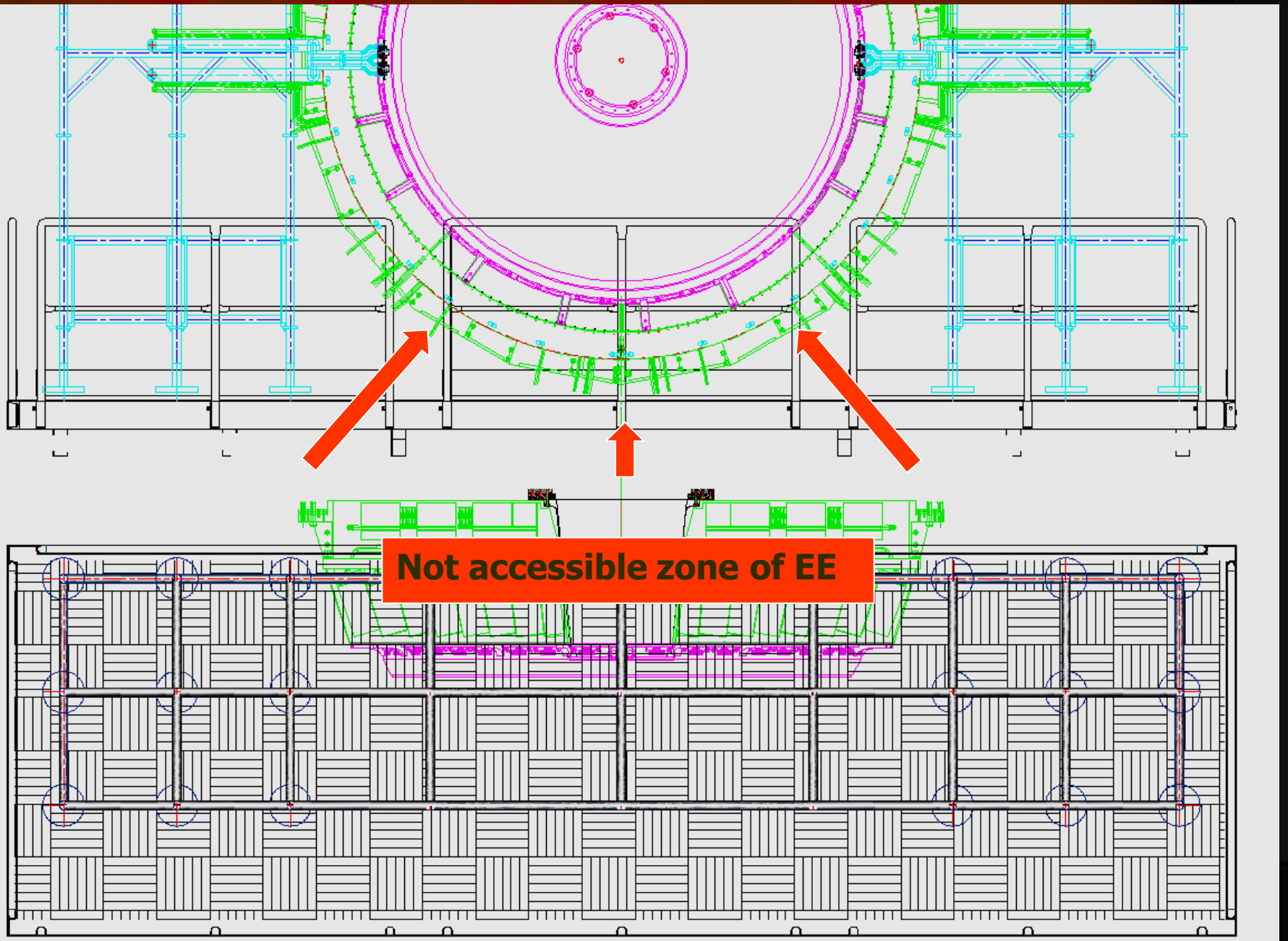
“ELLOW” TOWERS SYSTEM



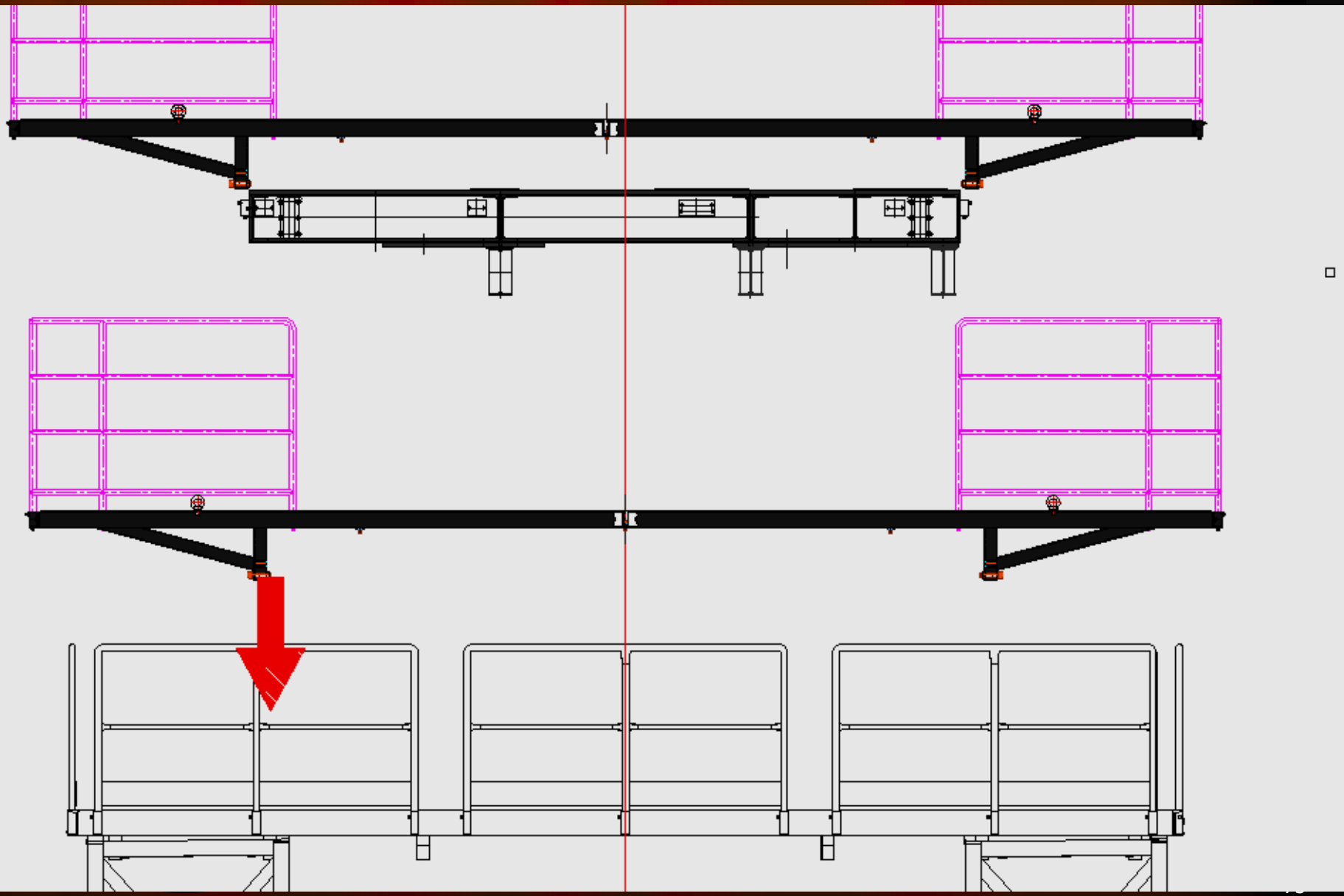

(-)End Cap open 10.4m
YB1/YB2 open 5.53m
(-)



Conflicts & access blocking to EE PP


Not accessible zone of EE

EE Access platform/Tower interface (not compatible)



EE Access platform/Tower interface (not compatible)