



CMS maintenance scenario for LS1 & Tooling

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CERN

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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

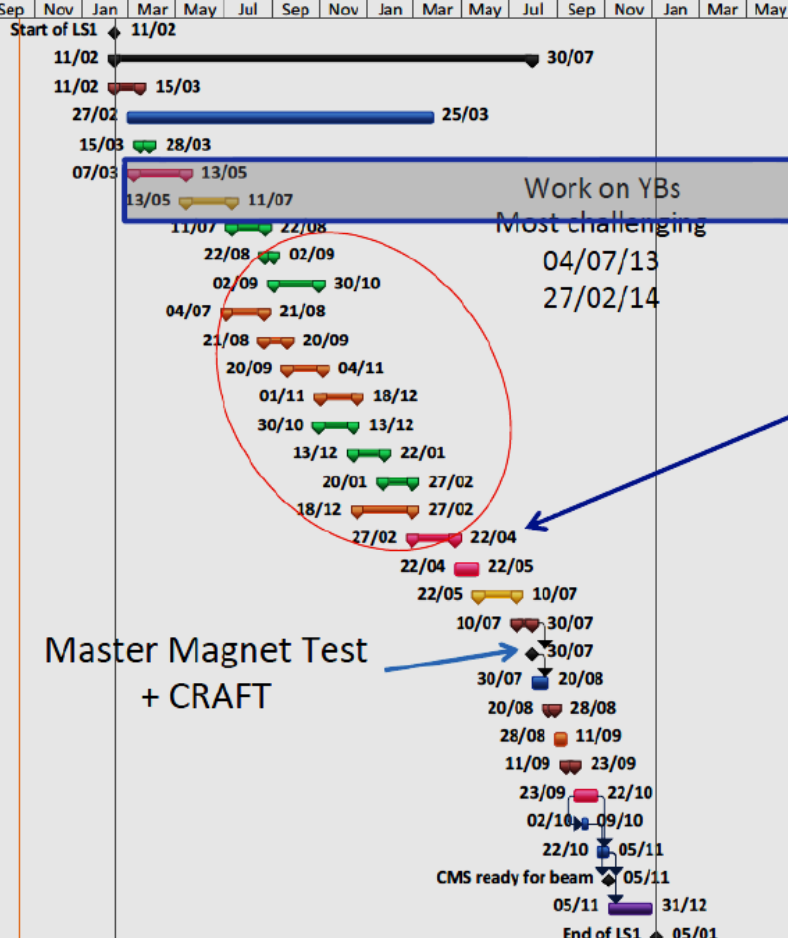
2- YB0/YB1/YB2 maintenance

3- RP main support onto PP1 posts
installation - Test

LS1 planning: v4.0

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

ID	Task Name	Duration	2012		Qtr 1, 2013			Qtr 3, 2013			Qtr 1, 2014			Qtr 3, 2014			Qtr 1, 2015		
			Sep	Nov	Jan	Mar	May	Jul	Sep	Nov	Jan	Mar	May	Jul	Sep	Nov	Jan	Mar	May
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, TASS6, 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																	

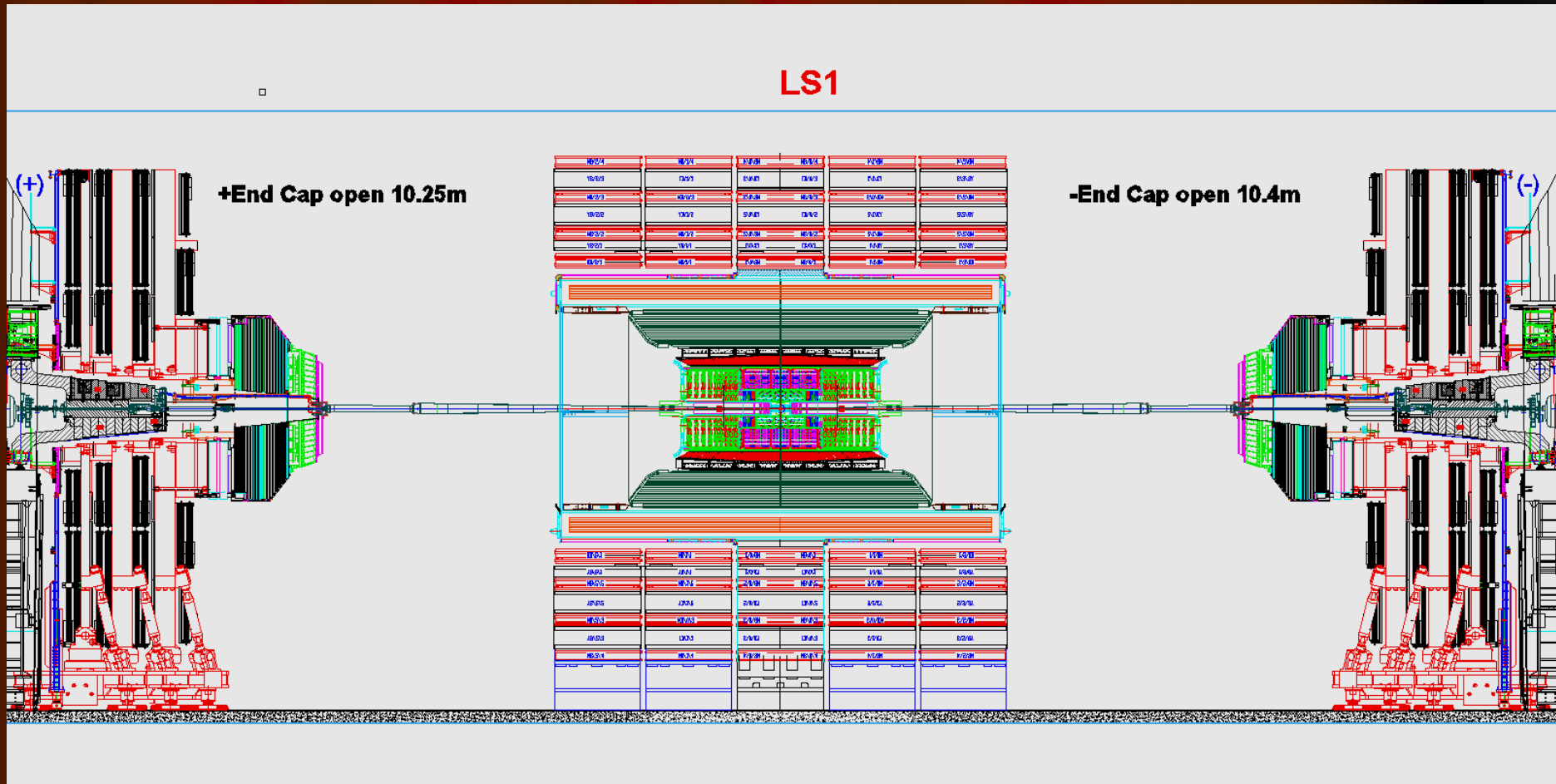


Major re-work of 1'st 5 months

-keeping end of bp installation as an anchor point.

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

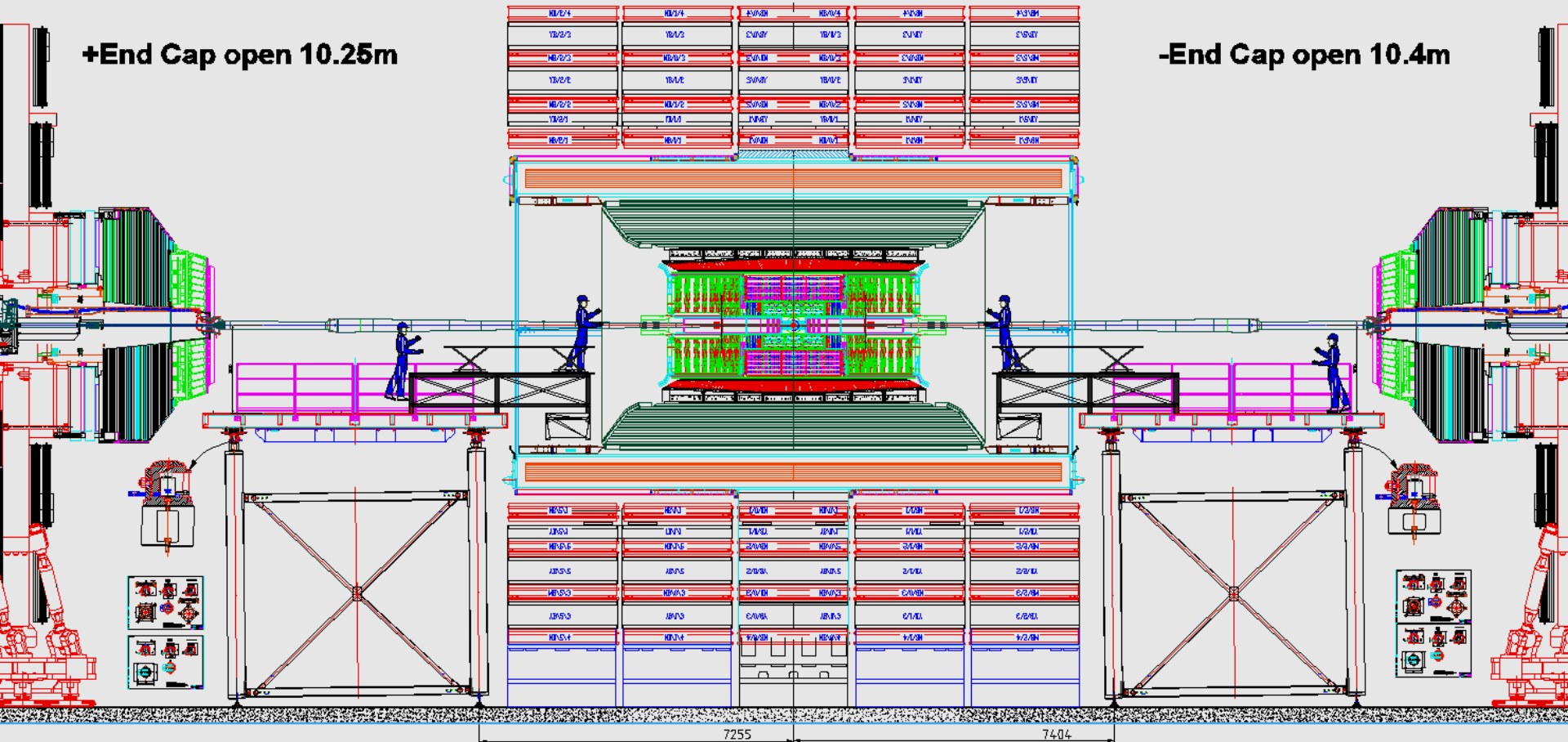
CMS OPENING (LS1)



ID...36-according M.G. planning v.4.0

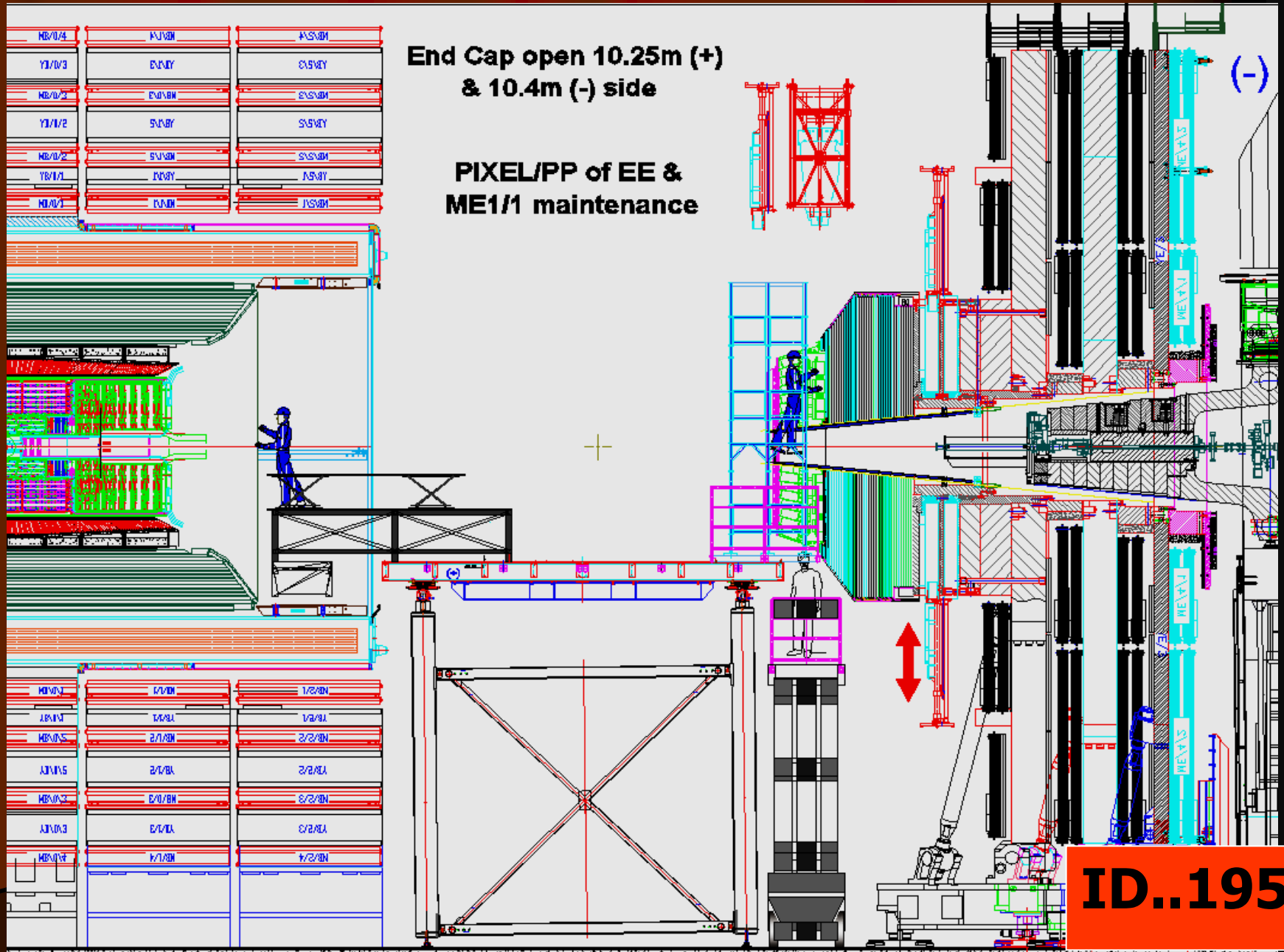
Remove PIXEL & BP (gas prom platform & main platform location)

BEAM PIPE REINSTALLATION. GAS PROM & MAIN PLATFORM LOCATION

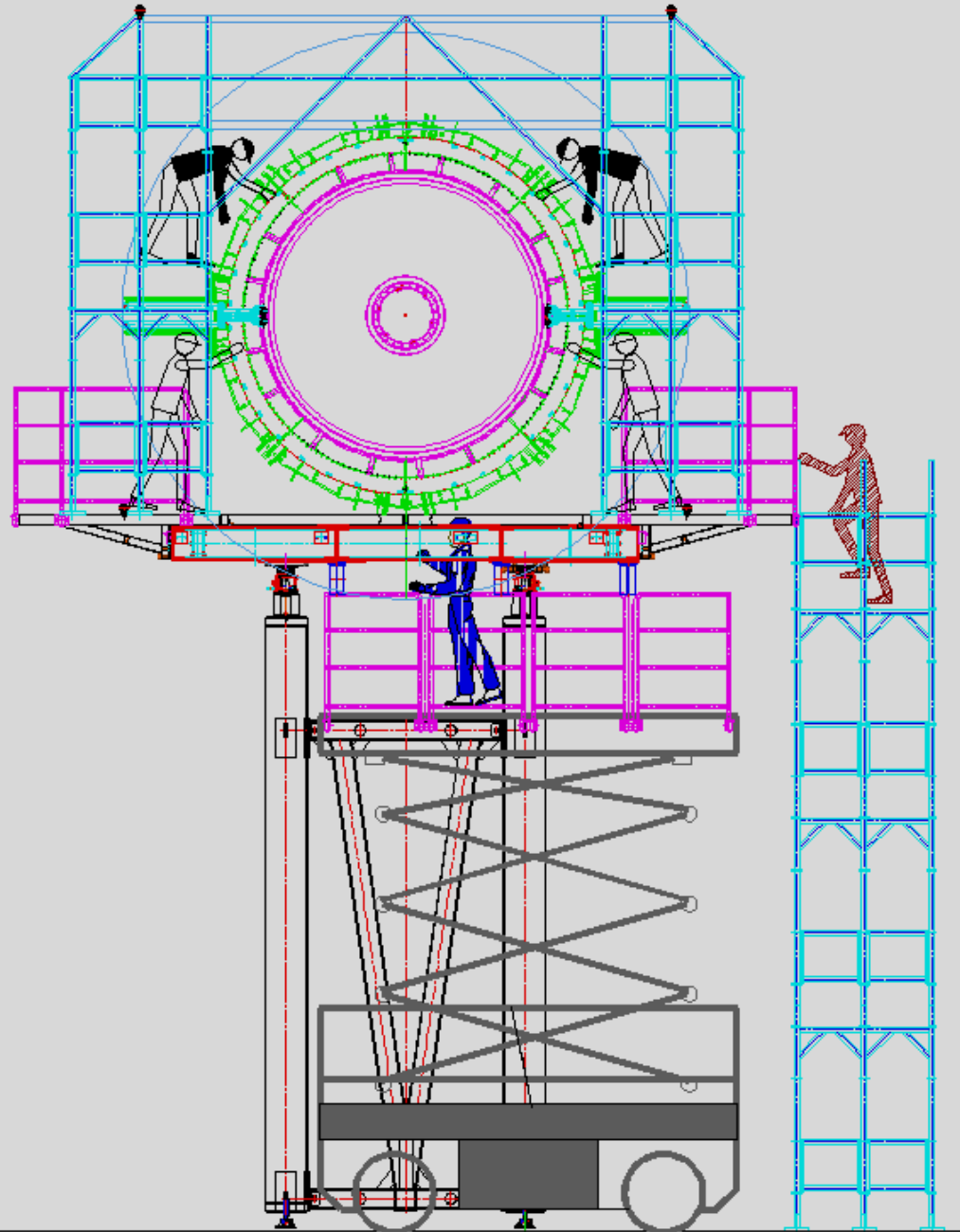


ID..107

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 platesNew
9. Screw jacks.....New

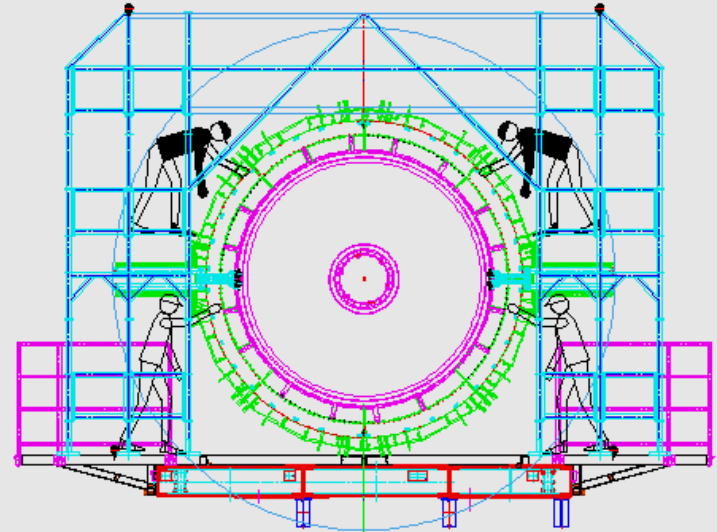
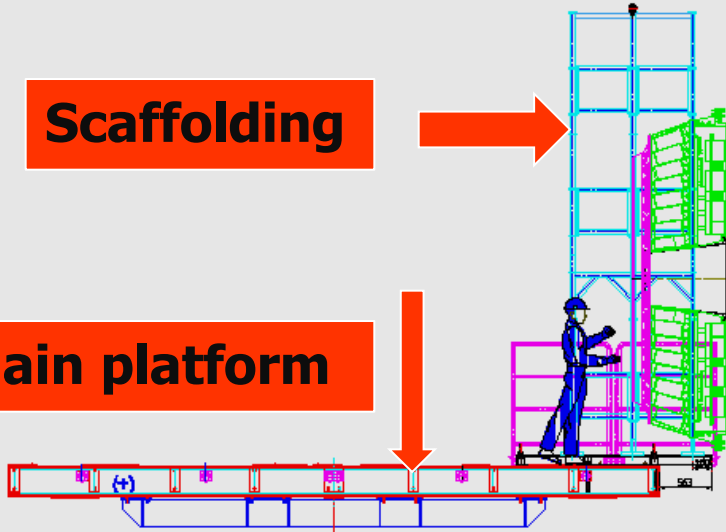


EE maintenance (Tooling)

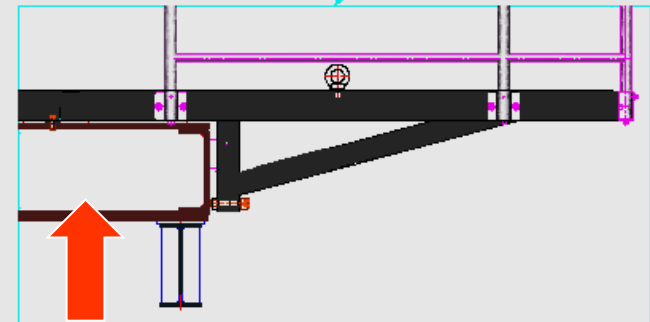
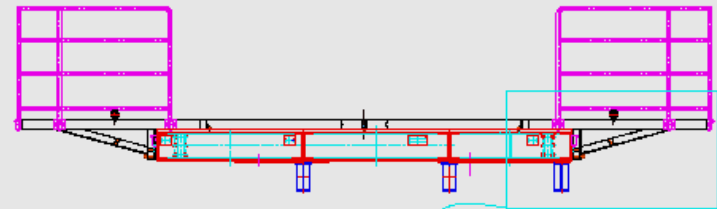
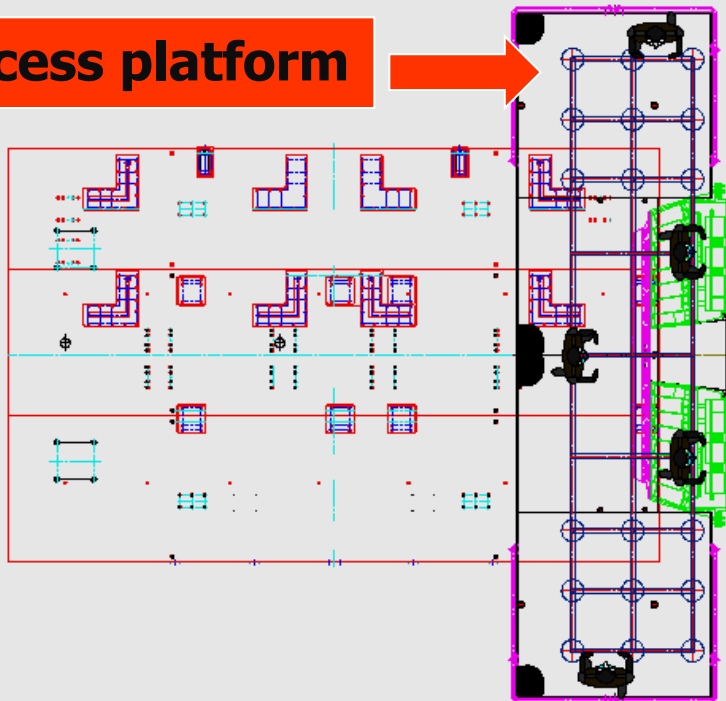
Scaffolding



Main platform

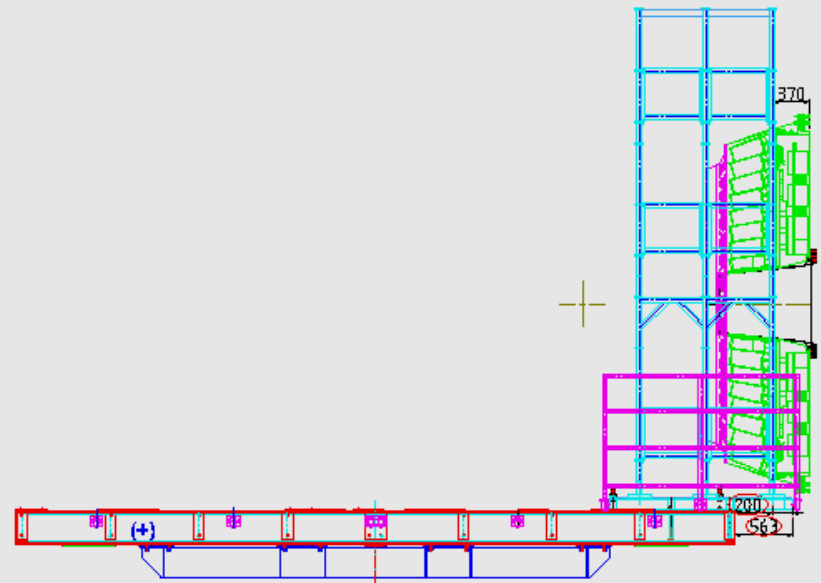
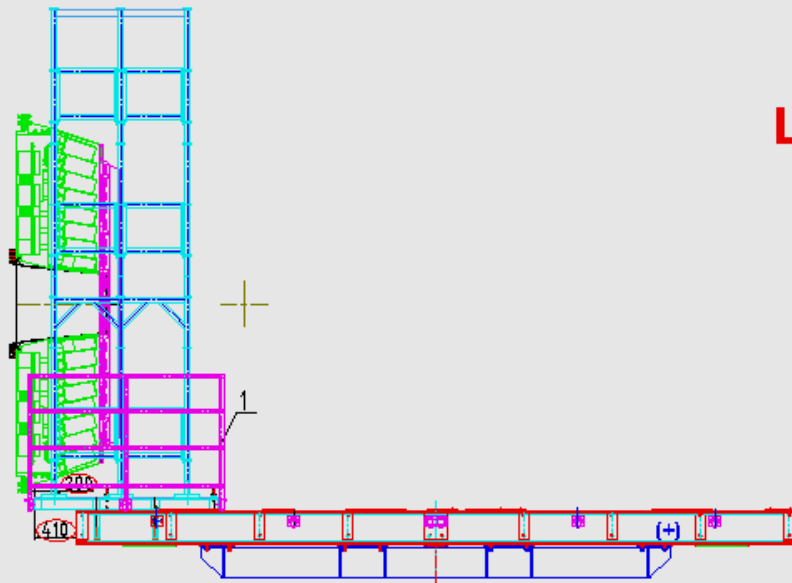


Access platform



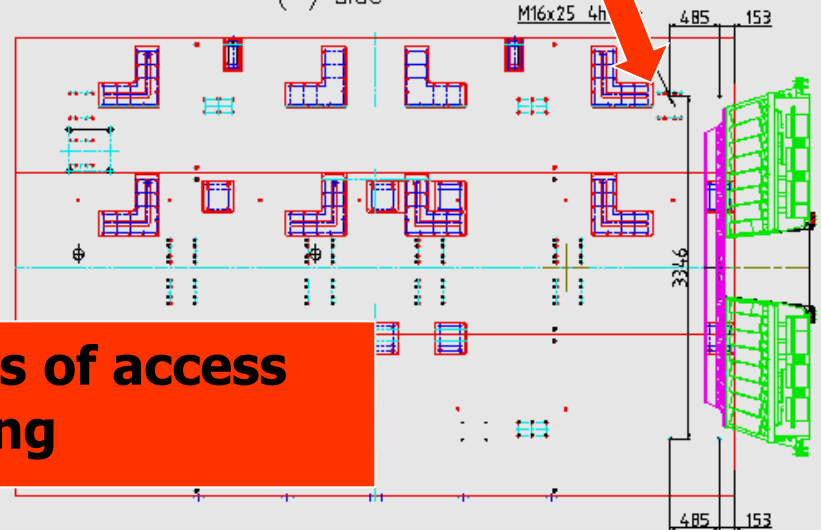
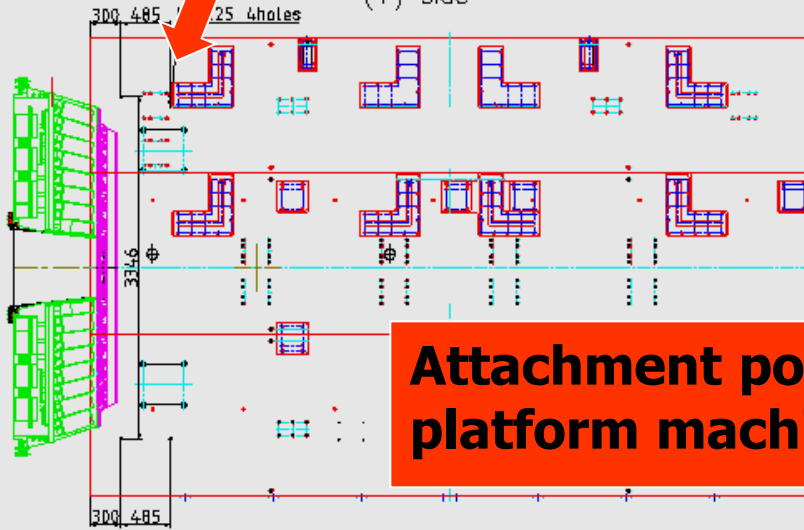
Main platform

LS1



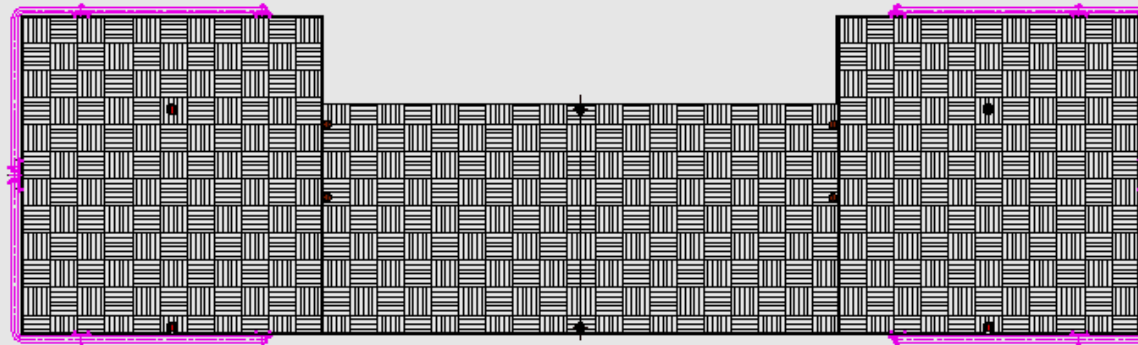
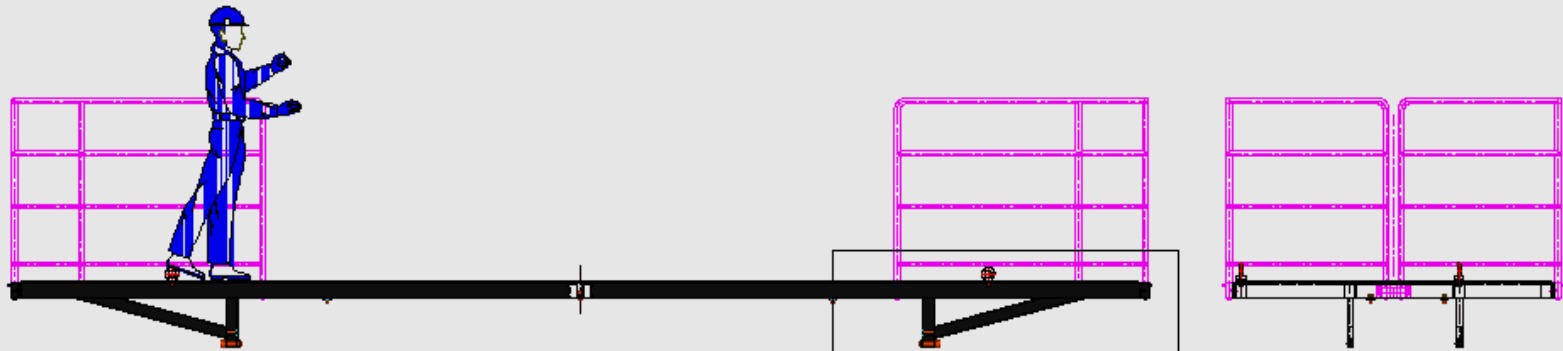
Main platform modification (+) side

Main platform modification (-) side

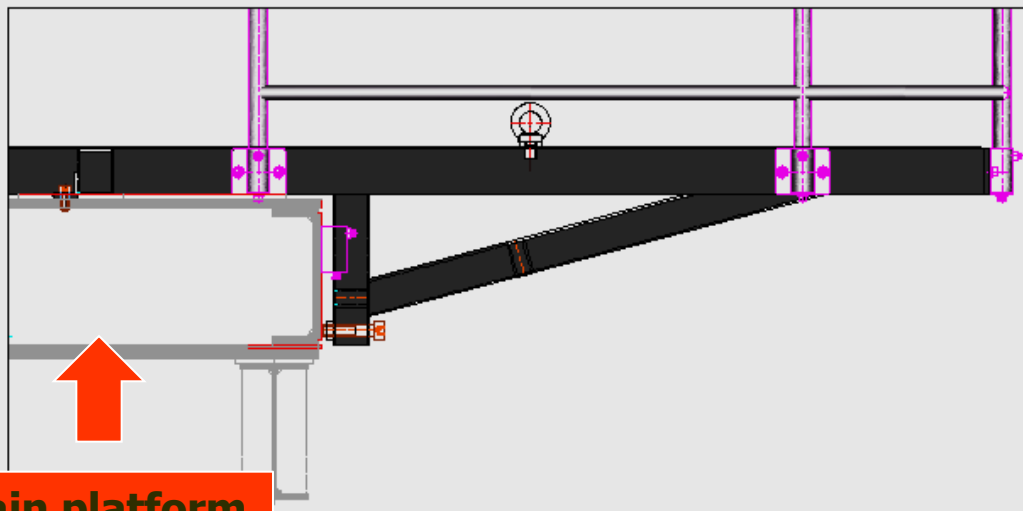


Attachment points of access platform machining

Access platform

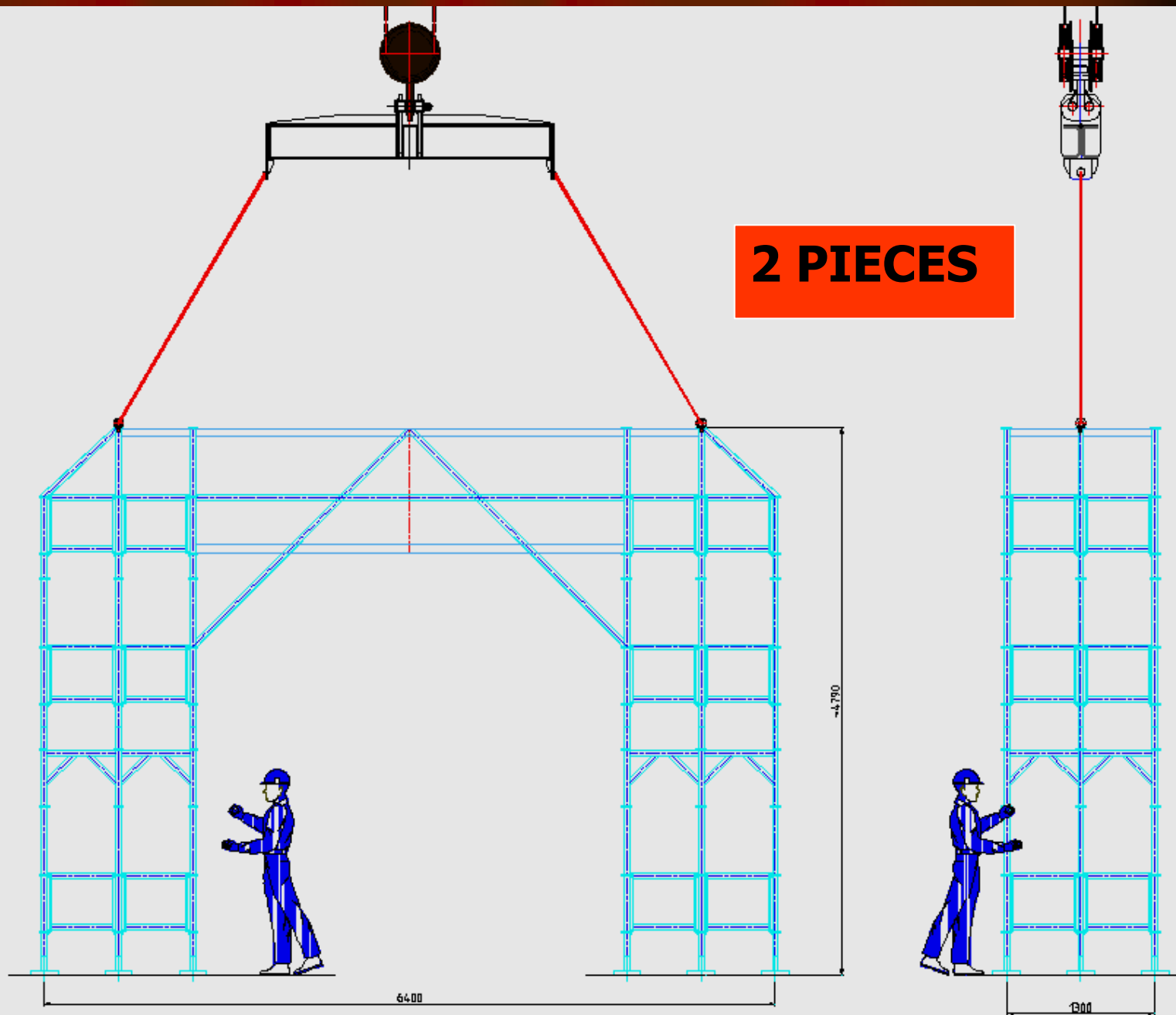


2 PIECES

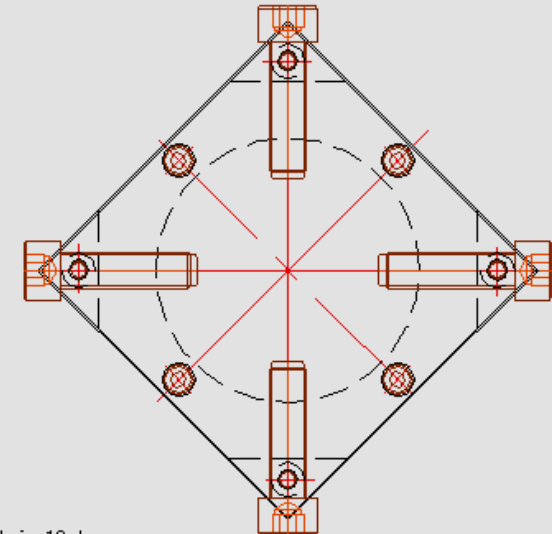
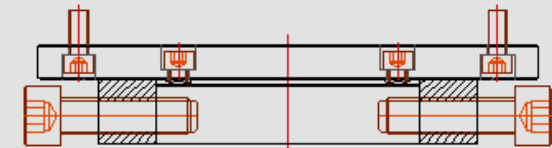
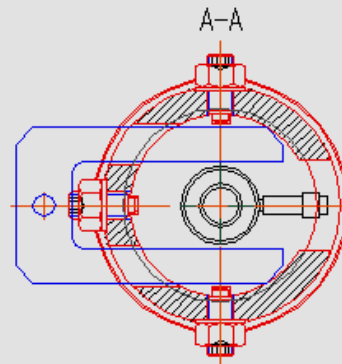
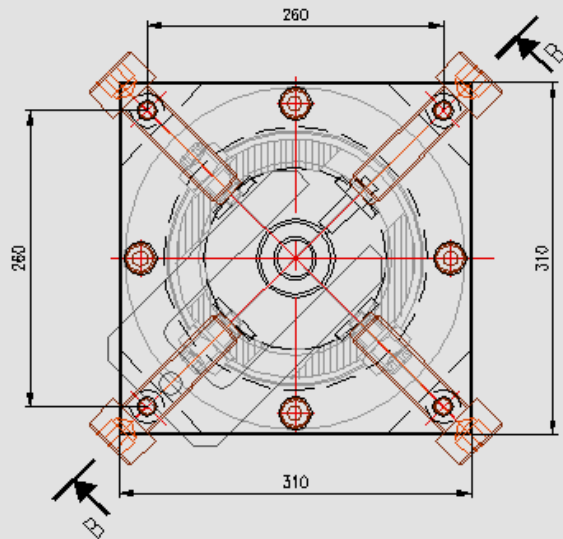
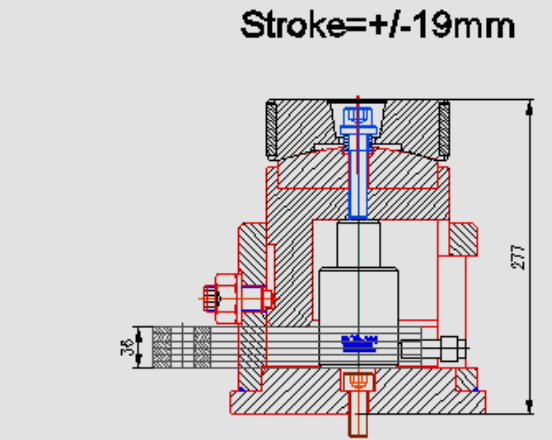
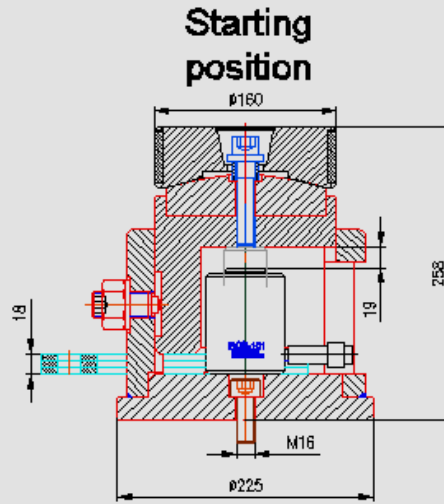
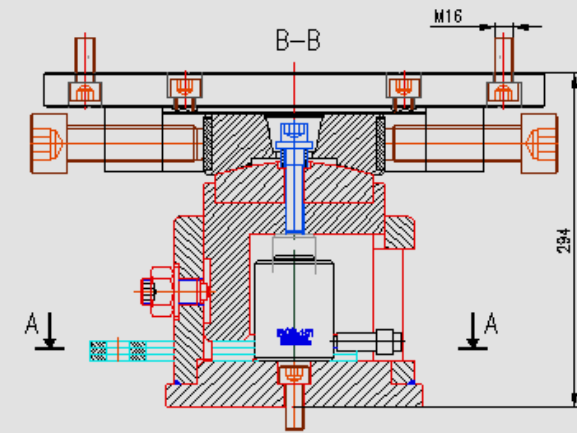


Main platform

Scaffolding



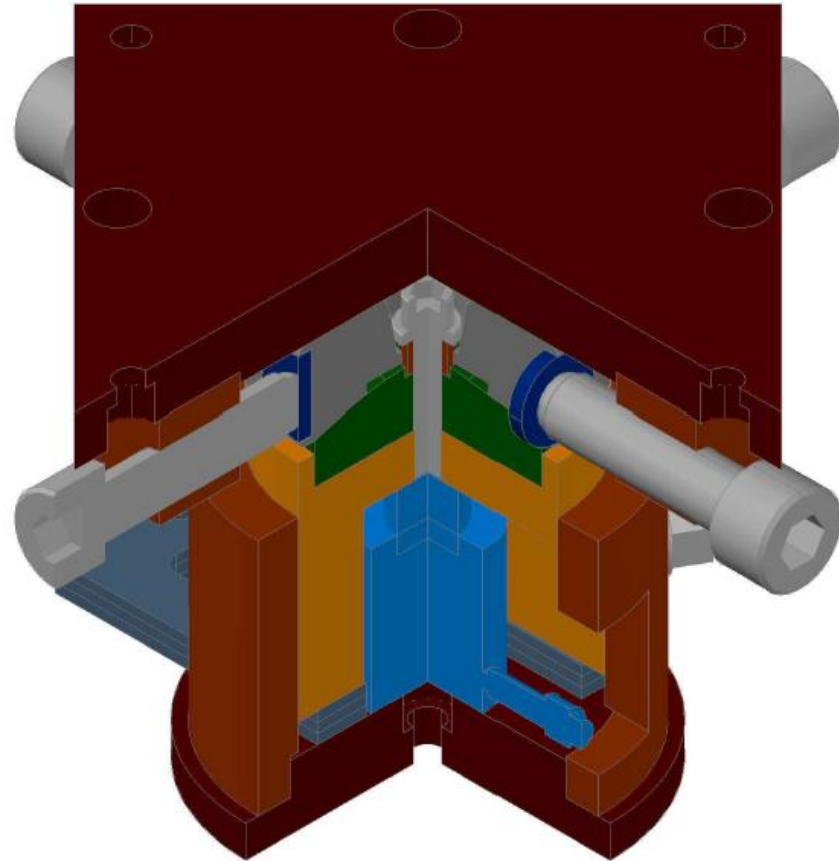
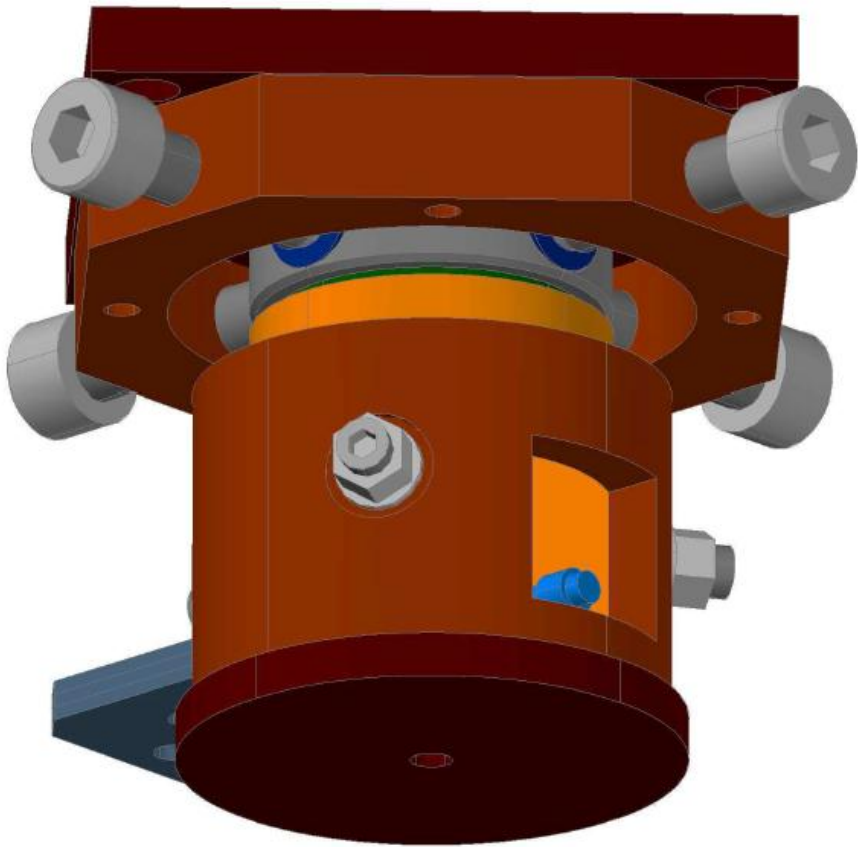
Support for adjustment of main platform (LS1)



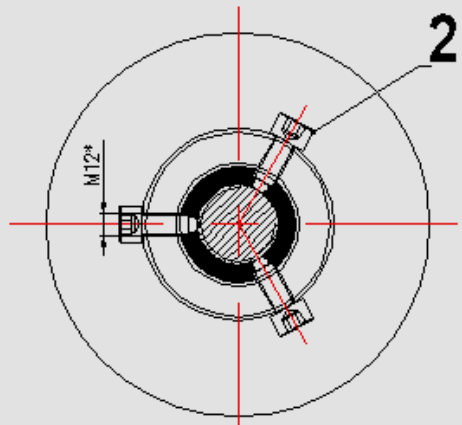
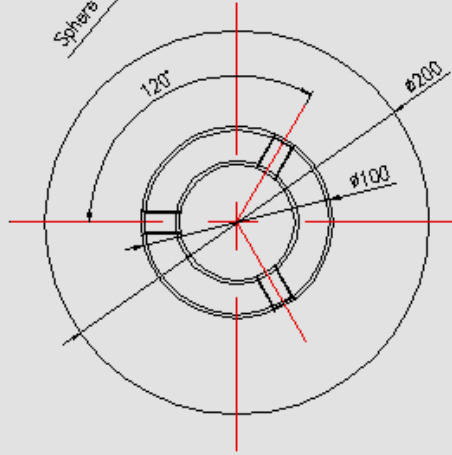
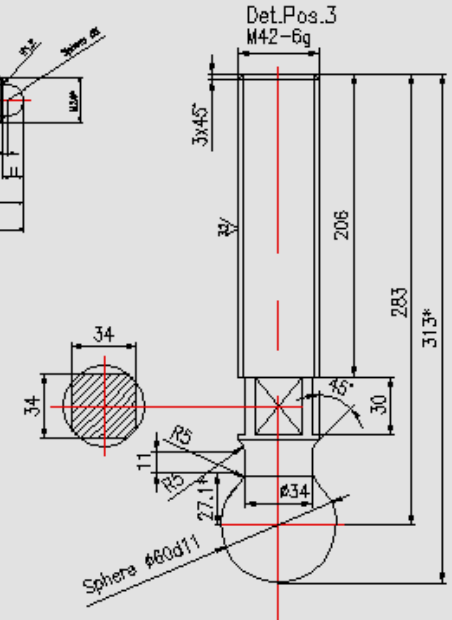
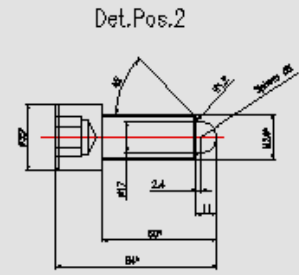
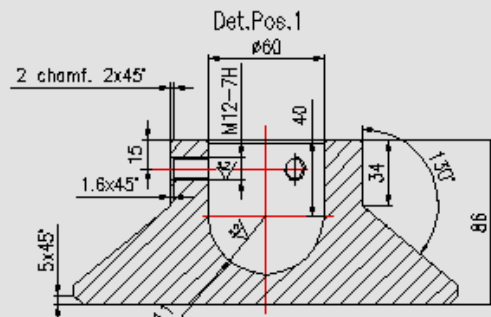
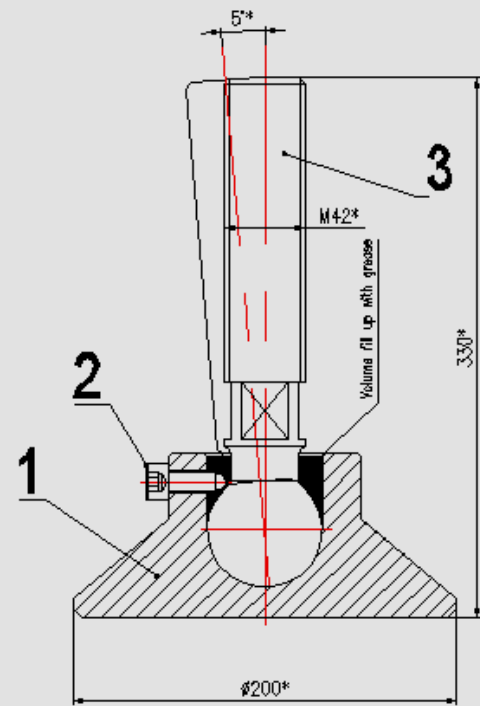
4 PIECES

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 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)

DIMENSION	<=6	> 6	> 30	> 100	> 315	>1000	>3000
USINÉE ENTRE/METRE/MACHINING	± 0.1	± 0.2	± 0.3	± 0.5	± 0.8	± 1.2	± 2
NECNO. SOLDORE/WELDED STRUCTURE	± 0.5	± 1	± 2	± 3	± 6	± 7	± 10

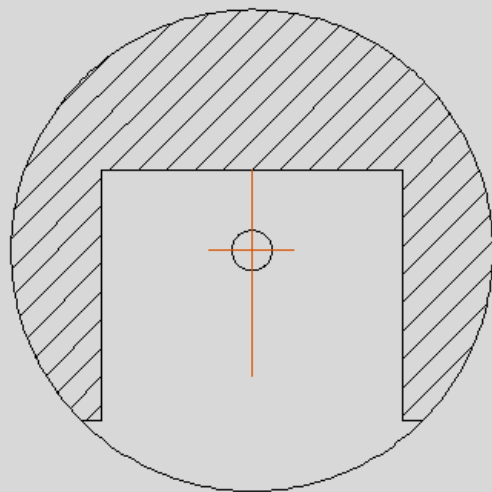
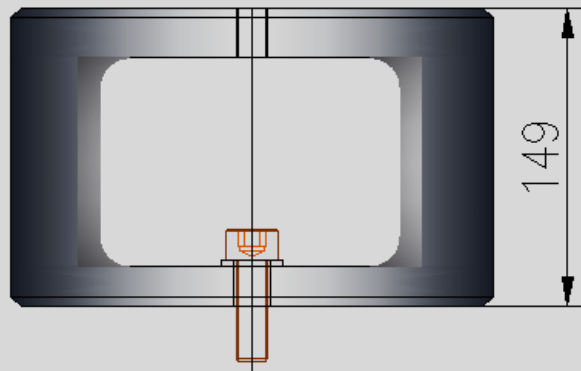
DESSIN, RUGOSITE, TOLERANCES
SECON N°FRAMES ISO
DRAWING, RUGOSITY, TOLERANCES
ACCORDING TO ISO STANDARDS



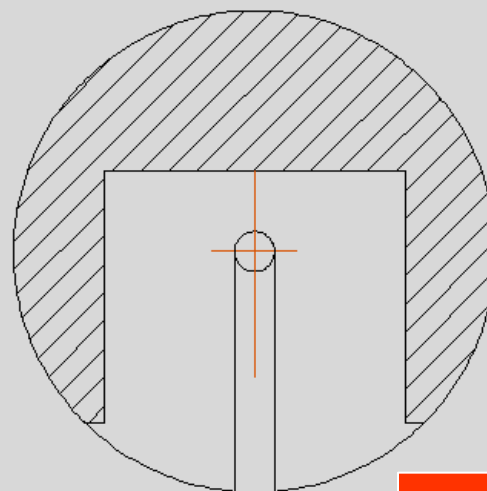
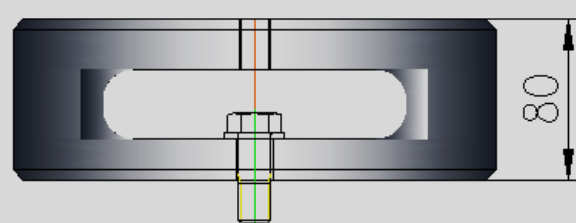
PROJECTION

GRANTATION D'EXÉCUTION POUR
L'EUROPEAN ORGANIZATION OF NUCLEAR RESEARCH
GENÈVE

On drawing no part shall utilize a size fine commercial unless more authorization write
This drawing may not be used for commercial purposes without written authorization



4 PIECES



6.3 (✓)

4 PIECES

1. H12,h12,±IT₁₂²
2. * Dimensions for reference.

QUANT.	DESCRIPTION	POS	MAT.	OBSERVATIONS	REF.CERN
ENS/ASS	S.ENS/S.ASS				
DETECTOR INTEGRATION-INFRASTRUCTURE-MECHANICS				ECHELLE SCALE	DES/DRA. A. Surkov 04.10.2012
SHIMS				CONTROLLED	
				RELEASED	
				APPROVED	
REPLACE/REPLACES					
NON VALABLE POUR EXECUTION NOT VALID FOR EXECUTION				SIZE A3	IND.

Shims (between main platform & support)

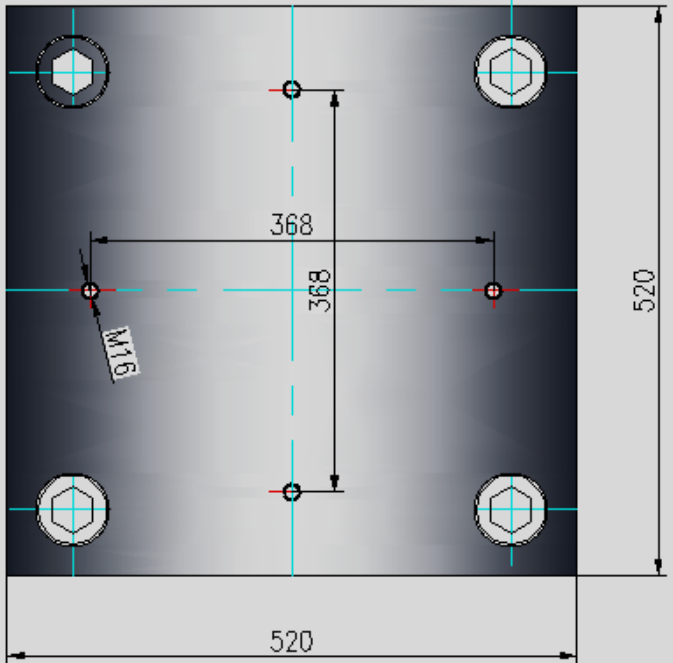
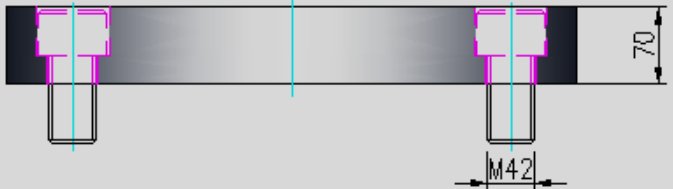
6.3/(\checkmark)

DIMENSION	<=6	> 6 < 30	> 30 < 100	> 100 < 315	> 315 < 1000	> 1000
USURE WOTSI/MENSI WAKSI/MSI	± 0.1	± 0.2	± 0.3	± 0.5	± 1.2	± 2
USURE SURE/MSURE/USURE SURE/MSURE	± 0.5	± 1	± 2	± 3	± 5	± 7

DESIGN, RUGOSITE, TOLERANCES
SELON NORMES ISO
DRAWING, RUGOSITY, TOLERANCES
ACCORDING TO ISO STANDARDS



MEMORANDUM DIMENSIONE ENER
LA RESERVAZIONE NELLE
DIMENSIONI NON SONO PERMESSI
ENTRARE IN CONFLITTO CON
QUESTA DISEGNO. IL DISEGNO NON
DEVE ESSERE UTILIZZATO
SENZA L'AUTORIZZAZIONE
DELLE AUTORITA' COMPETENTI.
This drawing may not be used for commercial purposes without written authorization.



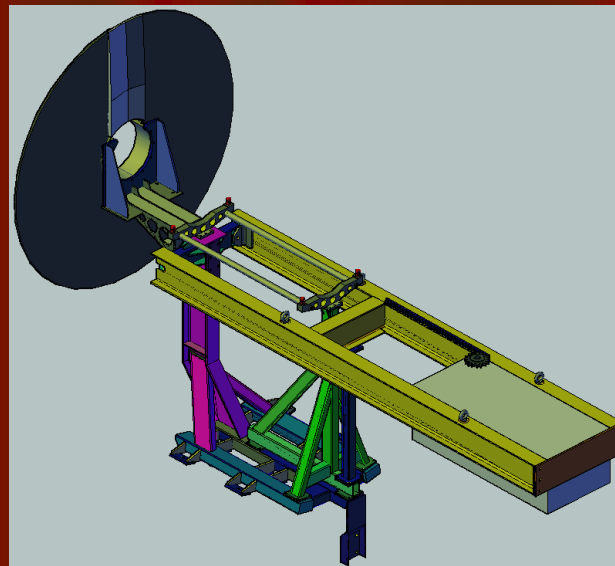
8 PIECES

1. H12,h12,±0.12
2. * Dimensions for reference.

Plate 520x520x40		STEEL S235JR02		44.43.32	
DESCRIPTION		PCS	MAT.	OBSERVATIONS	
ENS/ASS		S.ENS/S.ASS			
DETECTOR INTEGRATION-INFRASTRUCTURE-MECHANICS				44.43.32	
PLATE				030.7	
DES/DRA.	A. Sulkov	04.10.2012			
CONTROLLED					
RELEASED					
APPROVED					
CMS\SYE4M0\SYE4M					
REPLACE/REPLACES					
NON VALABLE POUR EXECUTION NOT VALID FOR EXECUTION				SIZE A3	ND.

MAIN SUPPORT (for radiation shielding) INSTALLATION onto PP1 posts

(LS1 TEST)

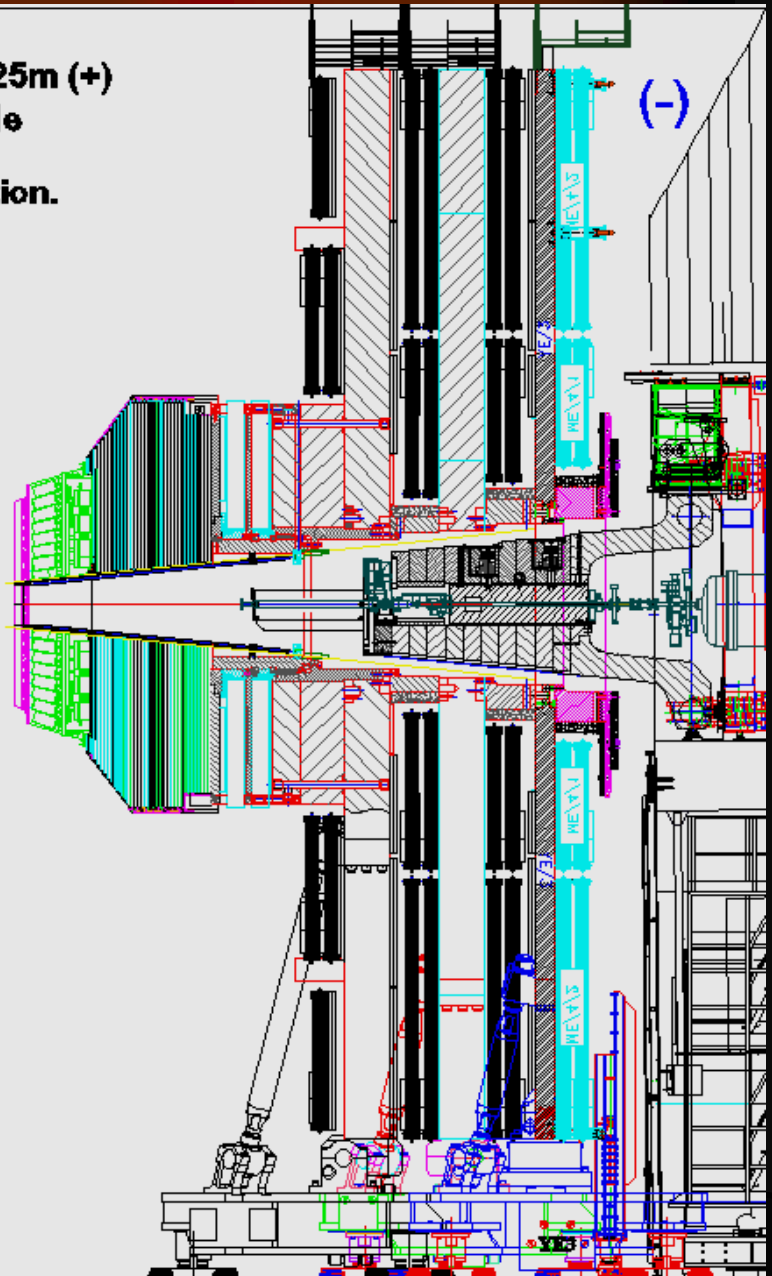
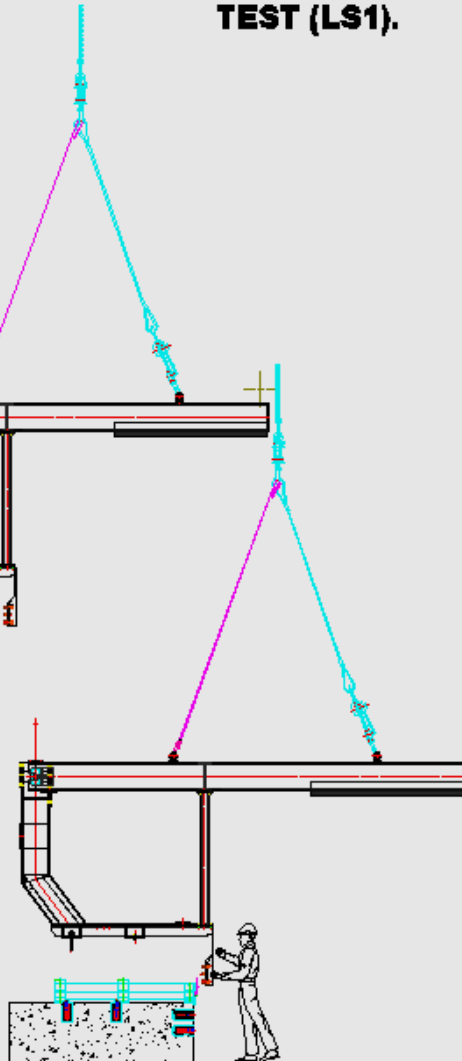


**End Cap open 10.25m (+)
& 10.4m (-) side**

**Main Support installation.
TEST (LS1).**

KB1/4	KS10N	KS10N
YB1/3	ES10Y	ES10Y
KB1/2	ES10N	SS10N
YB1/2	SS10Y	SS10Y
KB1/2	SS10N	SS10N
YB1/1	KS10Y	KS10Y
KB1/1	KS10N	KS10N

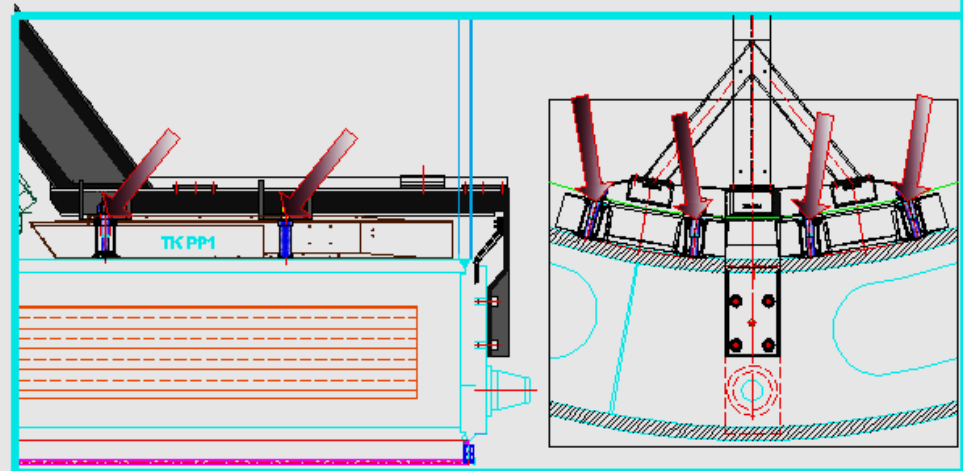
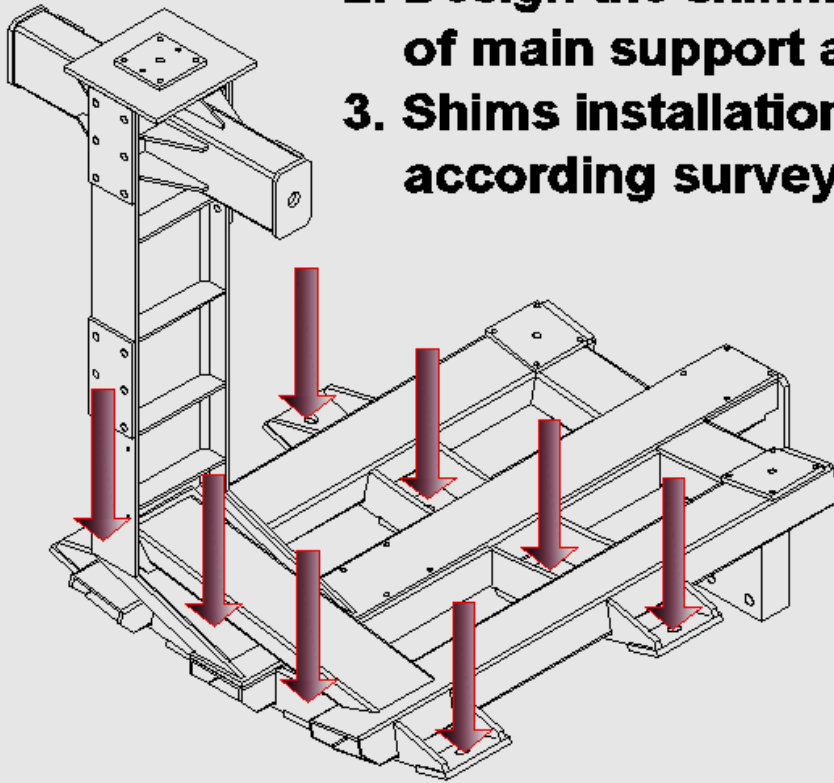
KB1/1	KS10N	KS10N
YB1/1	KS10Y	KS10Y
KB1/2	SS10N	SS10N
YB1/2	SS10Y	SS10Y
KB1/3	ES10N	ES10N
YB1/3	ES10Y	ES10Y
KB1/4	KS10N	KS10N



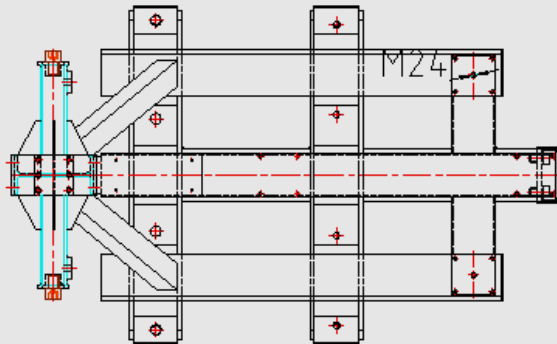
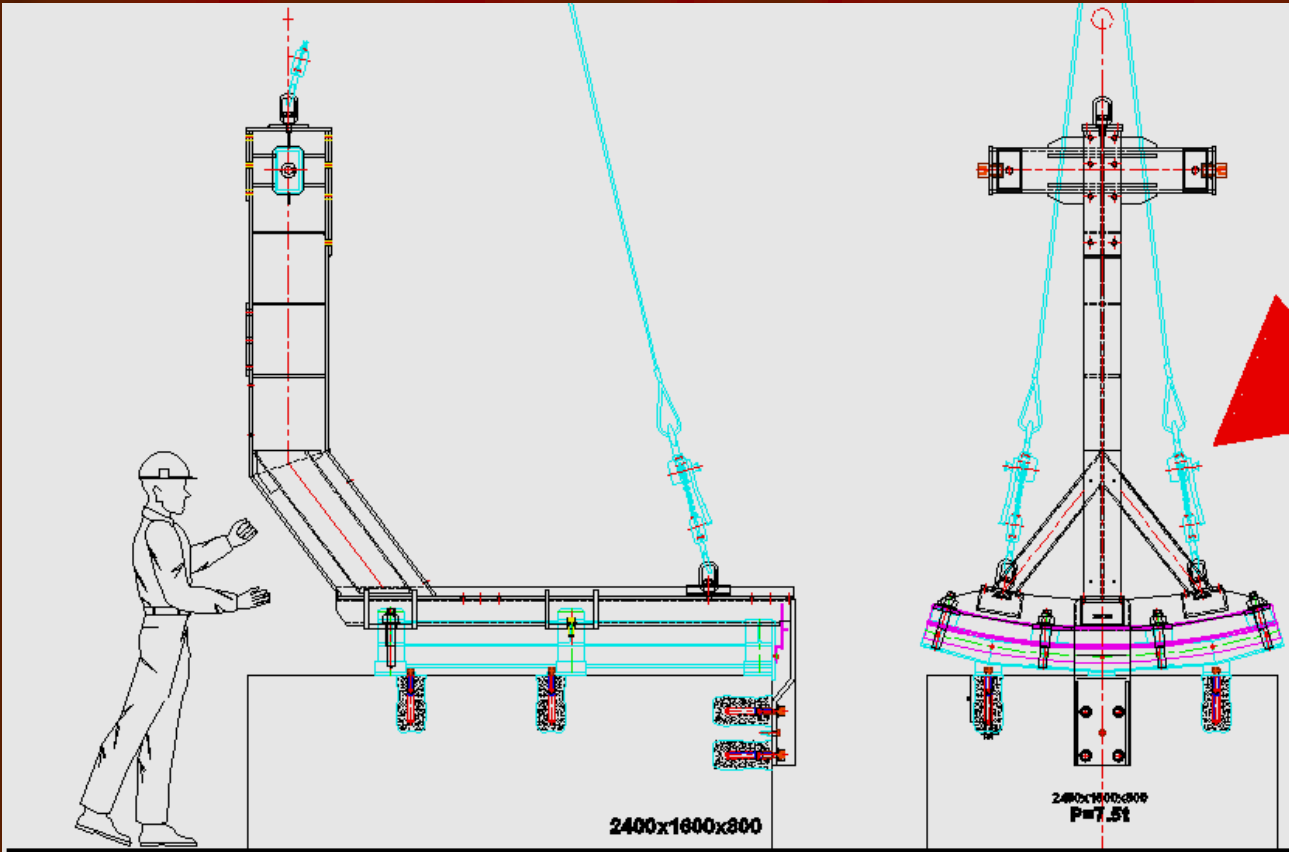
MAIN SUPPORT INSTALLATION

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

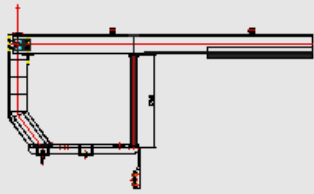


Main support installation onto concrete block



LS1

REV	DESCRIPTION	DATE	BY	CHKD	APP'D
01	ISSUED FOR CONSTRUCTION				
<p>PROJECT: INTEGRATION - INFRASTRUCTURE - MEGALAND</p> <p>SCALE: 1:1</p> <p>DATE: 10/20/2023</p> <p>DESIGNED BY: [Name]</p> <p>CHECKED BY: [Name]</p> <p>APPROVED BY: [Name]</p> <p>REVISIONS:</p>					
<p>NON VALIDO PER DEDIZIONE NOT VALID FOR DEDICATION</p>					<p>REV. NO.</p> <p>1/1</p>

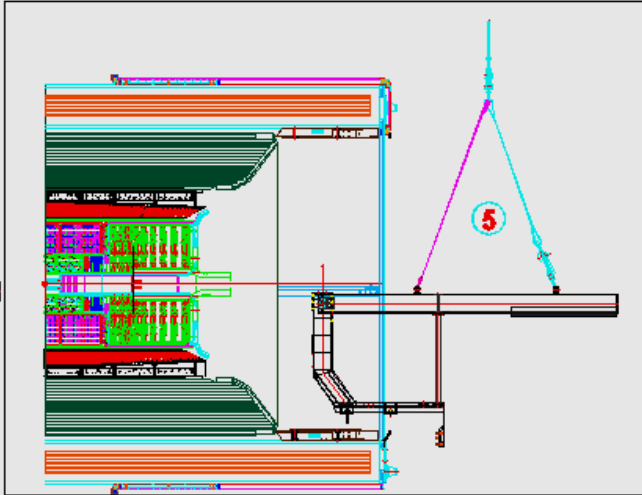


1

2

3

4



5

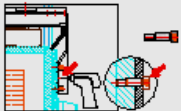
5

6

7

Main support installation (Test LS1)
Sequence installation

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



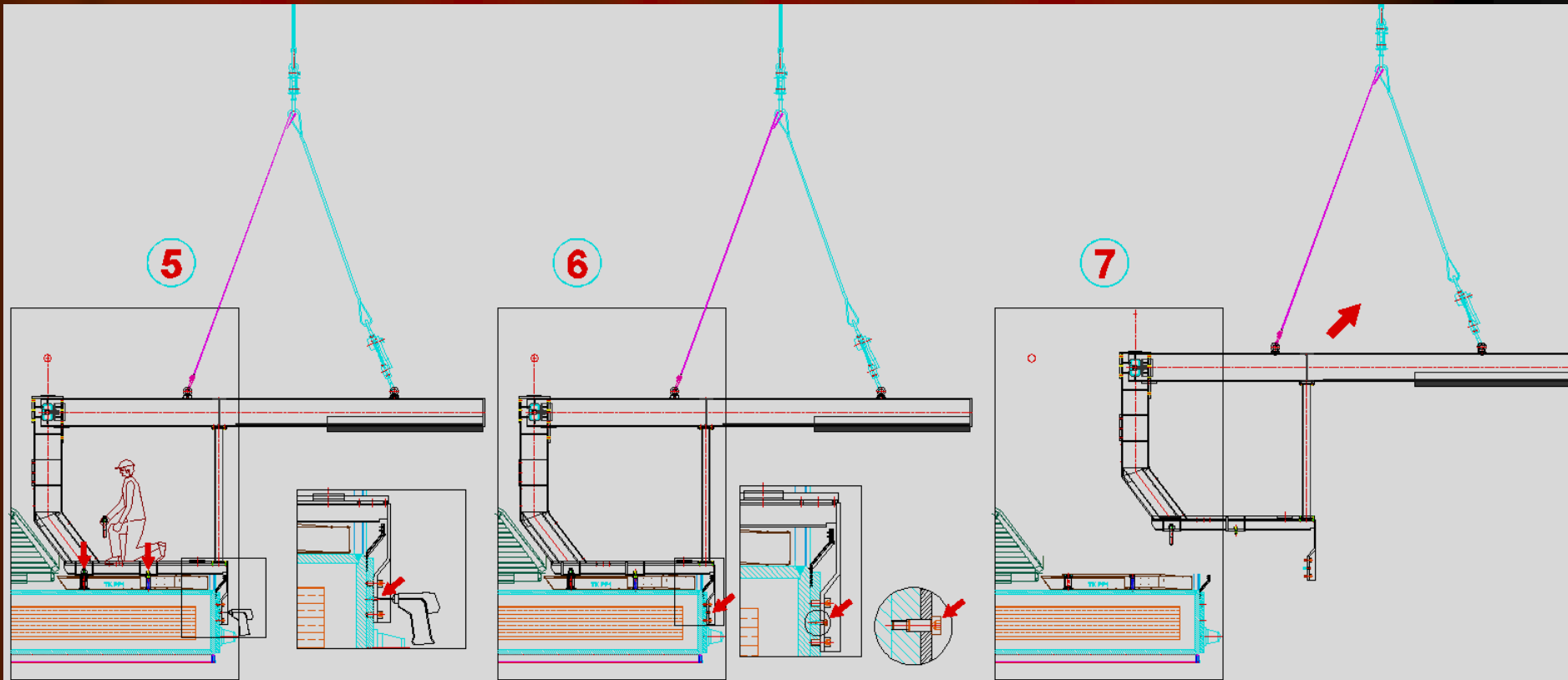
**Main Support installation. TEST (LS1).
 Sequence operations**

17.09.2012

NO.	DESCRIPTION	FOR	DATE	REVISION	REVISION
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2	CONSTRUCTION				
3	OPERATION				
4	MAINTENANCE				
5	REPAIR				
6	REPLACE				
7	REPLACE				

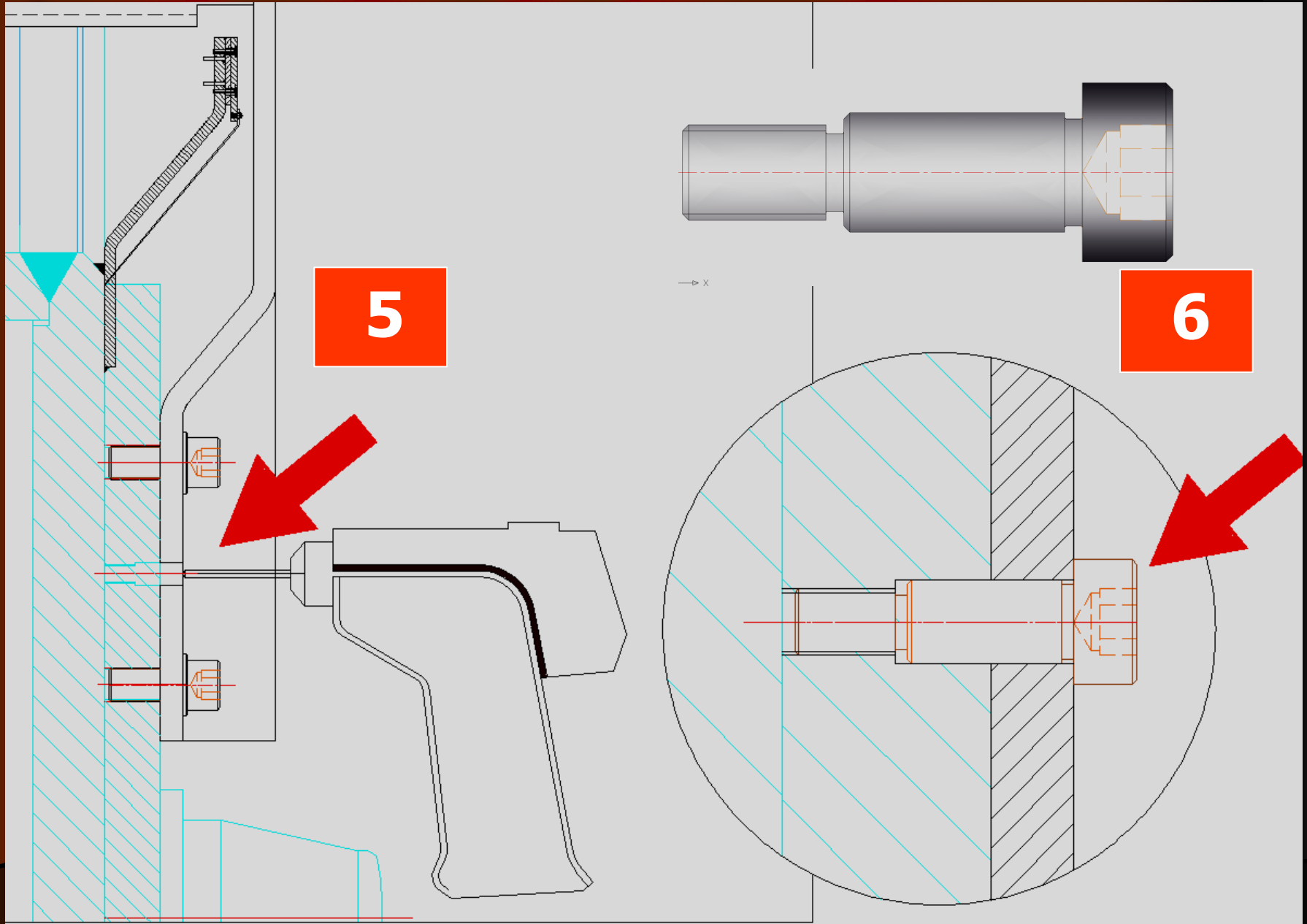
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 CHECKED: [Signature]
 APPROVED: [Signature]
 DATE: 17.09.2012
 PROJECT: [Project Name]
 SHEET: [Sheet Number] OF [Total Sheets]
 TITLE: Main support installation TEST (LS1)
 REVISIONS: [List of revisions]
 SCALE: [Scale]
 UNIT: [Unit]
 DRAWING CODE: [Code]
 PROJECT CODE: [Code]
 DRAWING NO.: [Number]
 SHEET NO.: [Number] OF [Total Sheets]

Main support installation (Test LS1)



**Main Support installation (LS1 test).
Sequence operations**

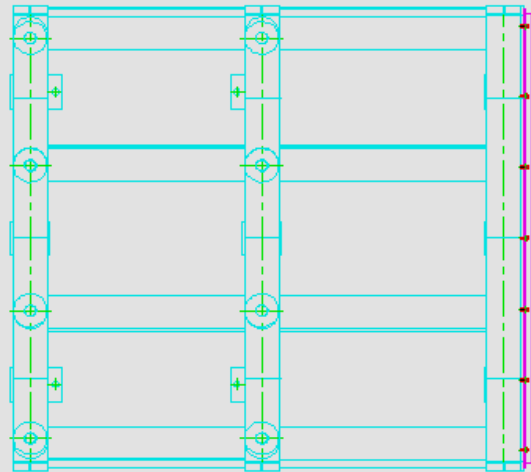
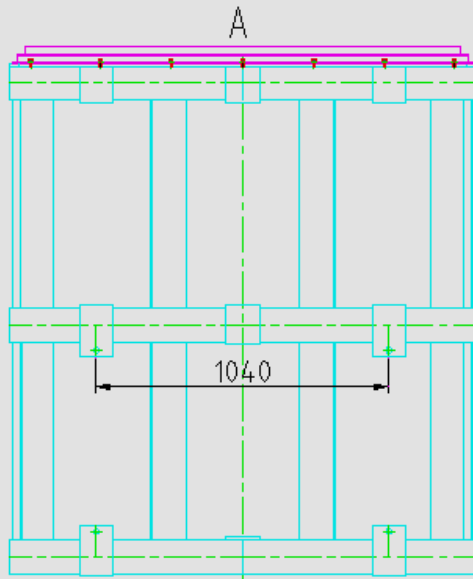
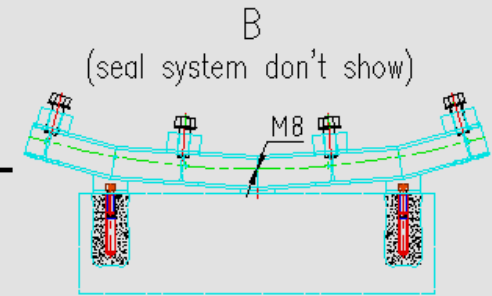
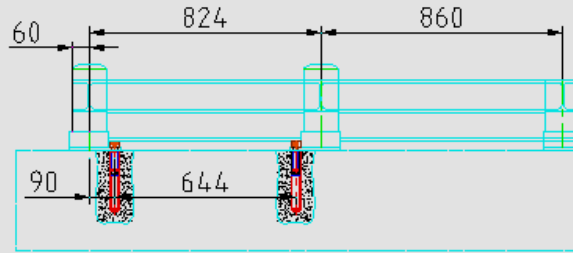
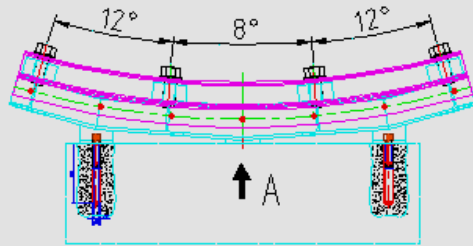
Machining of attachment holes



What is necessary for performance of main support installation ?

1. Main support
2. Support frame
3. Traverse

Support frame



2 PIECES

Seal system (model)



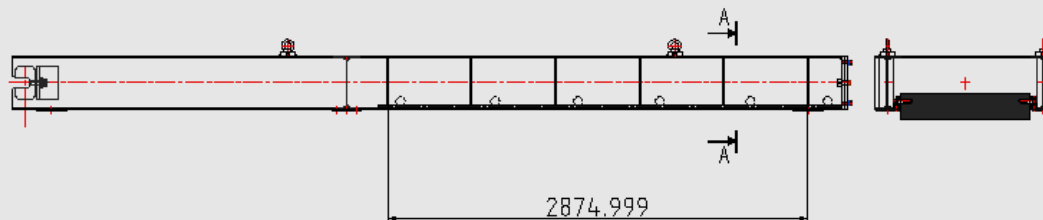
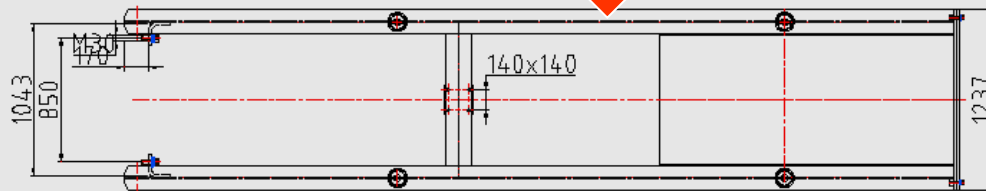
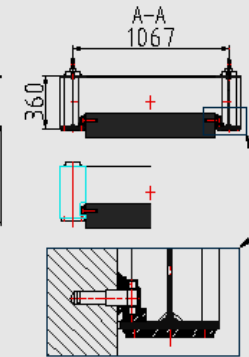
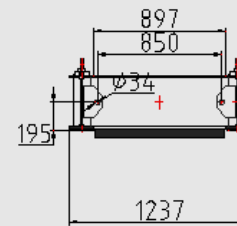
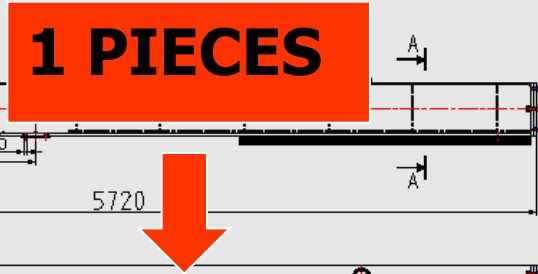
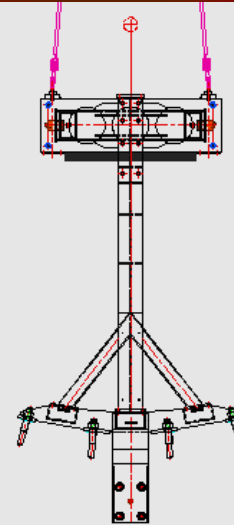
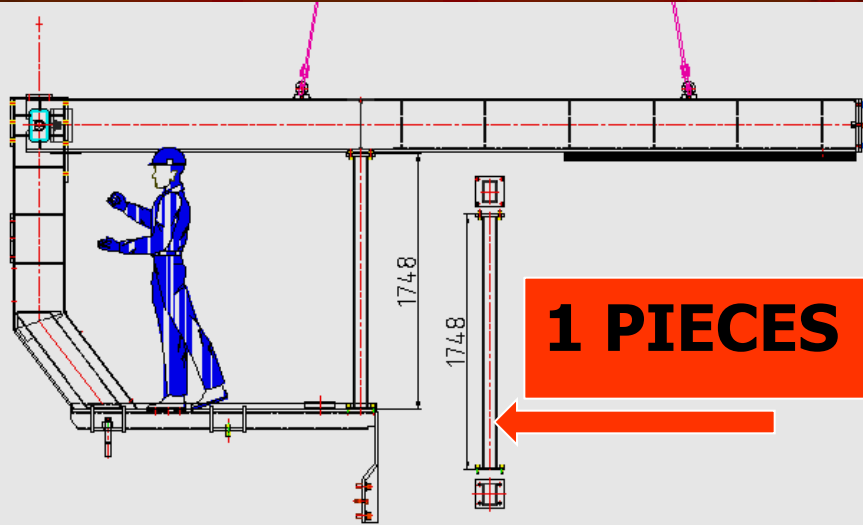
- Mass: kg.
 1. Weld according to ISO 2553:1992(E).
 2. *Dimensions for reference.

NO.	DESCRIPTION	QTY	UNIT	REVISION	REVISION
1	Support frame				

DESIGNED	DATE	SCALE
DRAWN		
CHECKED		
APPROVED		

NON VALIDO PER ESECUTIONE
 NOT VALID FOR EXECUTION

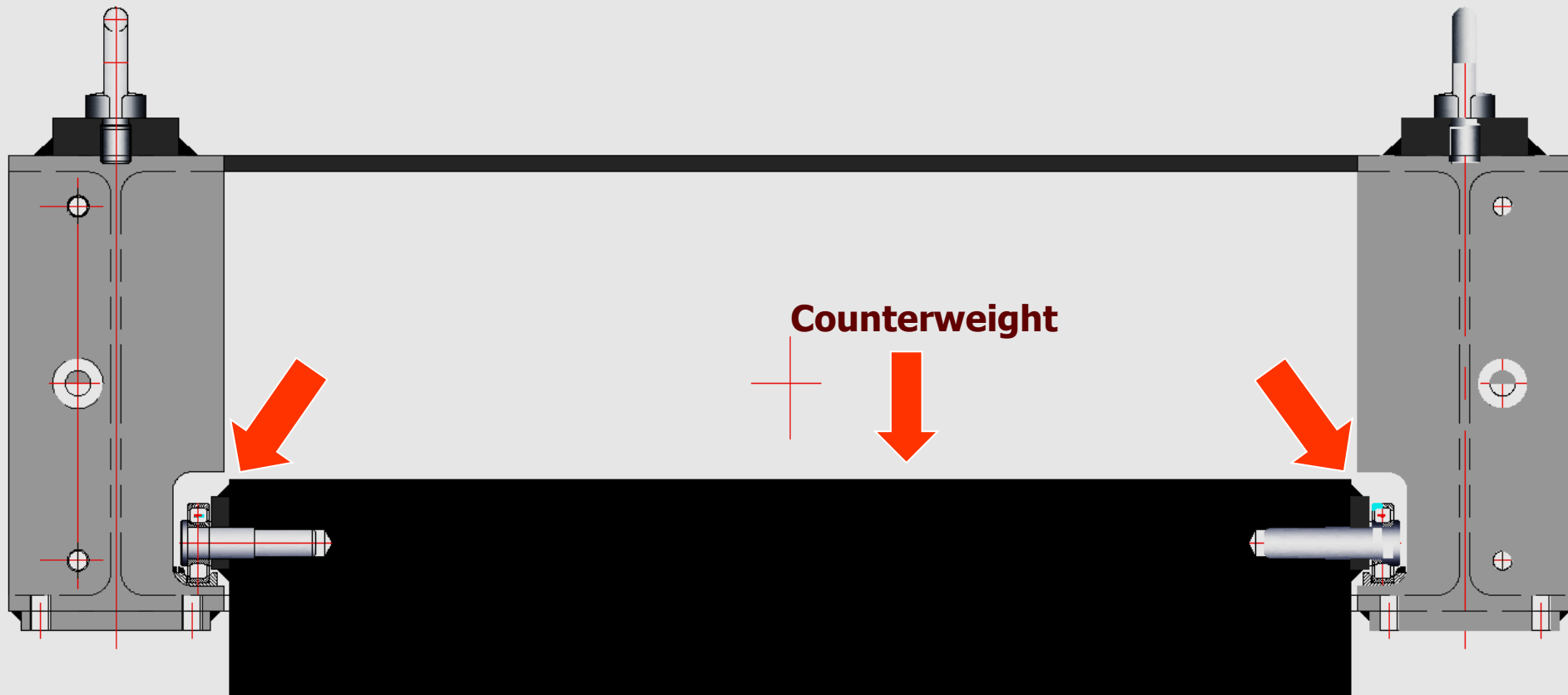
Traverse for main support installation (LS1)



Dimensions for reference.

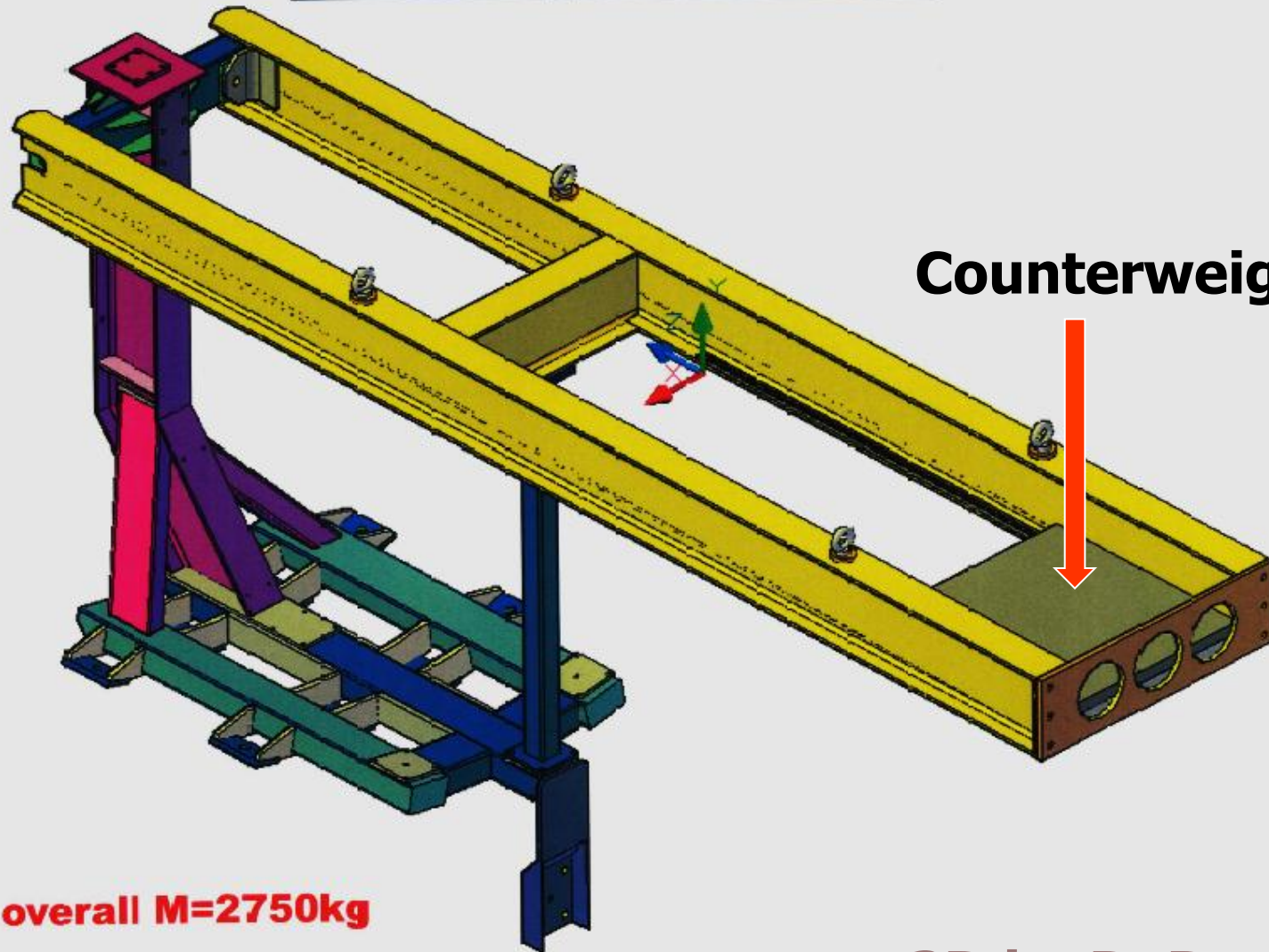
QTY	DESCRIPTION	POS	MAT.	OBSERVATIONS	REF. QTY
EN5/456					
EN5/456	DETECTOR INTEGRATION-INFRASTRUCTURE-MECHANICS			DES. OR. A. Surkov CONTROLLED RELEASED APPROVED CHS NEW/PLATE/REPLACES	02.10.2012

TRAVERSE (Counterweight guide)



Traverse with main support (LS1)

For fitting test on LS1

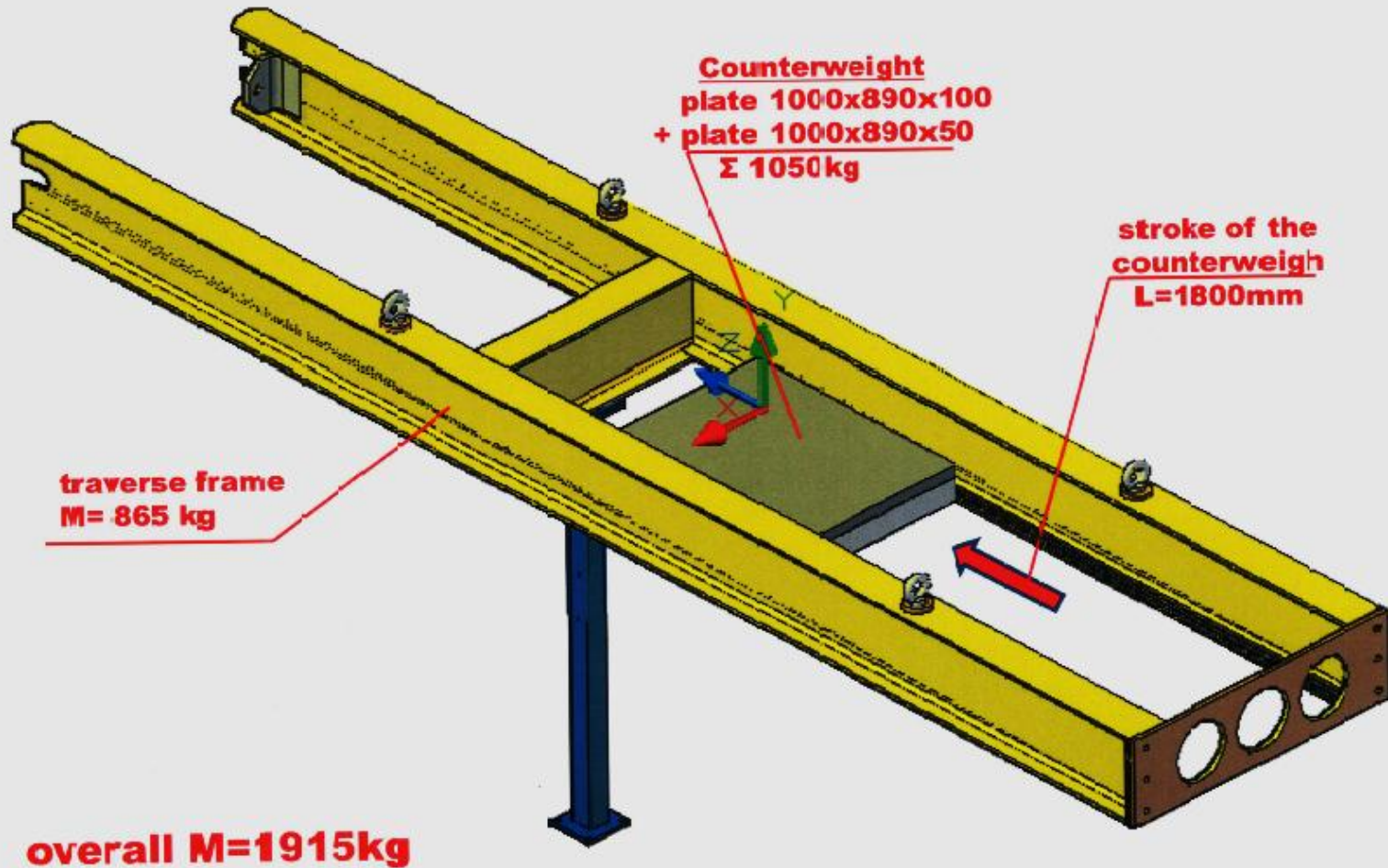


overall M=2750kg

3D by D. Druzhkin

TRAVERSE (LS1)

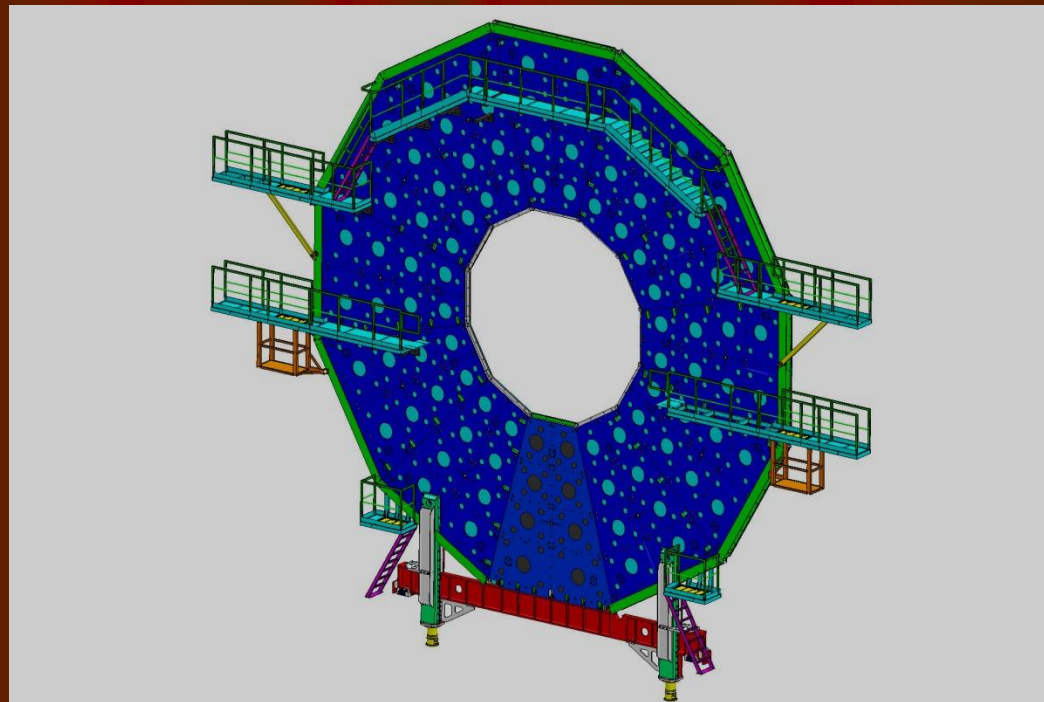
For fitting test on LS1



3D & calculation by D. Druzhdin

YE4 (+) INSTALLATION

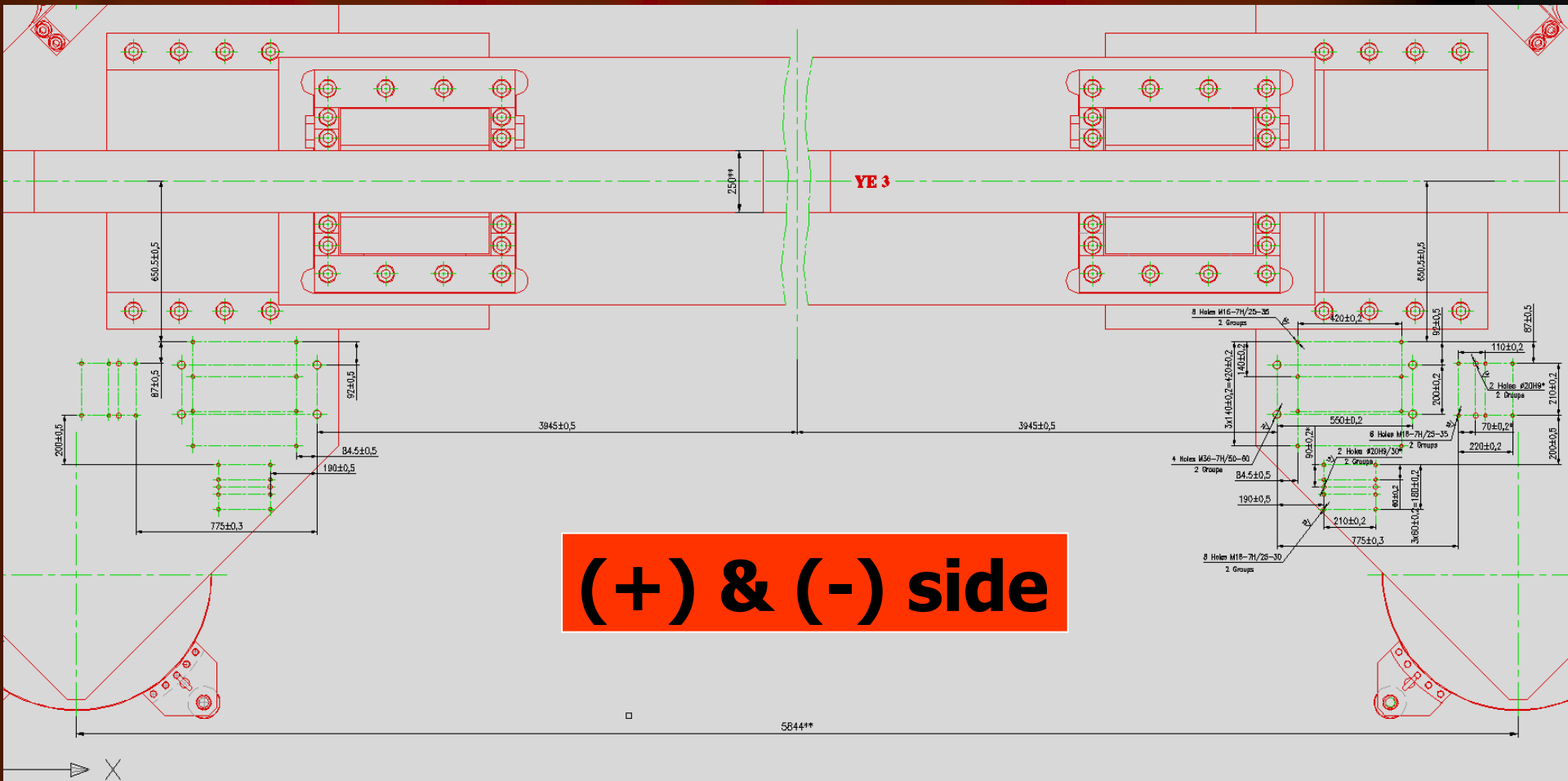
(MAJOR ASSEMBLY STEPS)



ID..218

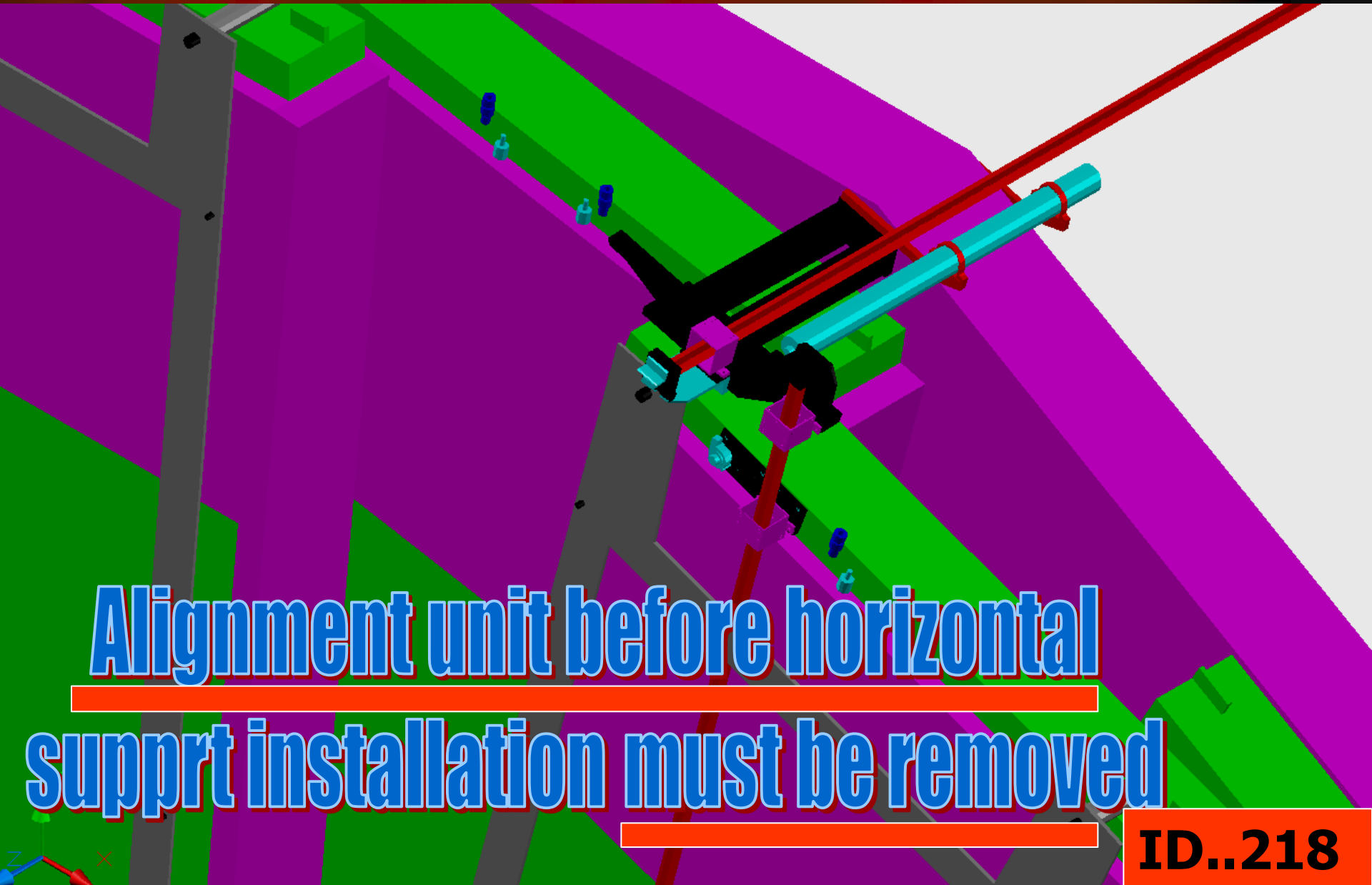
YE3 Cart.

YE4 Support system attachment points machining



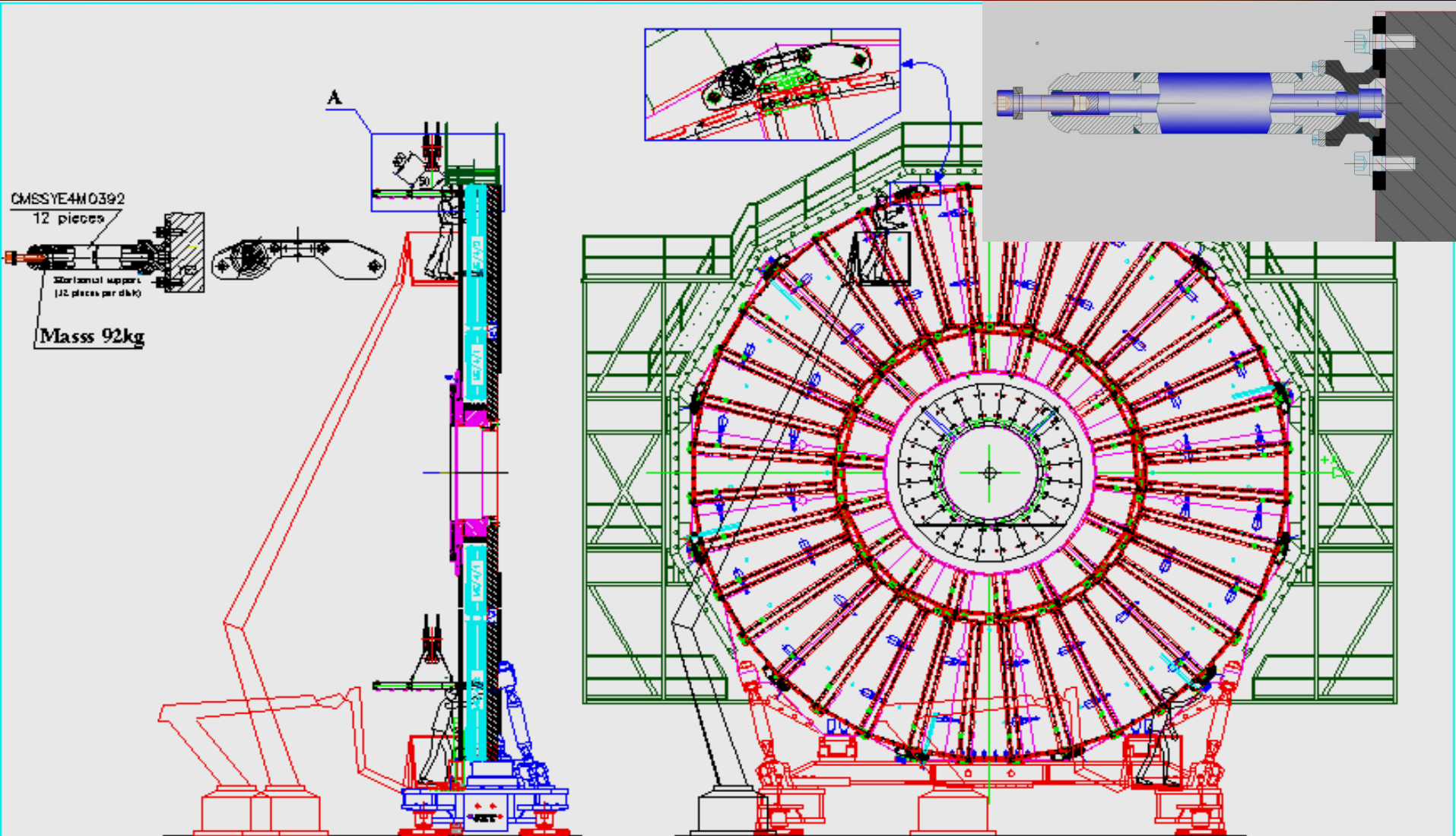
ID..218

YE3 with alignment unit (YE4 horizontal support position)



**Alignment unit before horizontal
support installation must be removed**

YE4 horizontal supports installation



YE3 must be in vertical position !!!

SEQUENCE OPERATIONS:

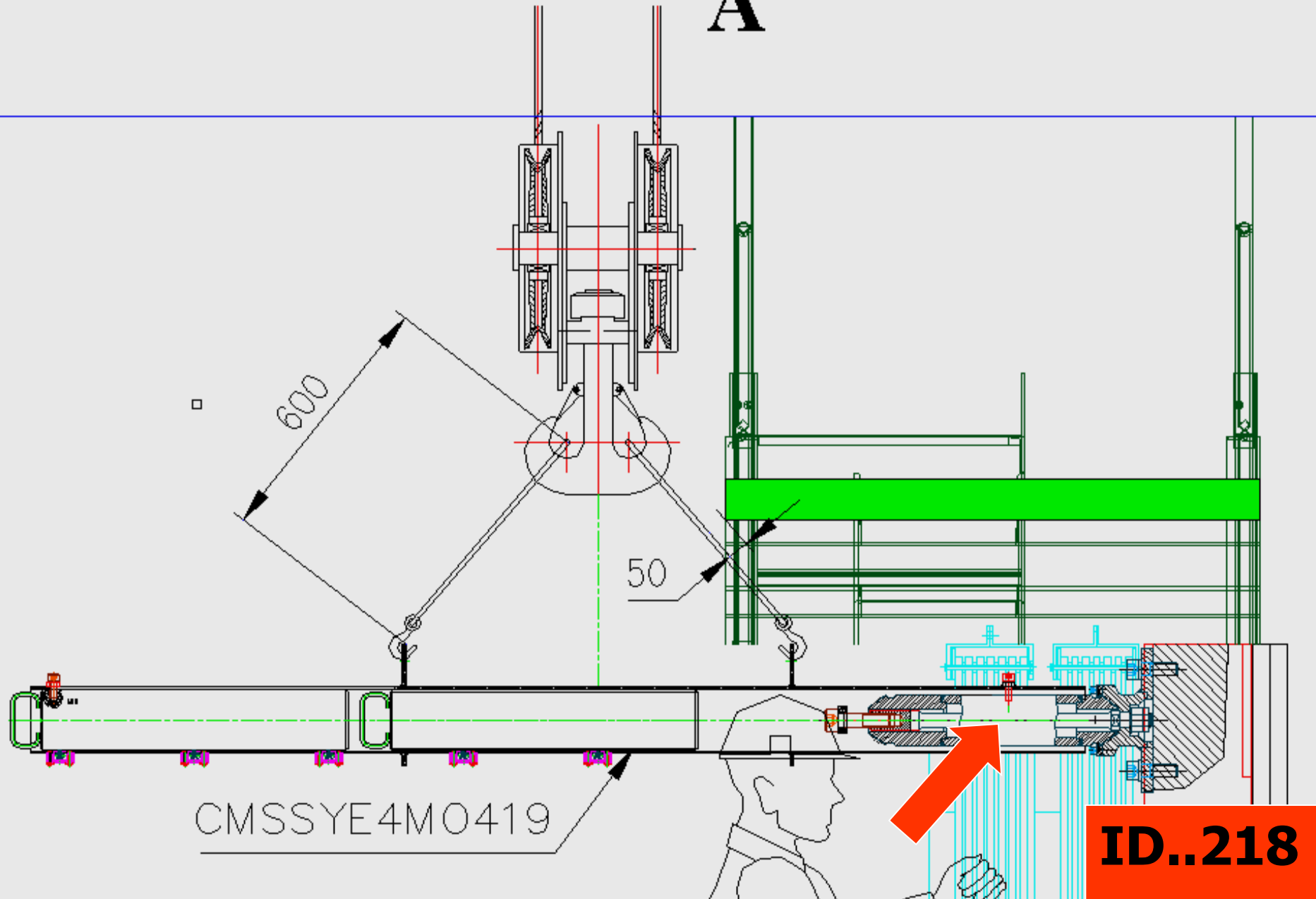
1. Alignment units & services removing
2. Horizontal supports installation
3. Alignment units reinstallation



ID..218

YE4 horizontal support installation

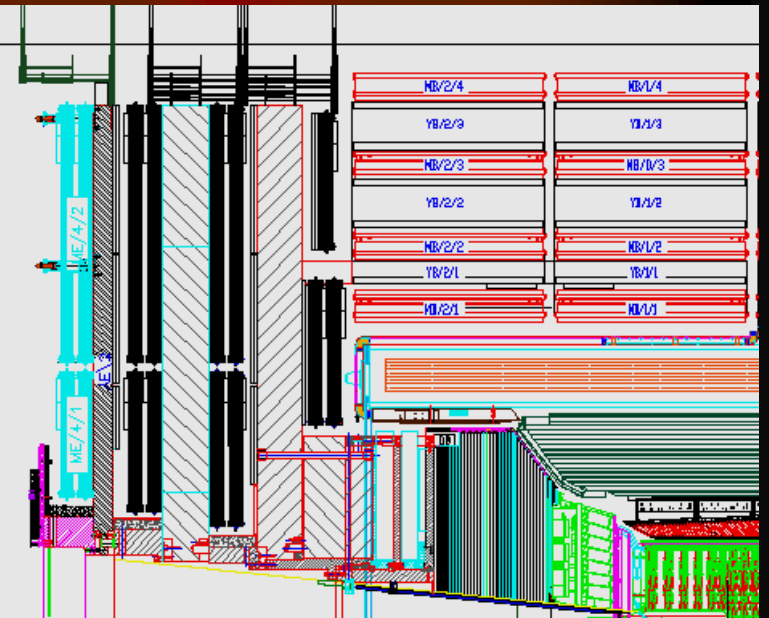
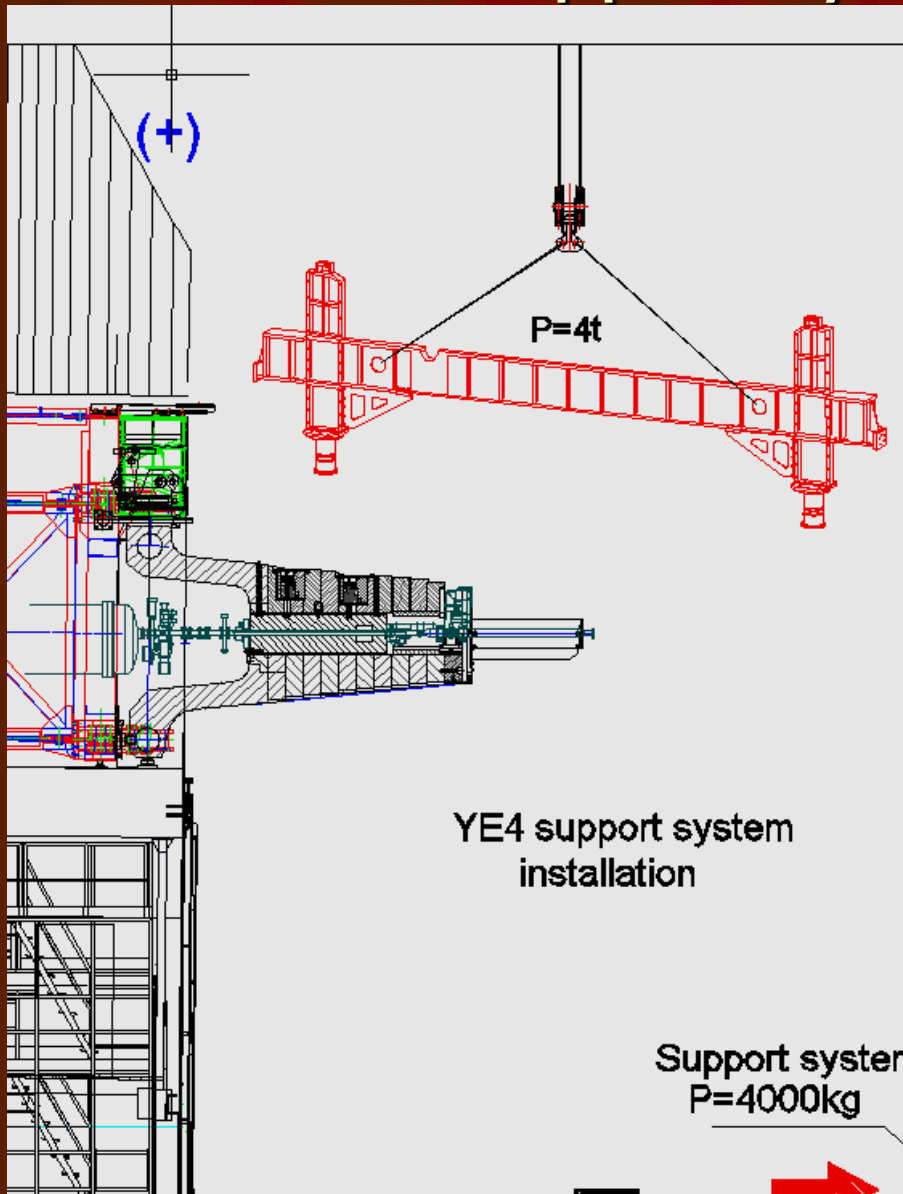
A



CMSSYE4M0419

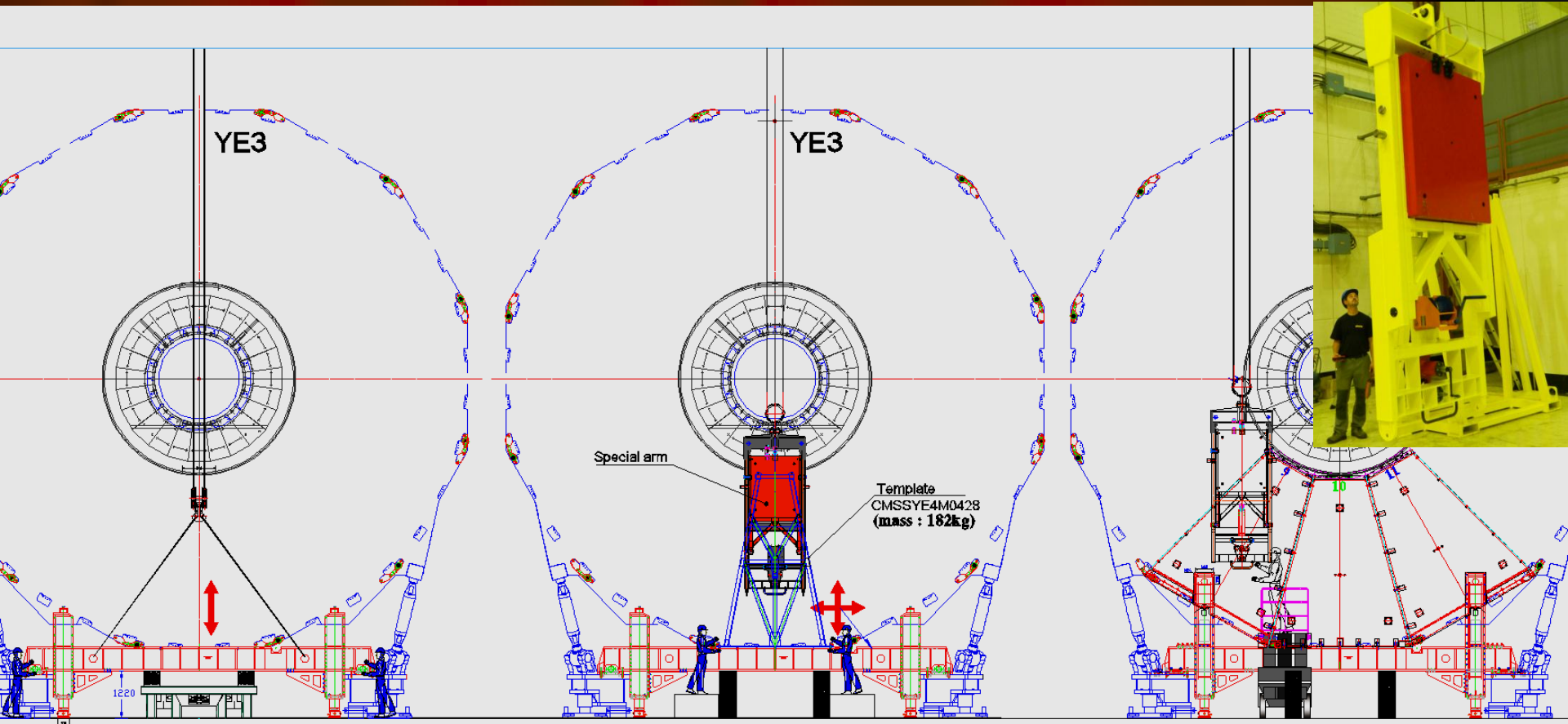
ID..218

YE4 support system installation



ID..218

YE4 Support system & sectors N10, N11, N9 installation



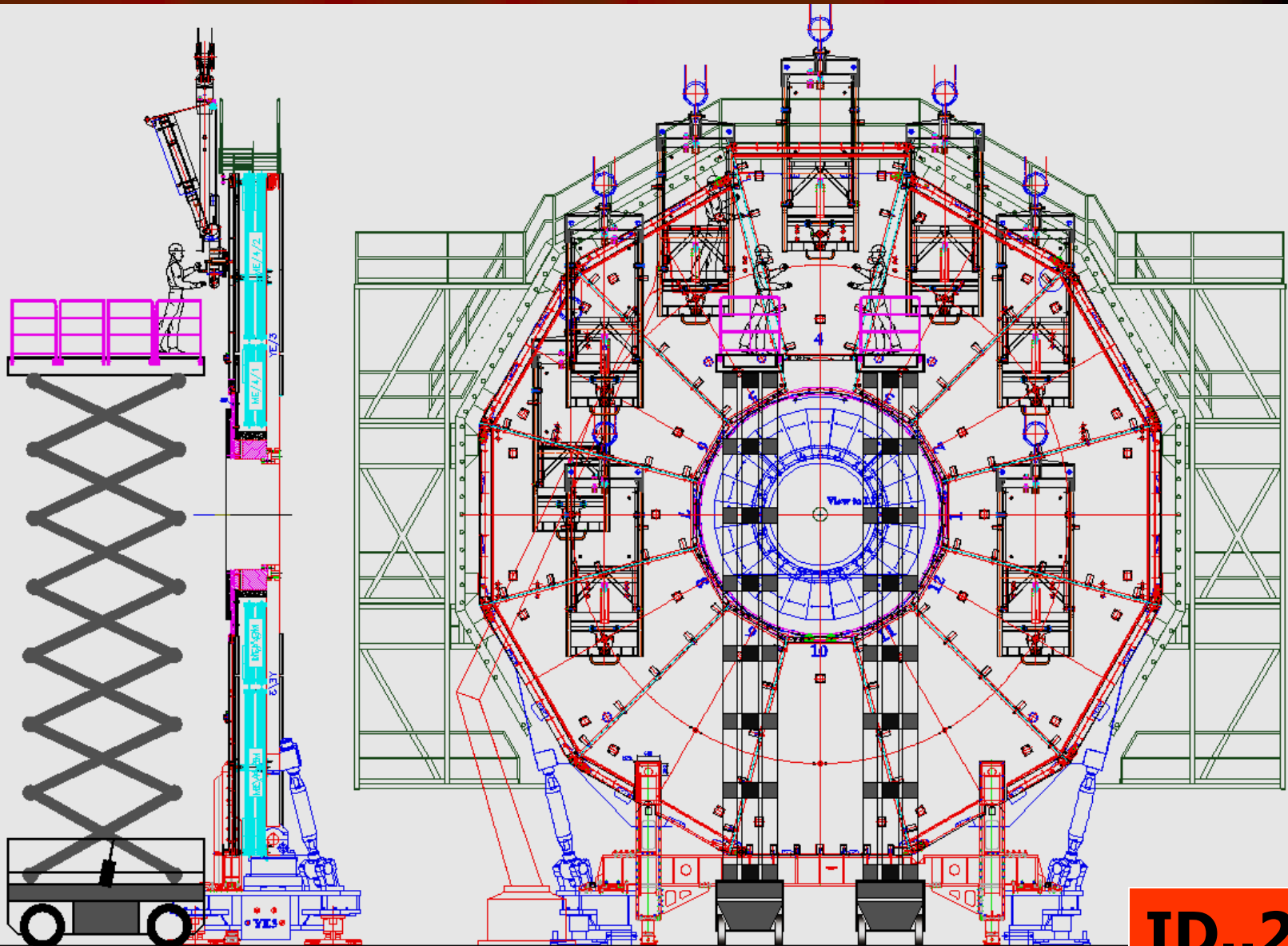
ID..218

TOOLING ACCORDING of YE4 EDR

YE4 sector installation

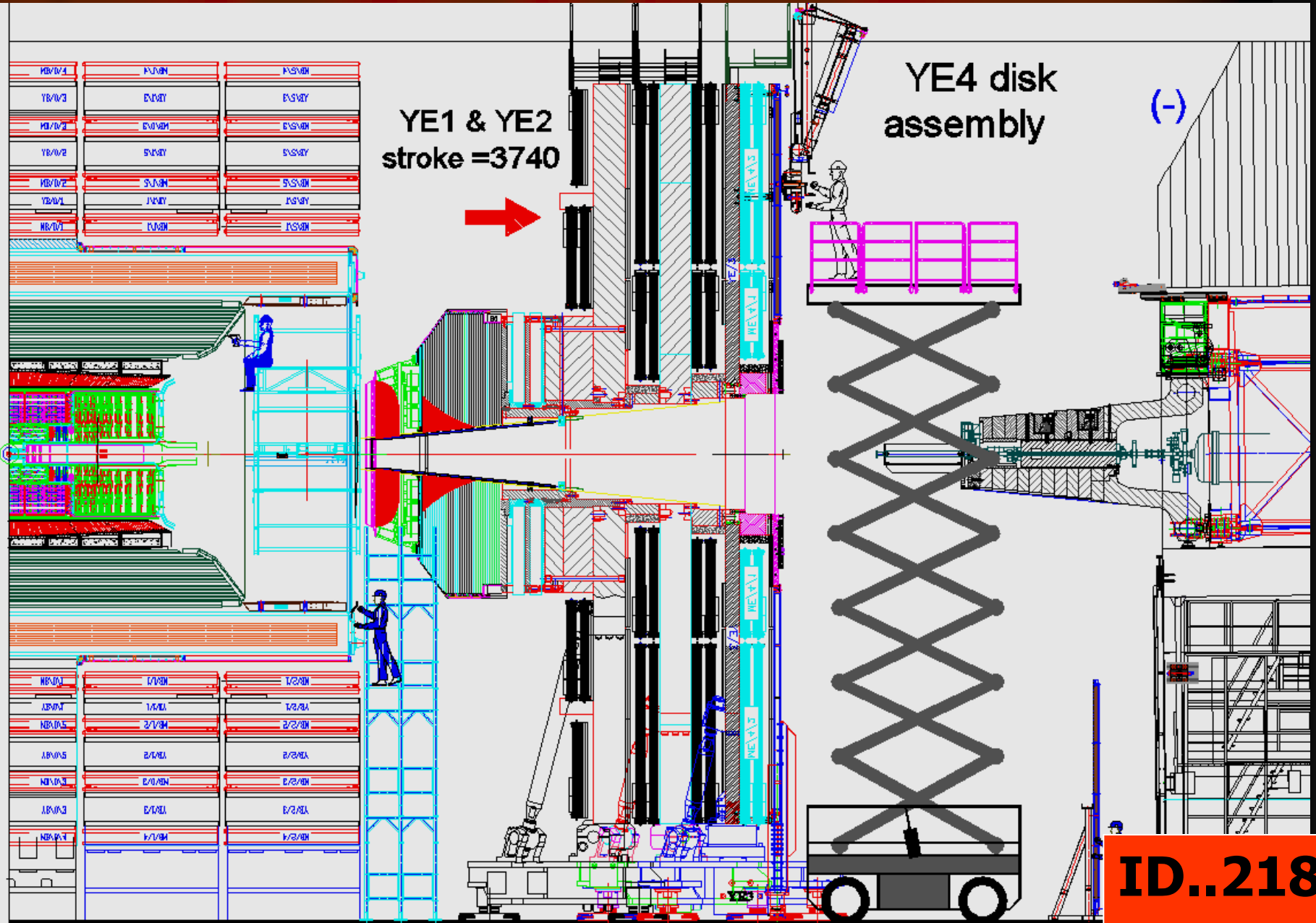


YE4 installation

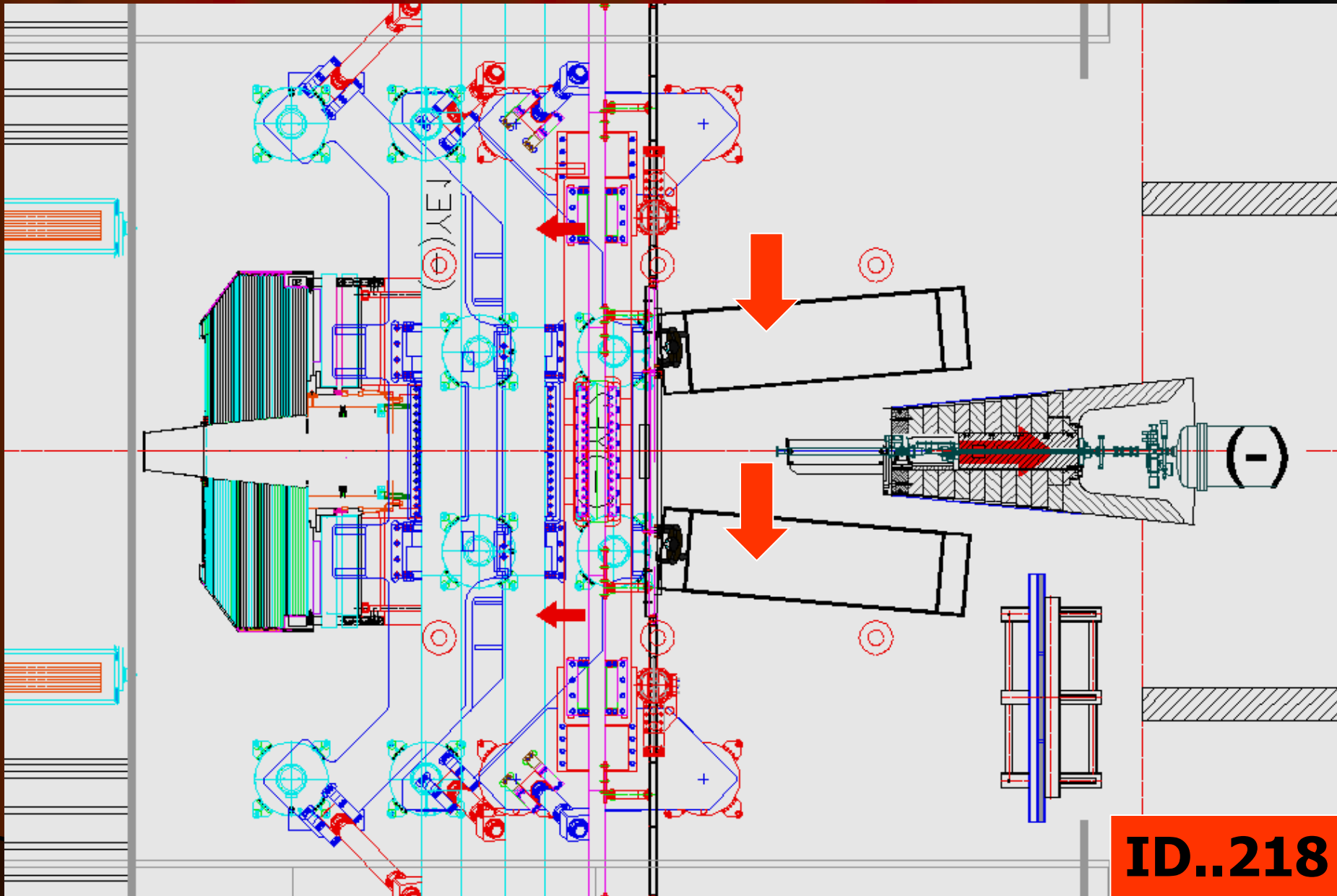


ID..218

YE4 installation (Endcap open 3.74m)

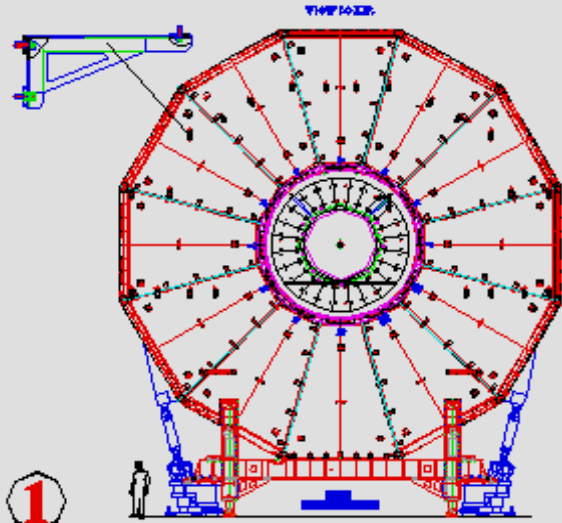


YE4 Installation. Nacelles position. Top view

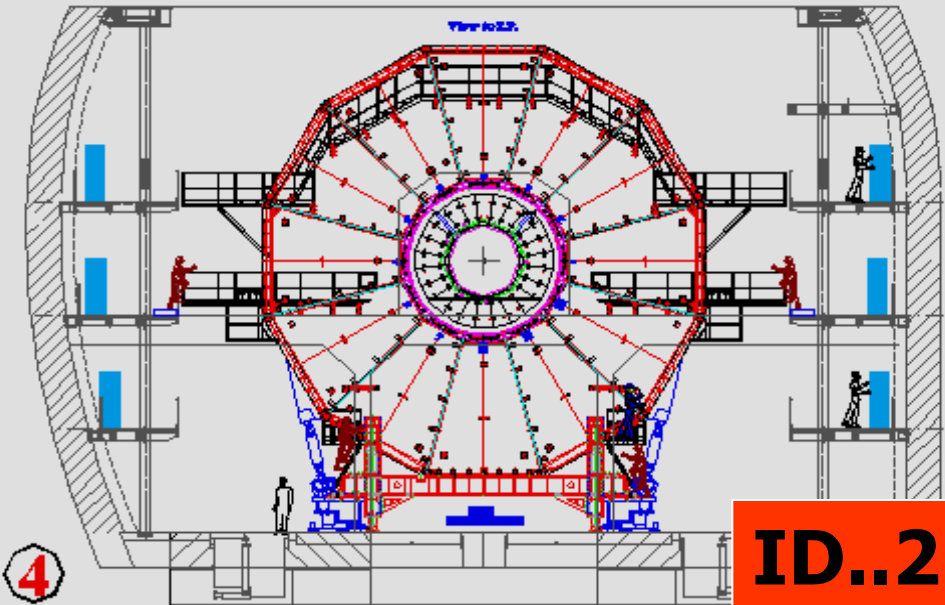
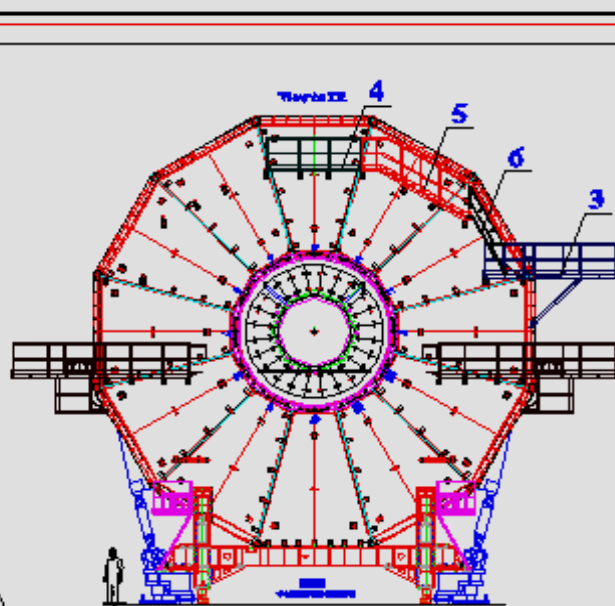
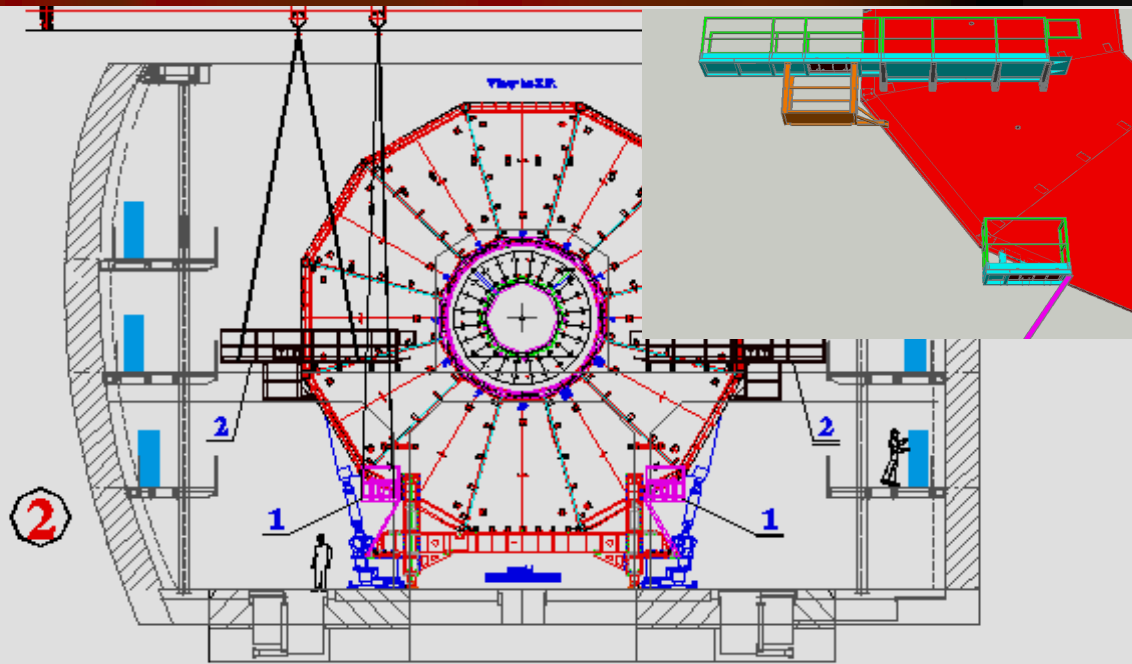


ID..218

YE4 Walkways Installation



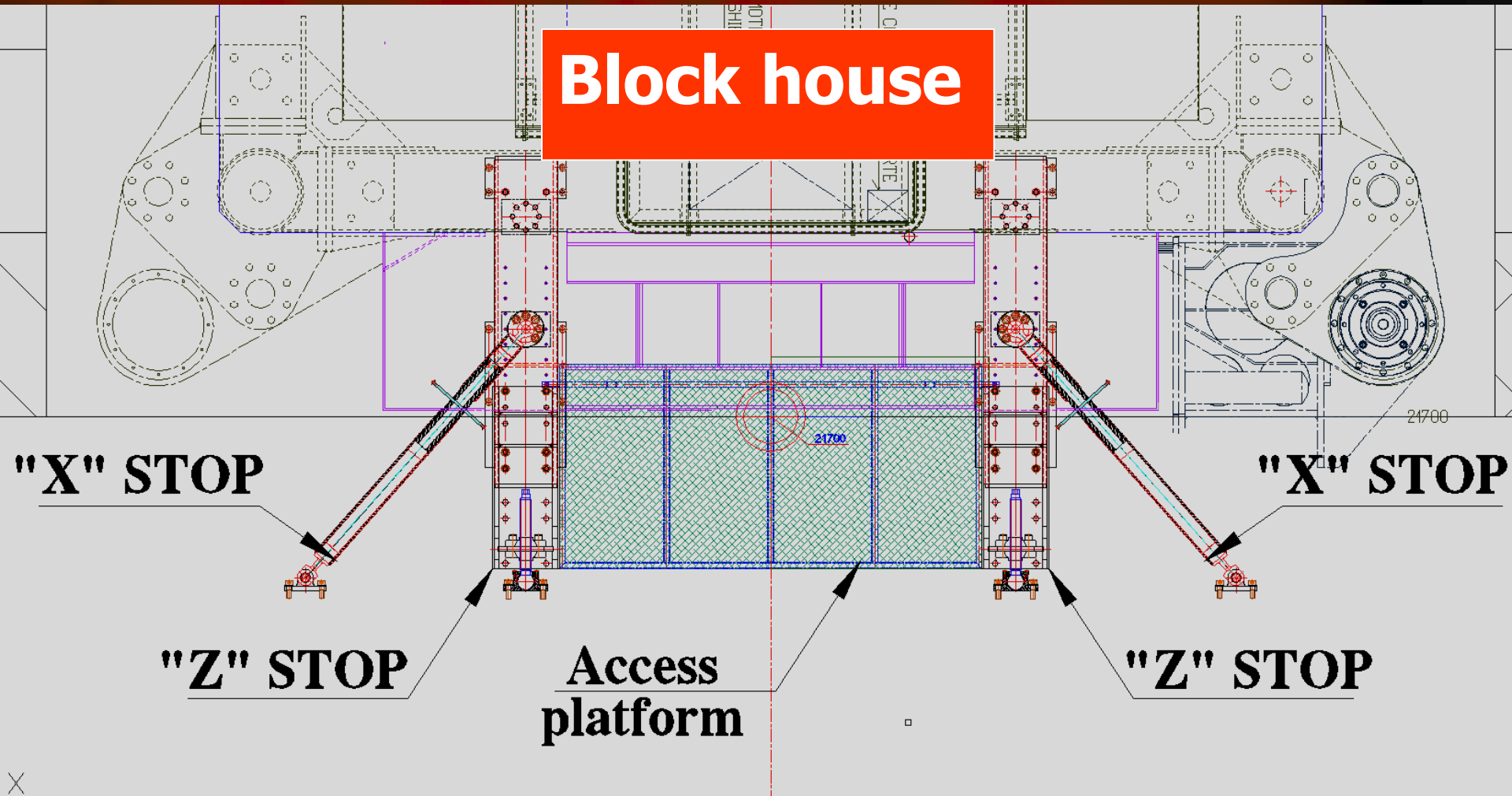
Brackets installation. 22 position



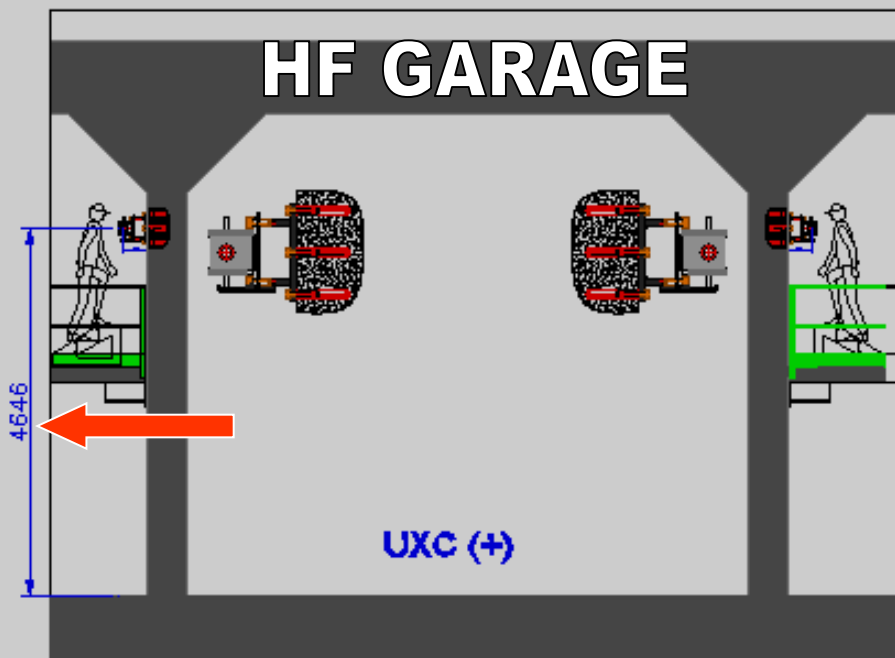
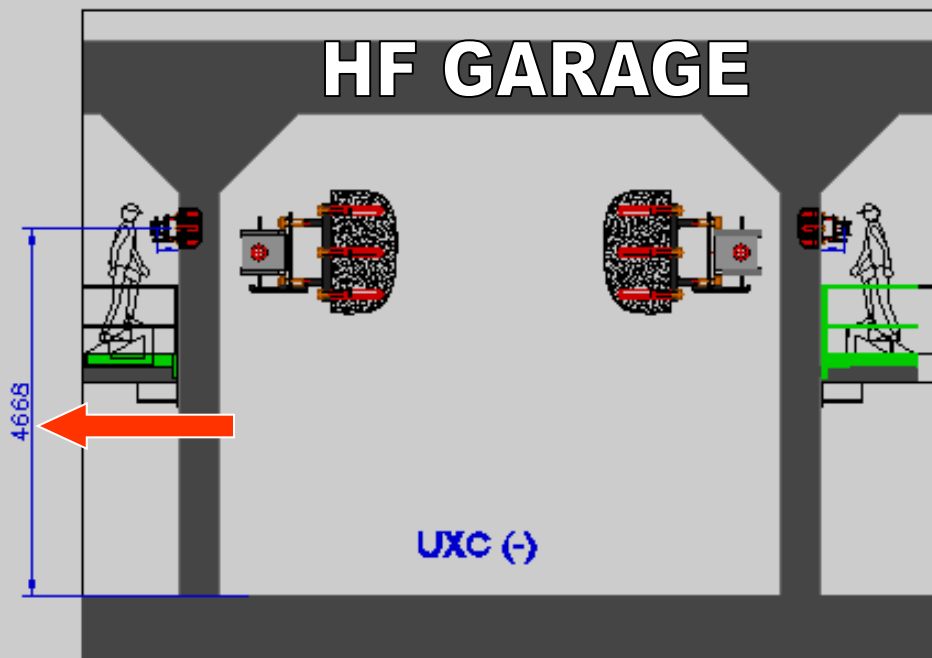
ID..218

"Z" & "X" stop installation-top level (LS1)

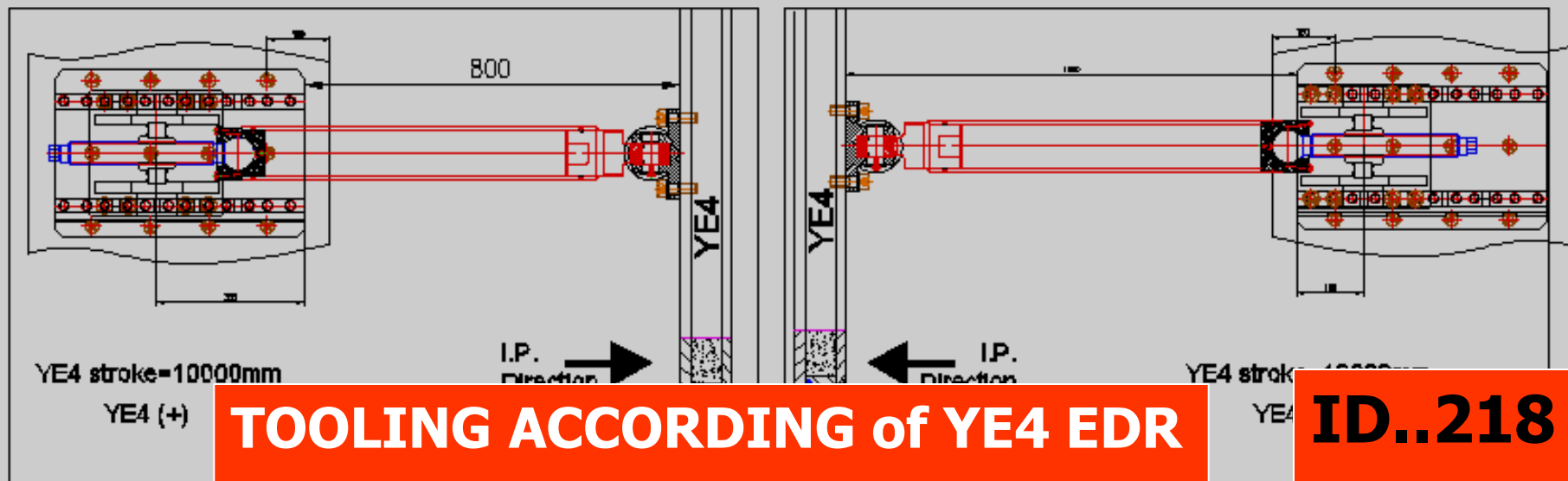
Block house



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



YE4 stroke=10000

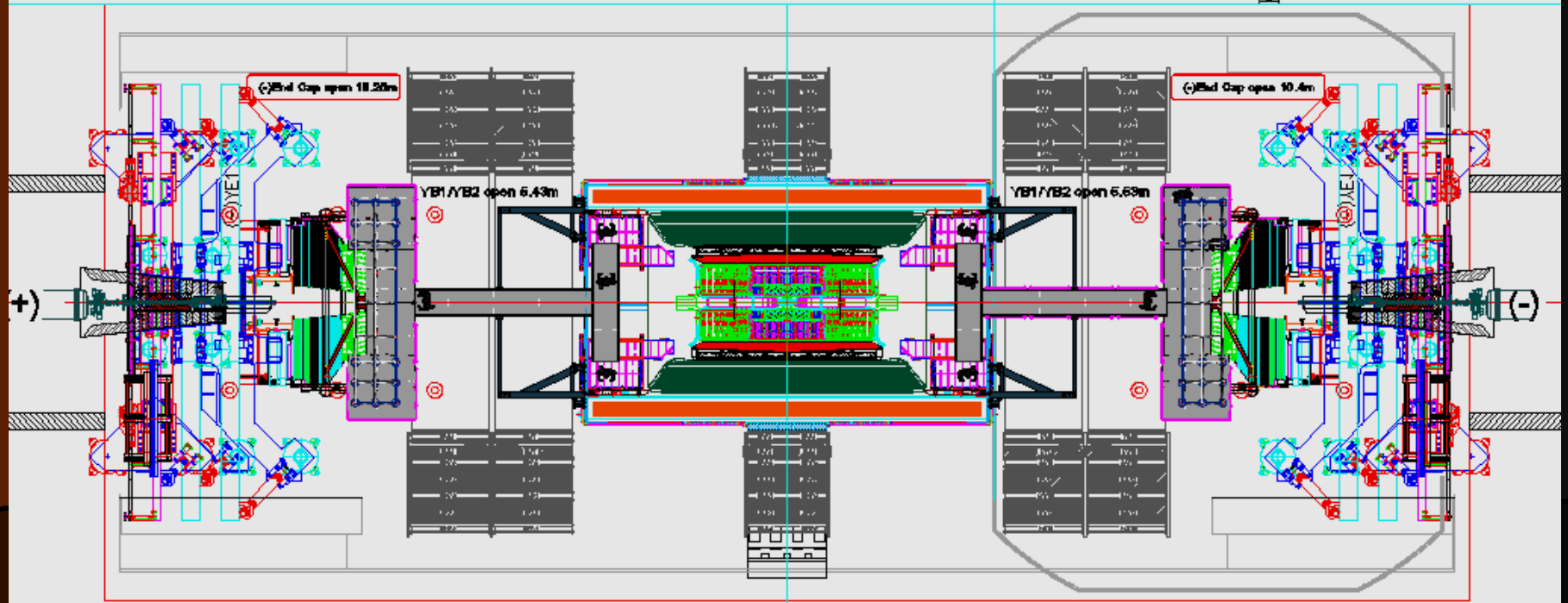
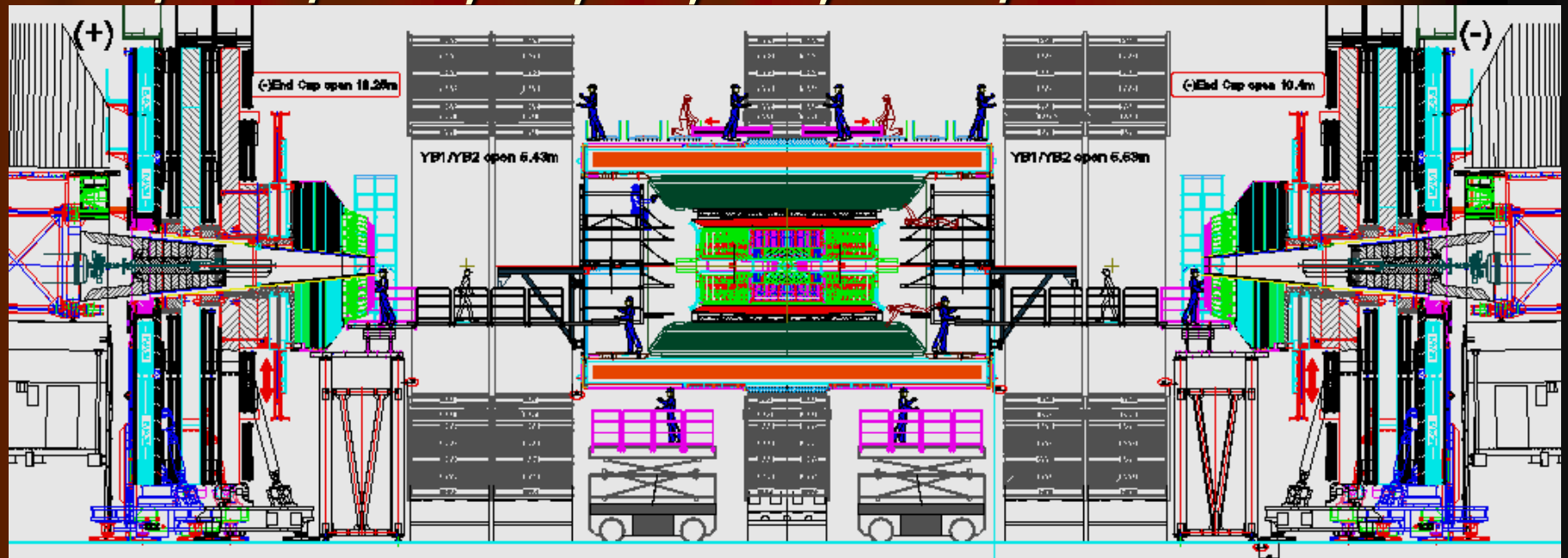


TOOLING ACCORDING of YE4 EDR

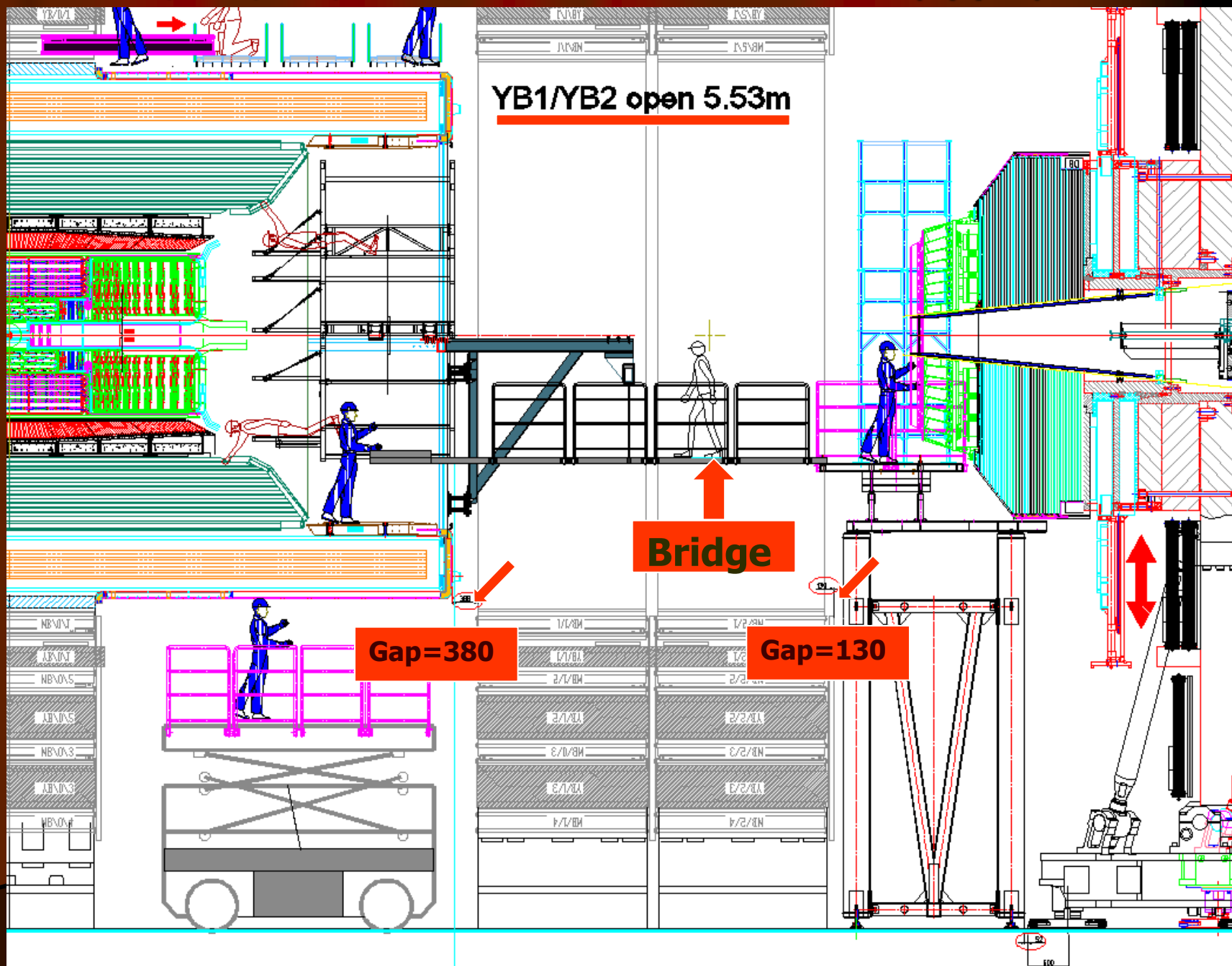
ID..218

YB0, YB1, YB2 MAINTENANCE

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

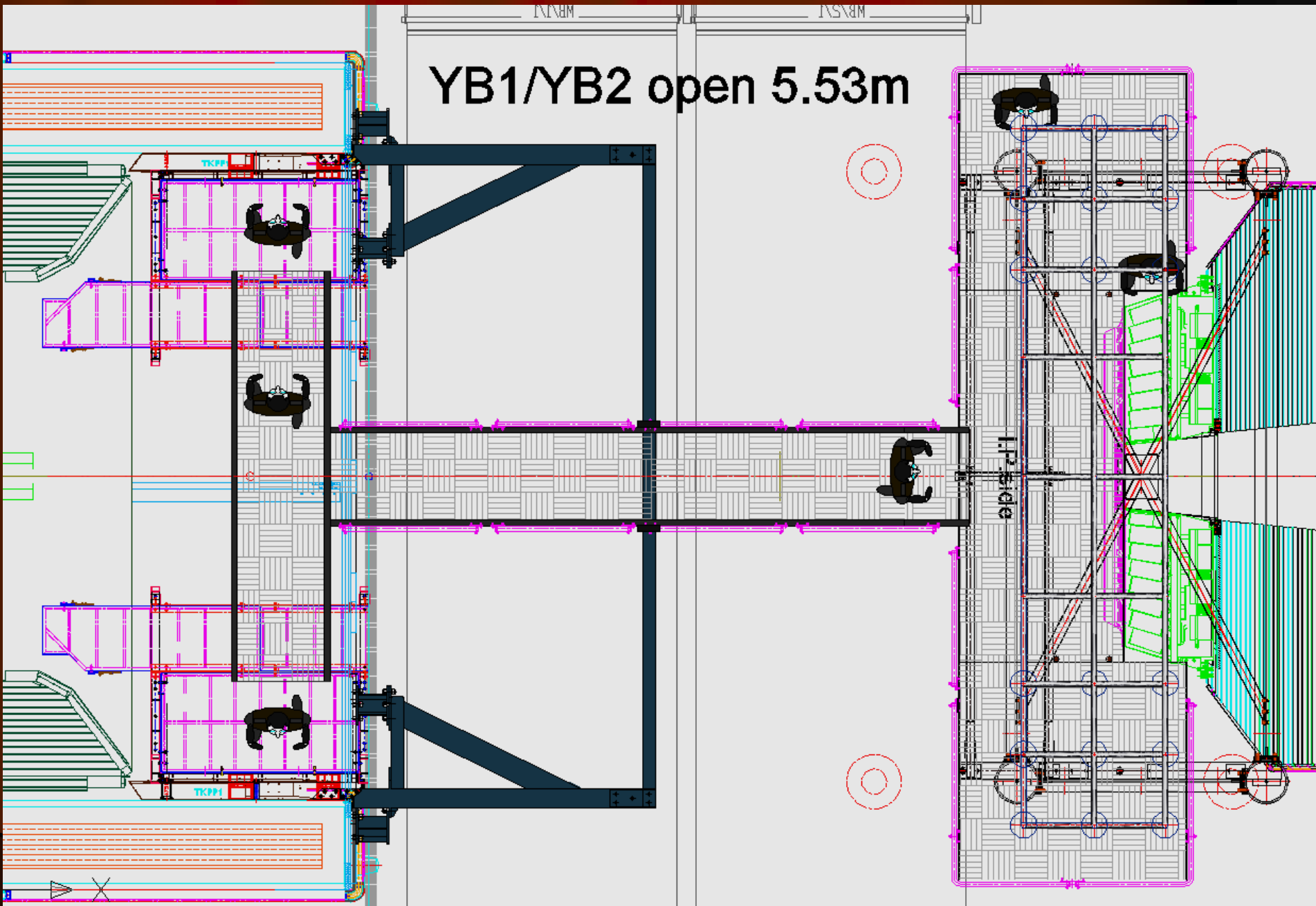


YB0-YB1, HB, EE, ME1/1 maintenance. Endcap(-) open 10.4m

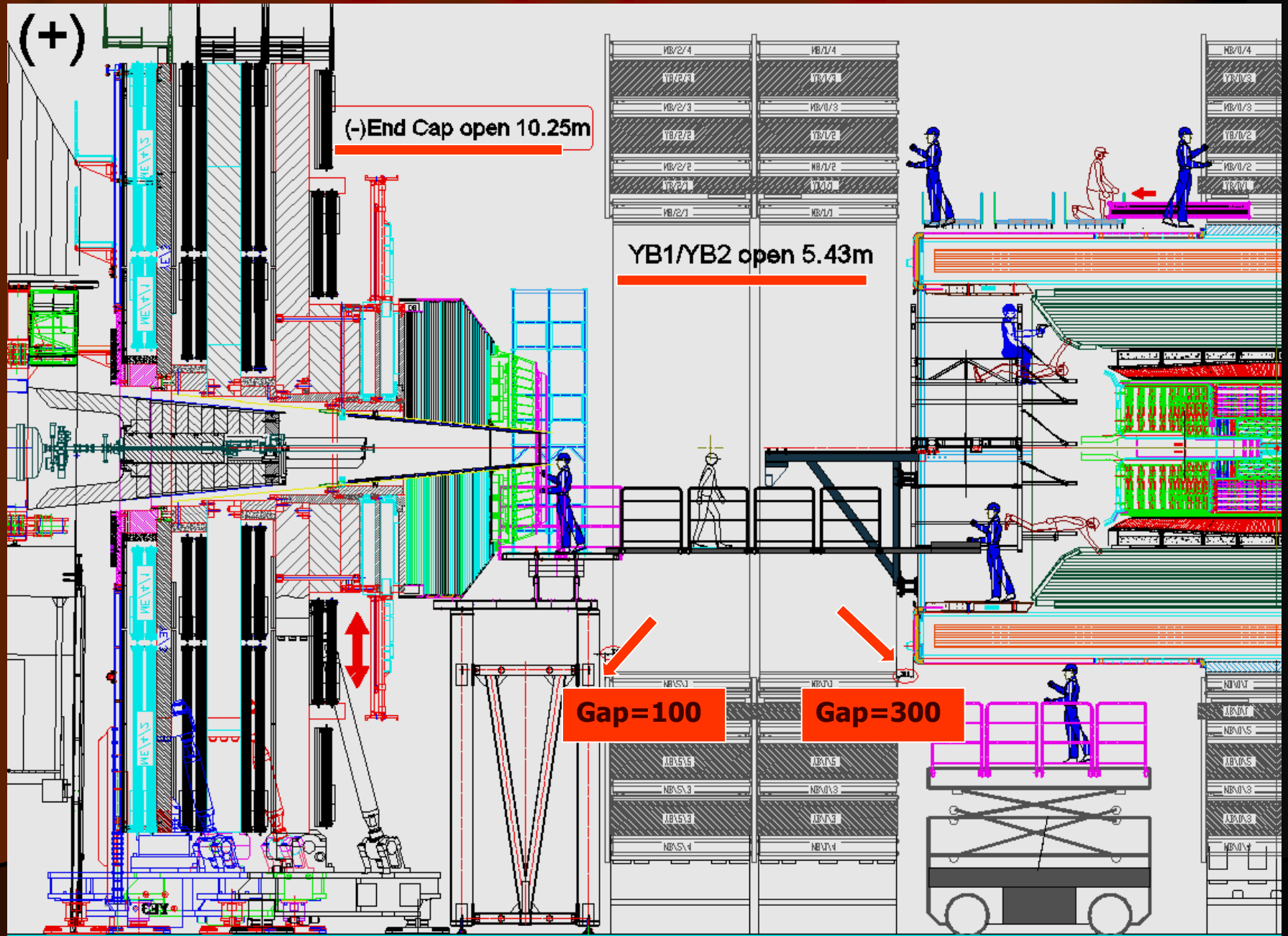


TK,EB,HB,EE maintenance (-)side. Top view

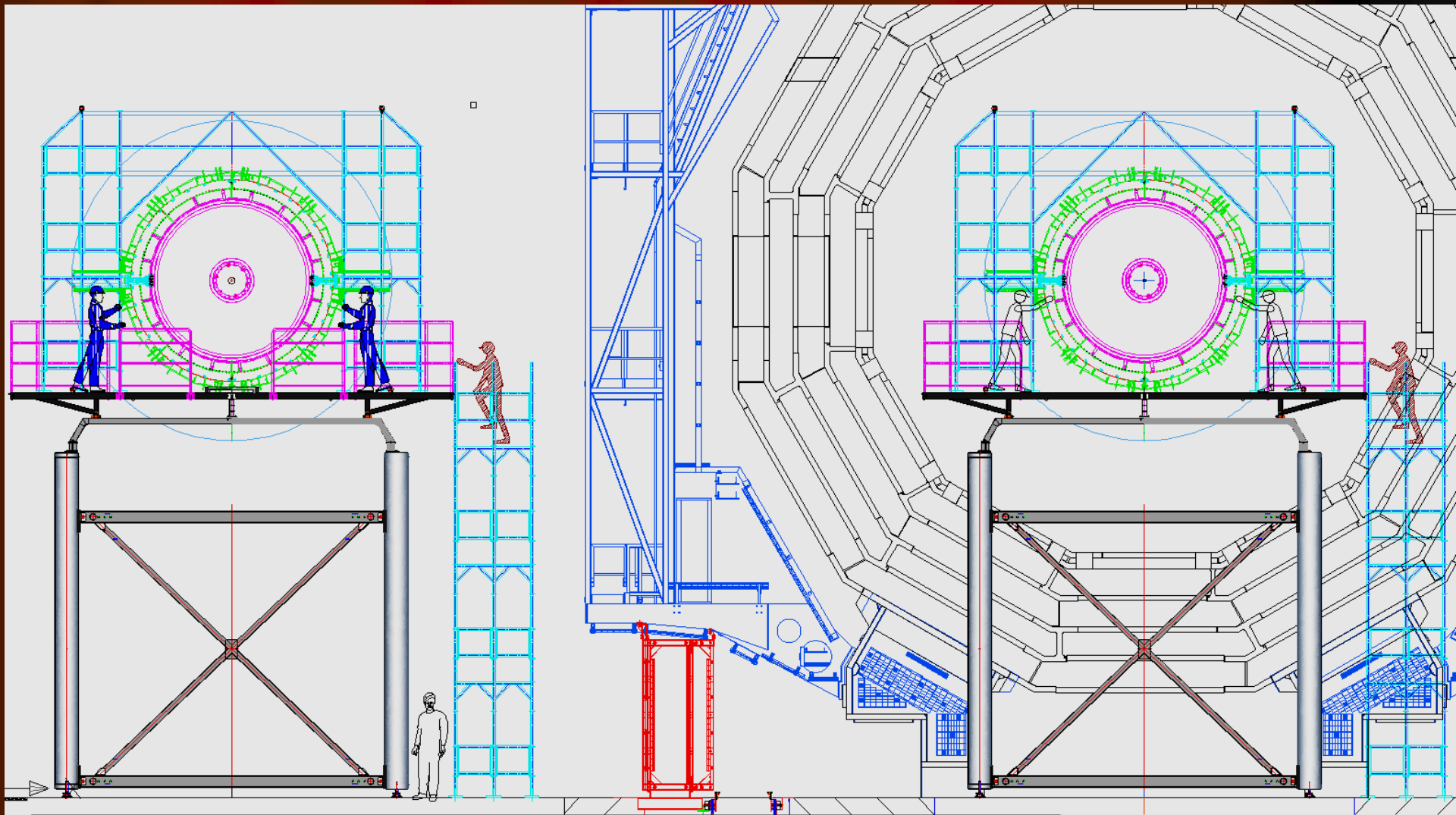
YB1/YB2 open 5.53m



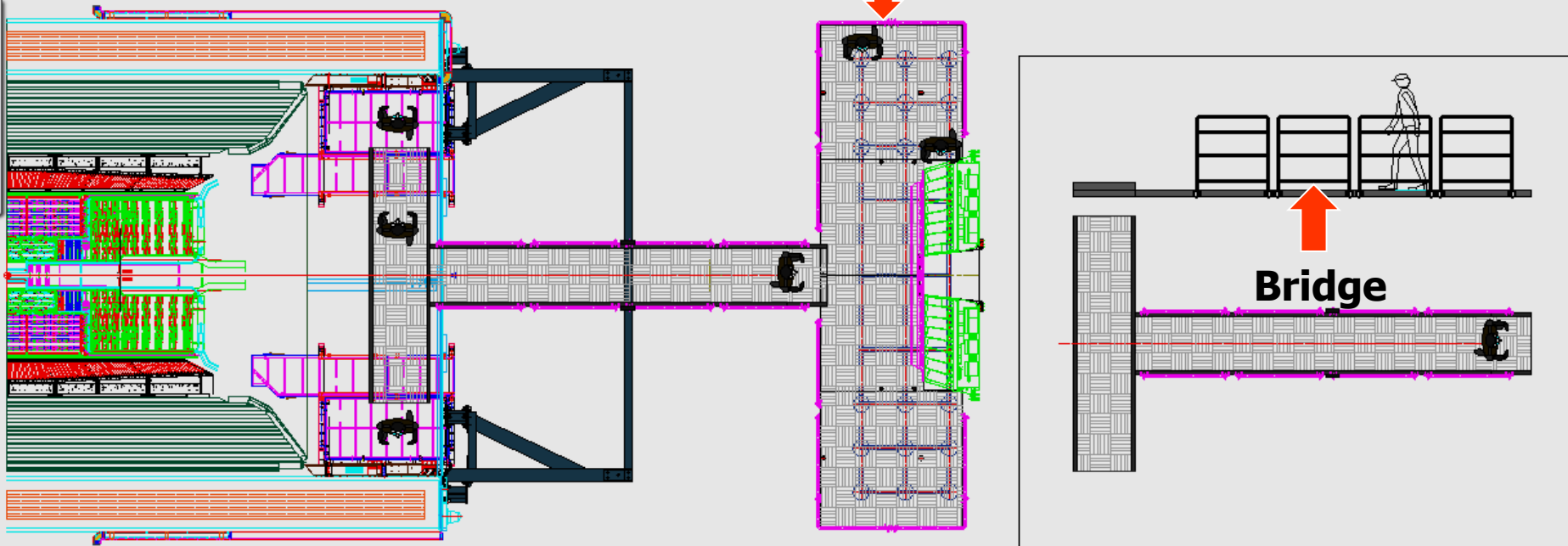
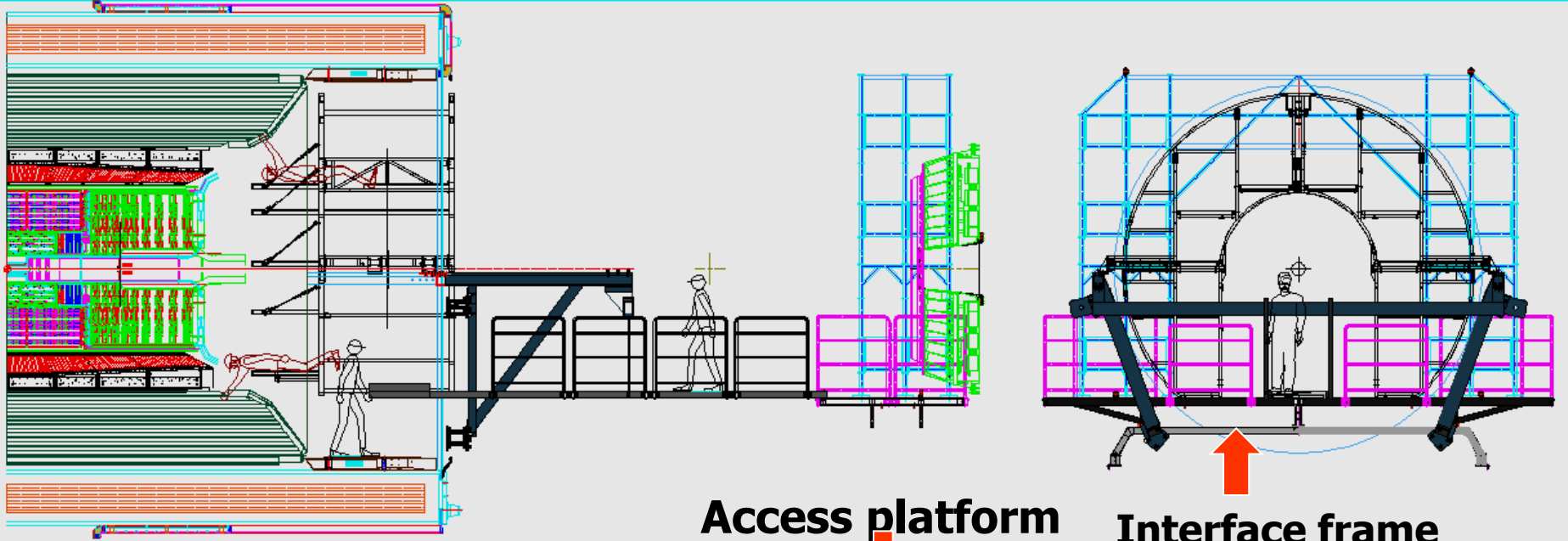
YB0-YB1, HB, EE, ME1/1 maintenance (+)side



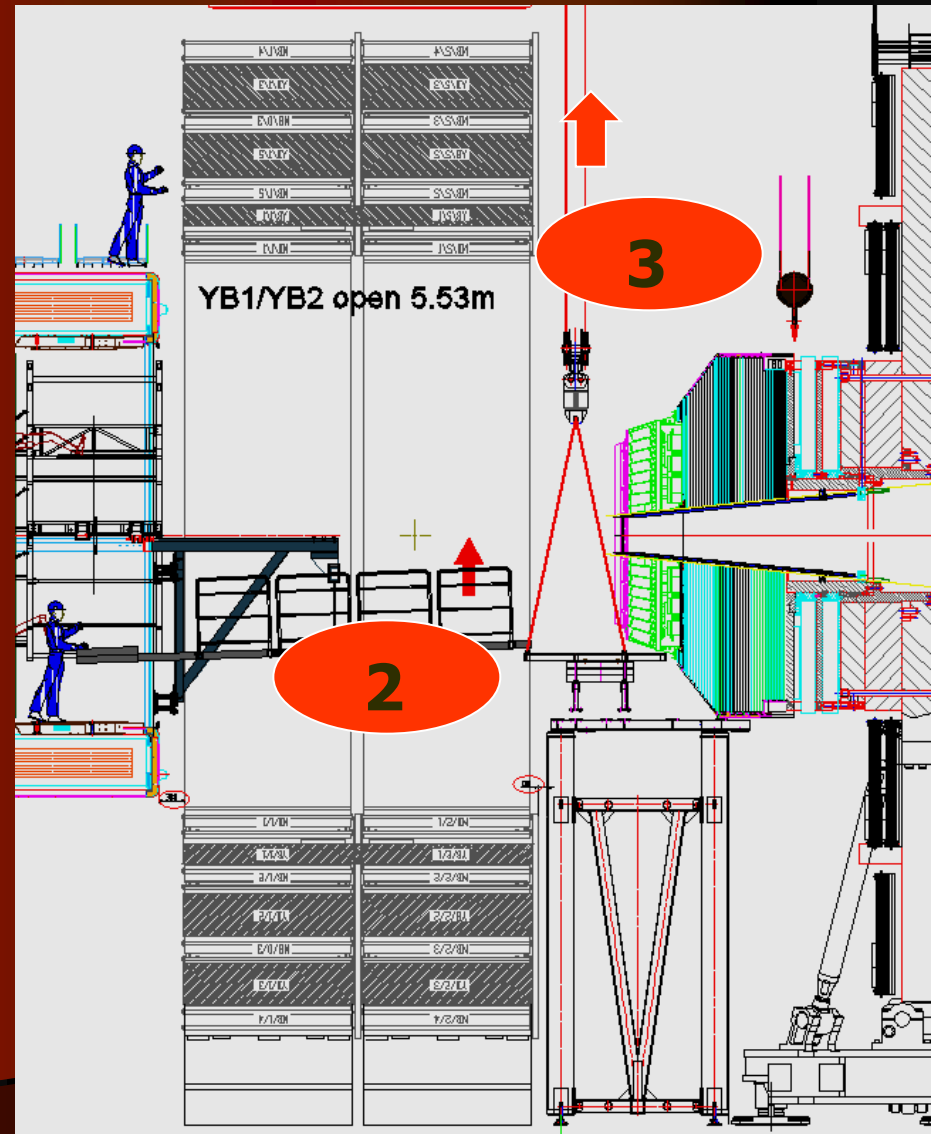
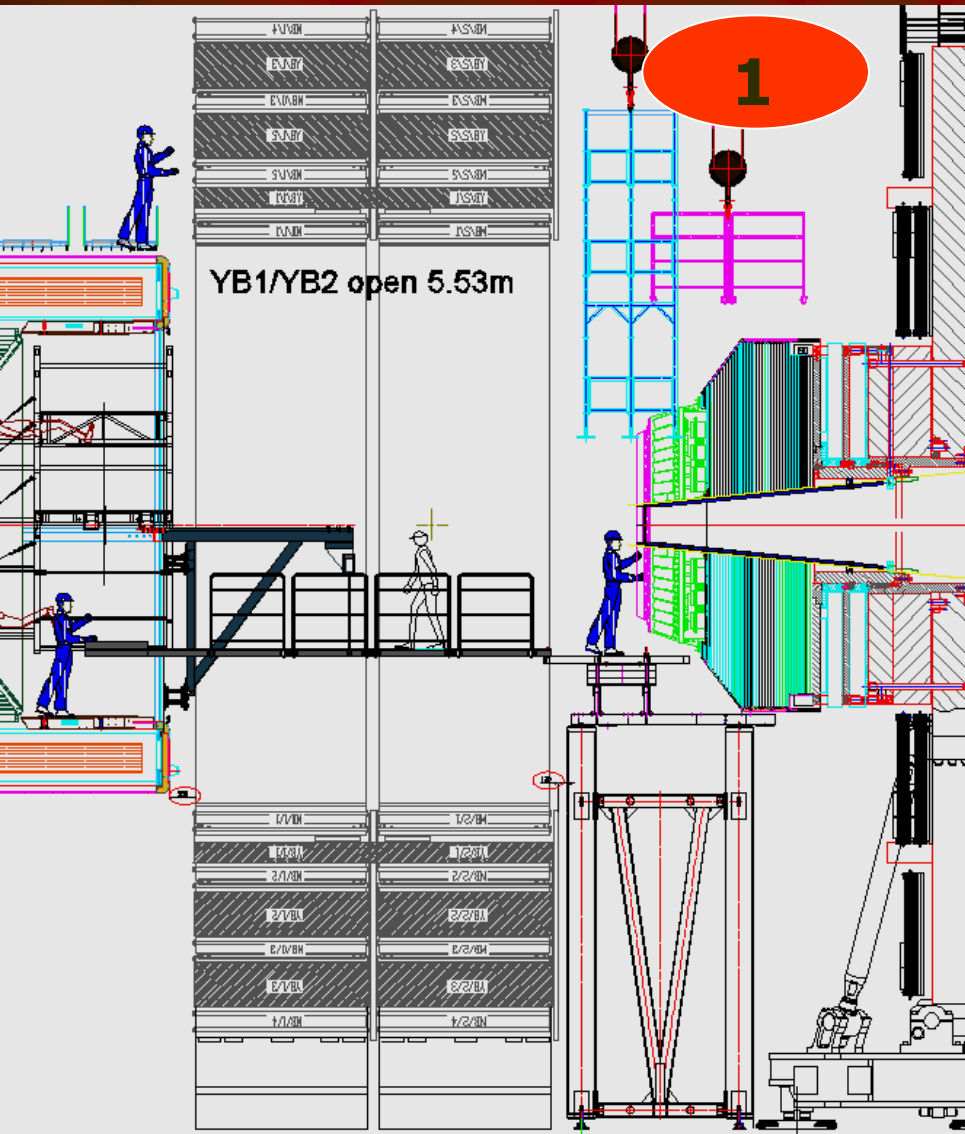
HB/EB/TK/PIXEL, EE/ES maintenance (Tooling)



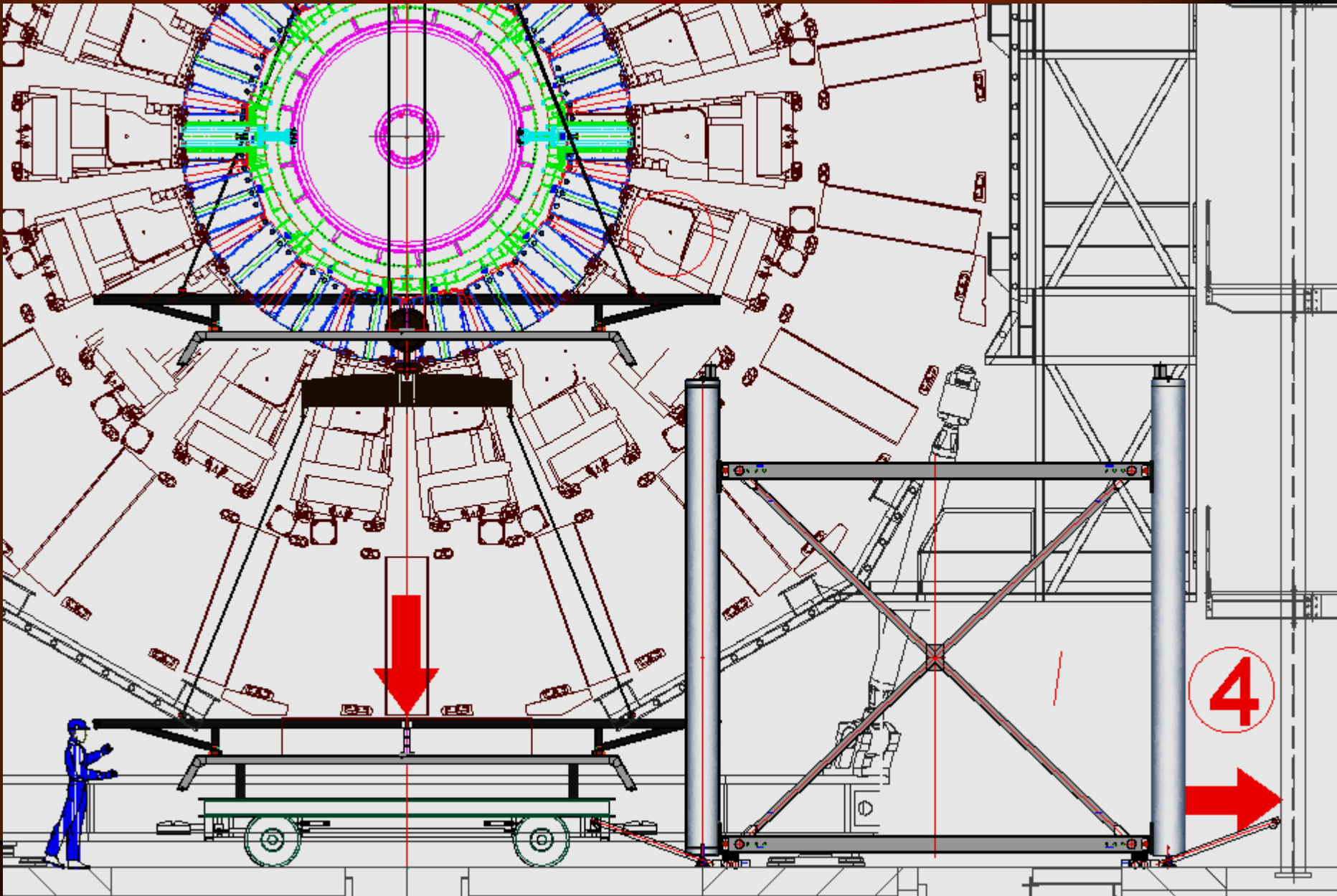
HB/EB/TK/PIXEL,EE/ES maintenance (Tooling)



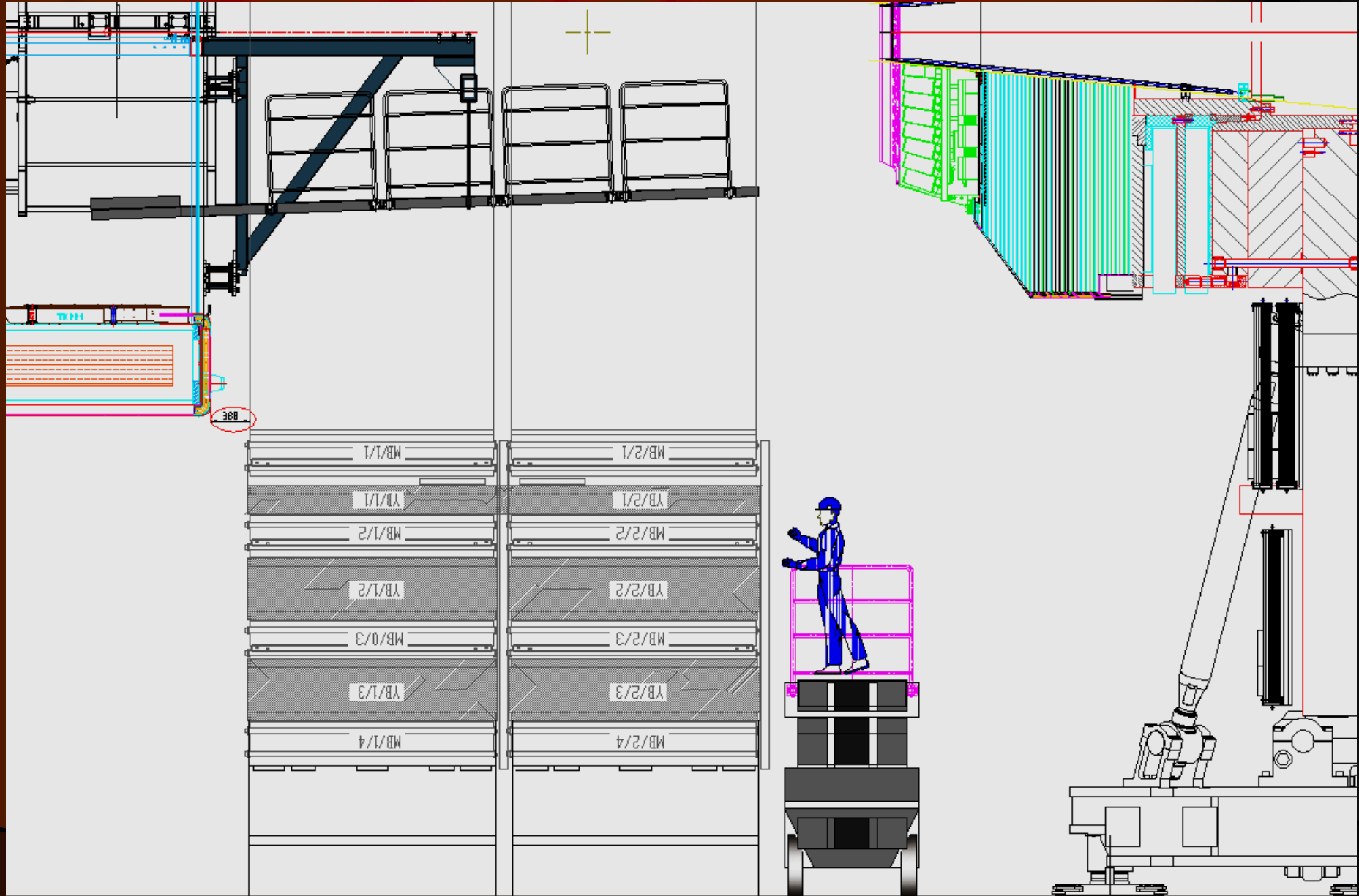
"Gasprom" platform remove (sequence operations)



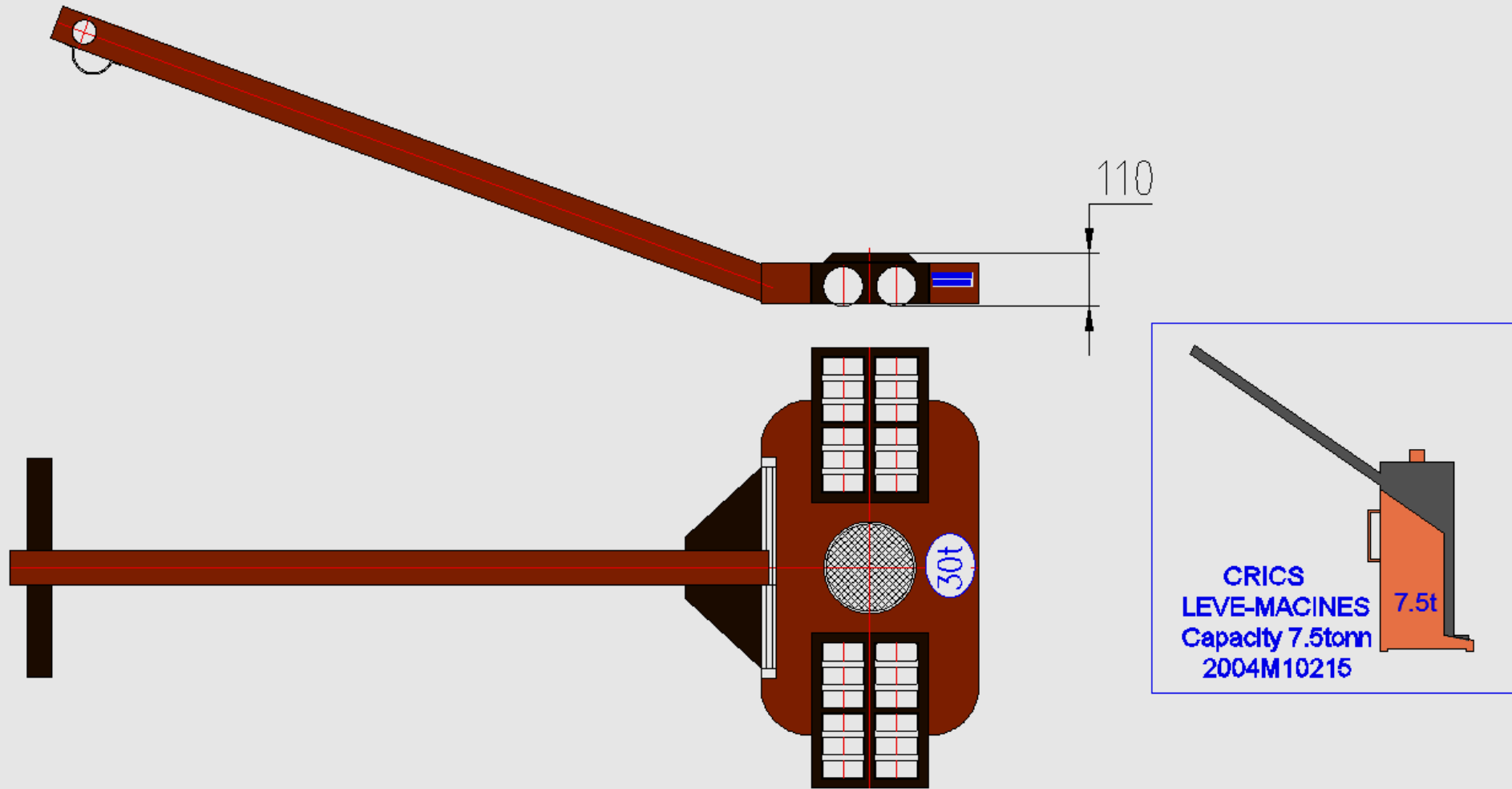
Gasprom" platform remove (sequence operations)



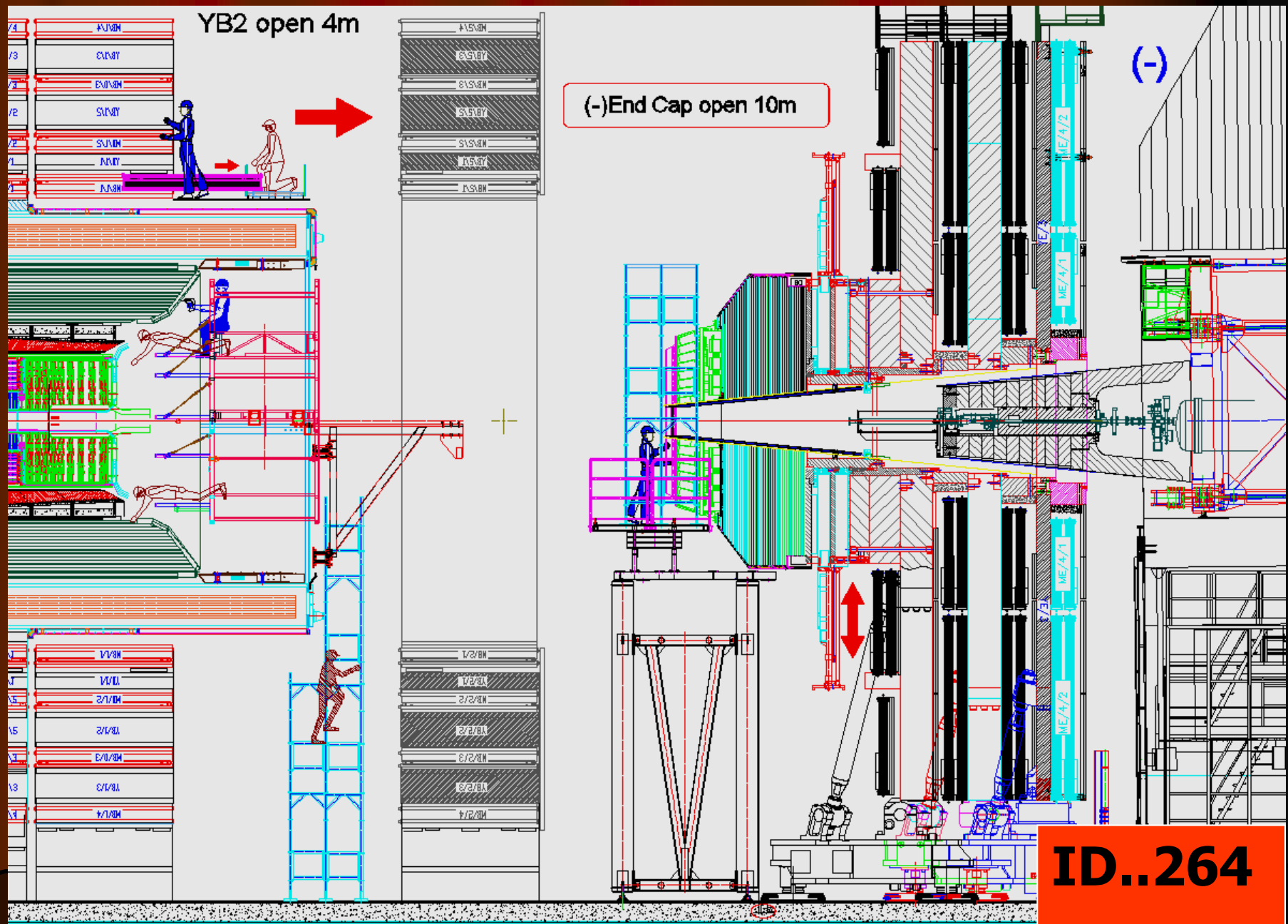
YB2 maintenance



Tooling for lifting & move "Gasprom" platform



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



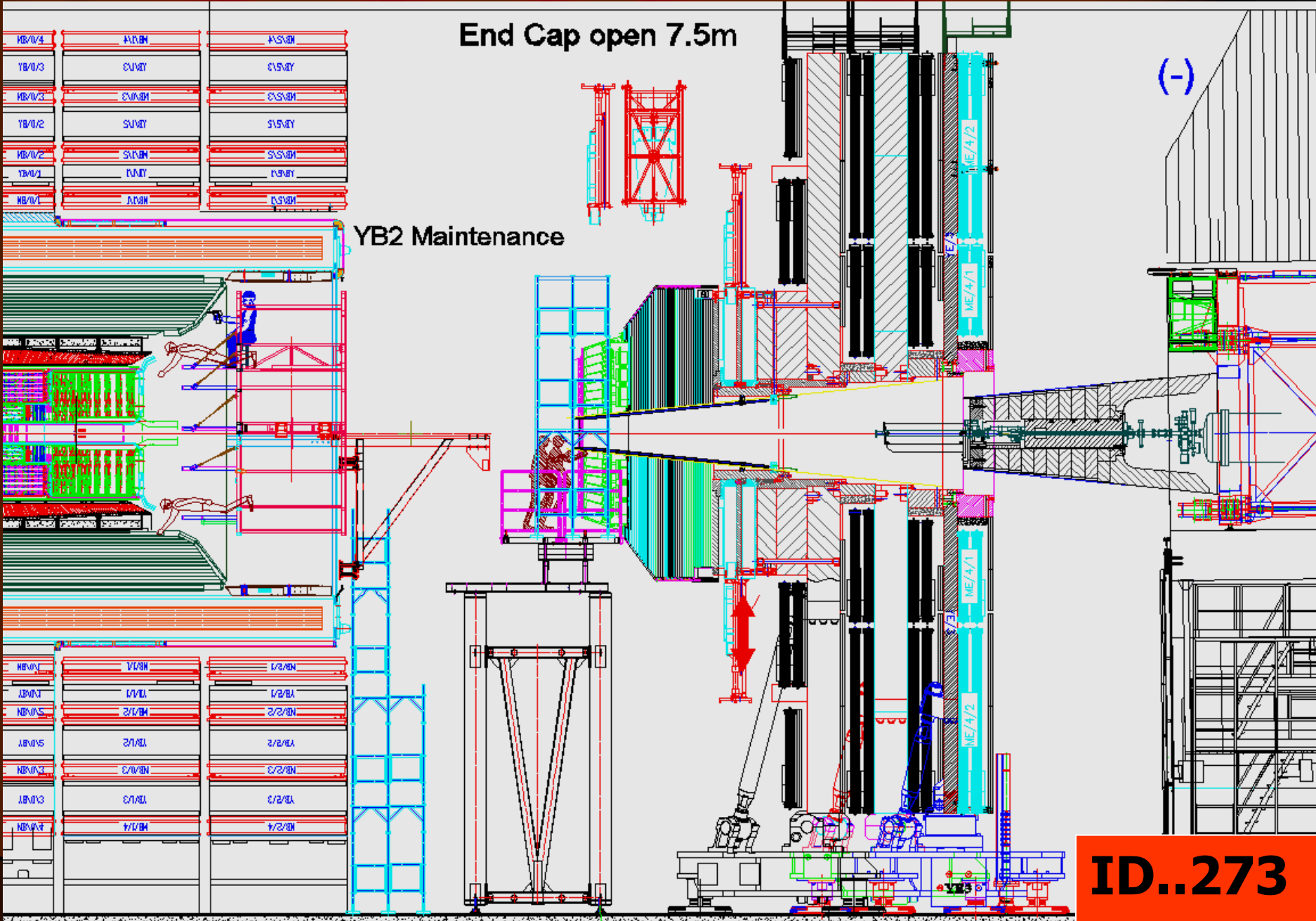
ID..264

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

End Cap open 7.5m

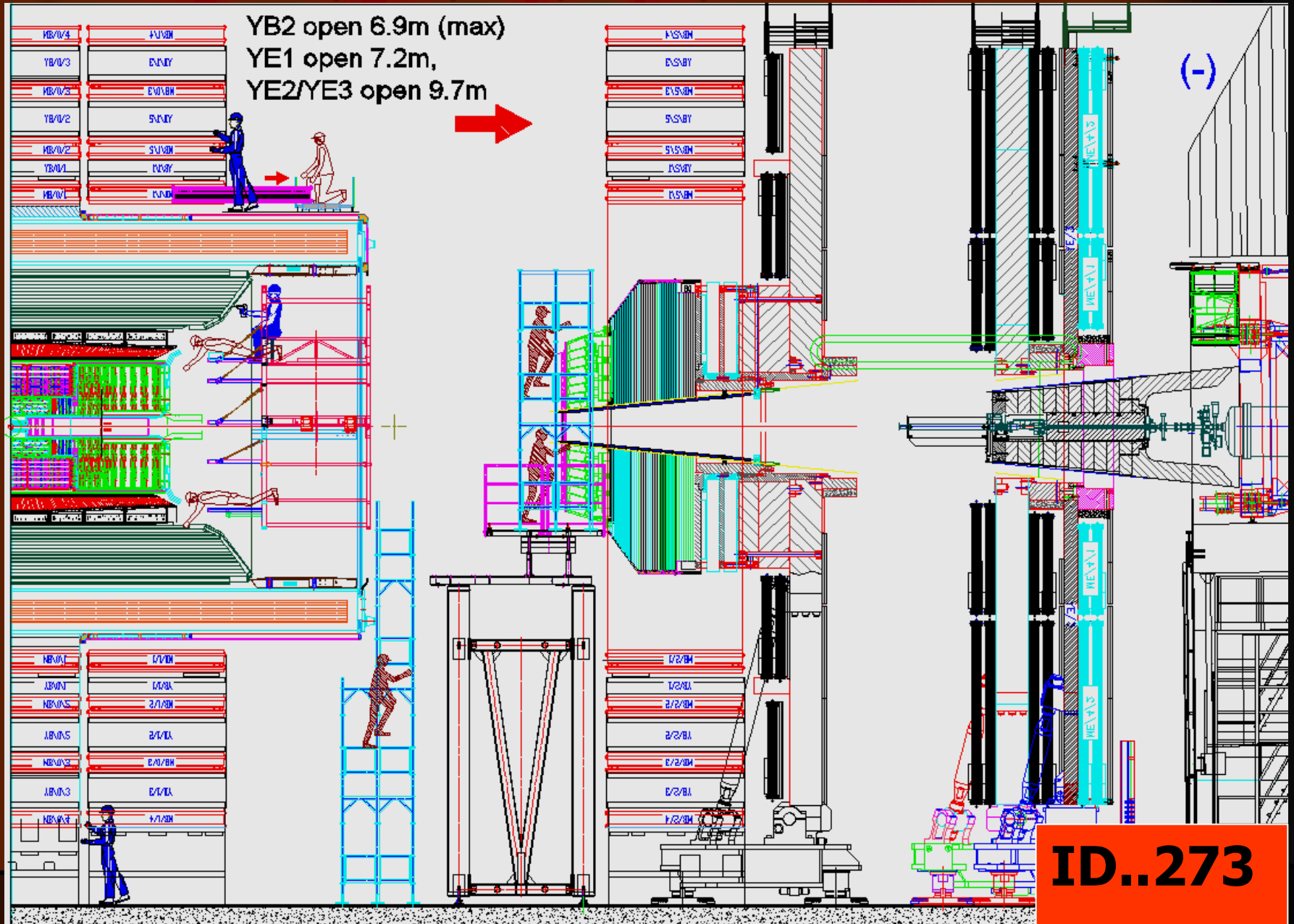
(-)

YB2 Maintenance



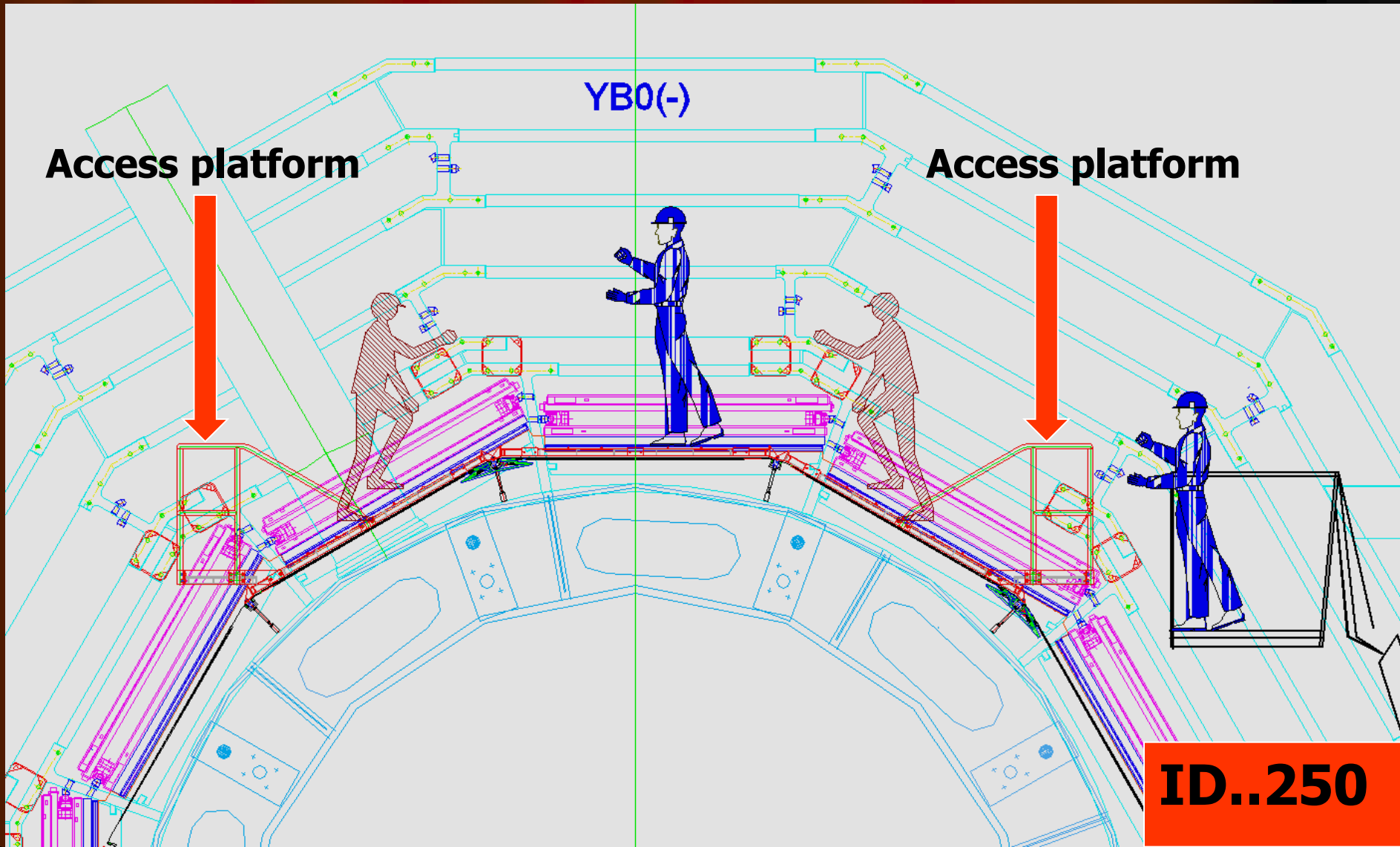
ID..273

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



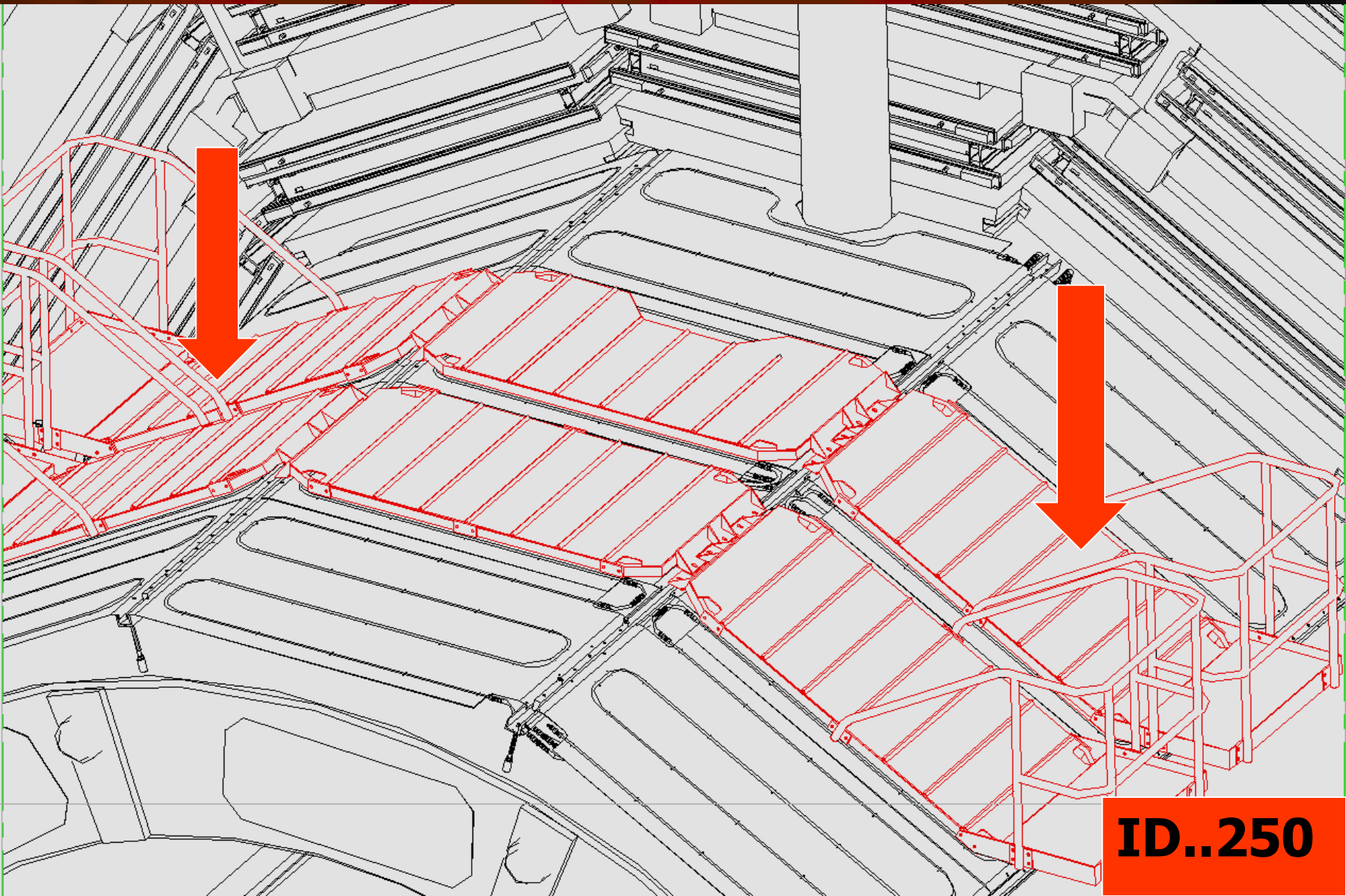
ID..273

YB0/YB1/YB2/ maintenance (LS1)



ID..250

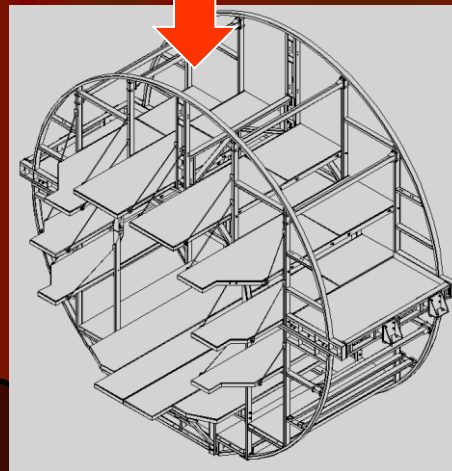
YB0/YB1/YB2 maintenance (LS1)



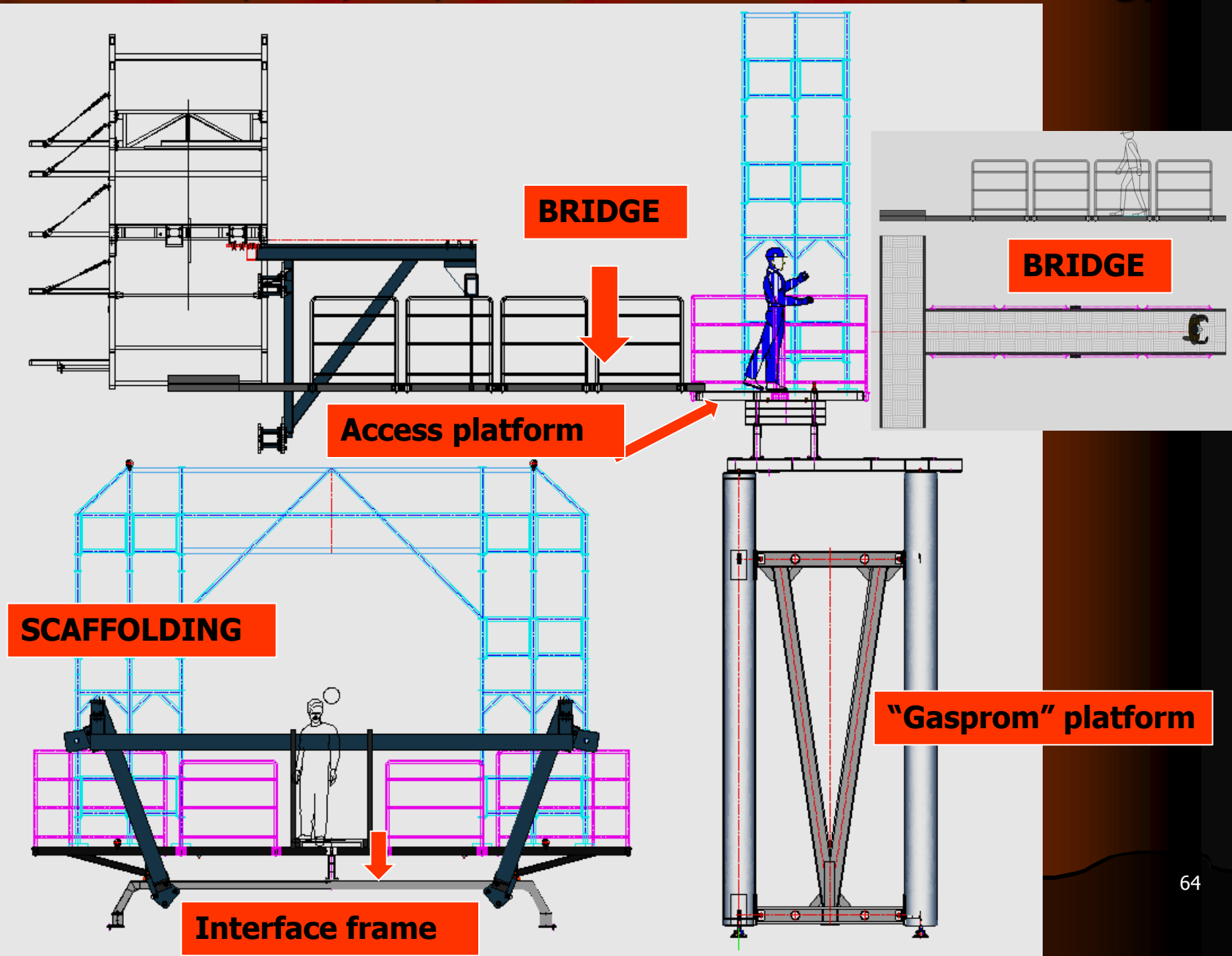
ID..250

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)



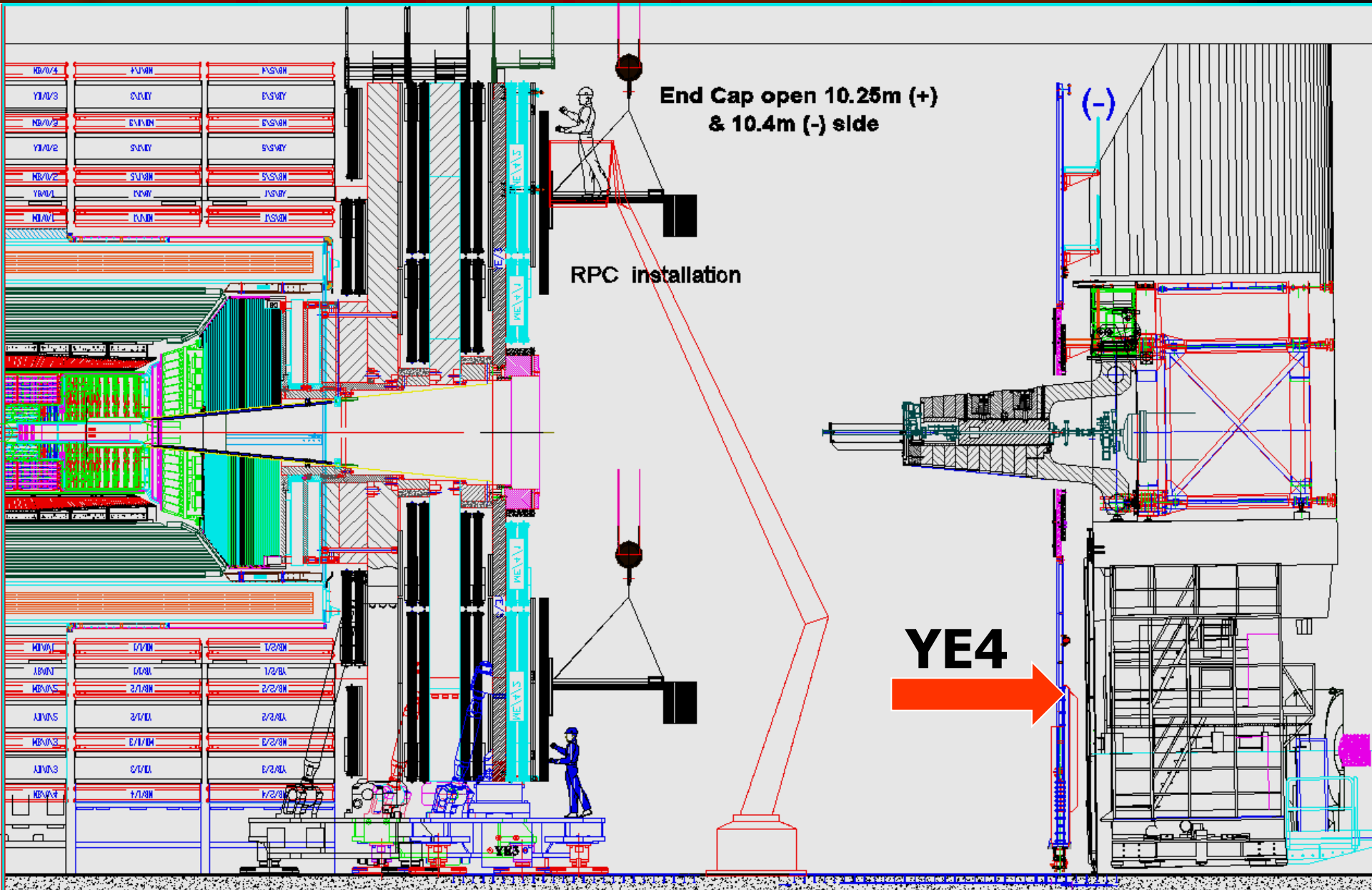
YB0-YB1, HB, EE, ME1/1 maintenance (Tooling)



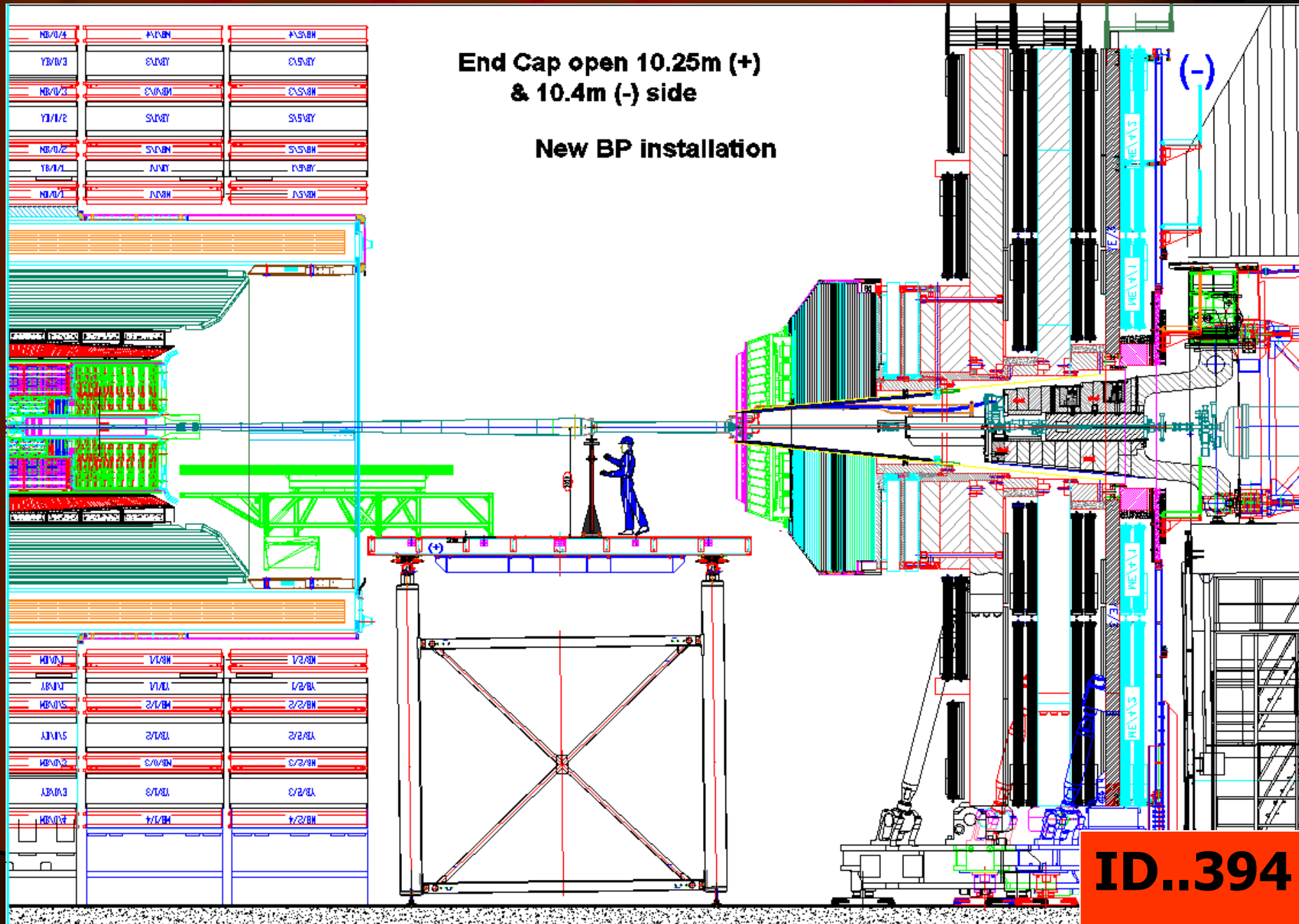
ME, RPC Installation

(LS1)

ME/RPC installation (LS1)



New BP installation



ID..394

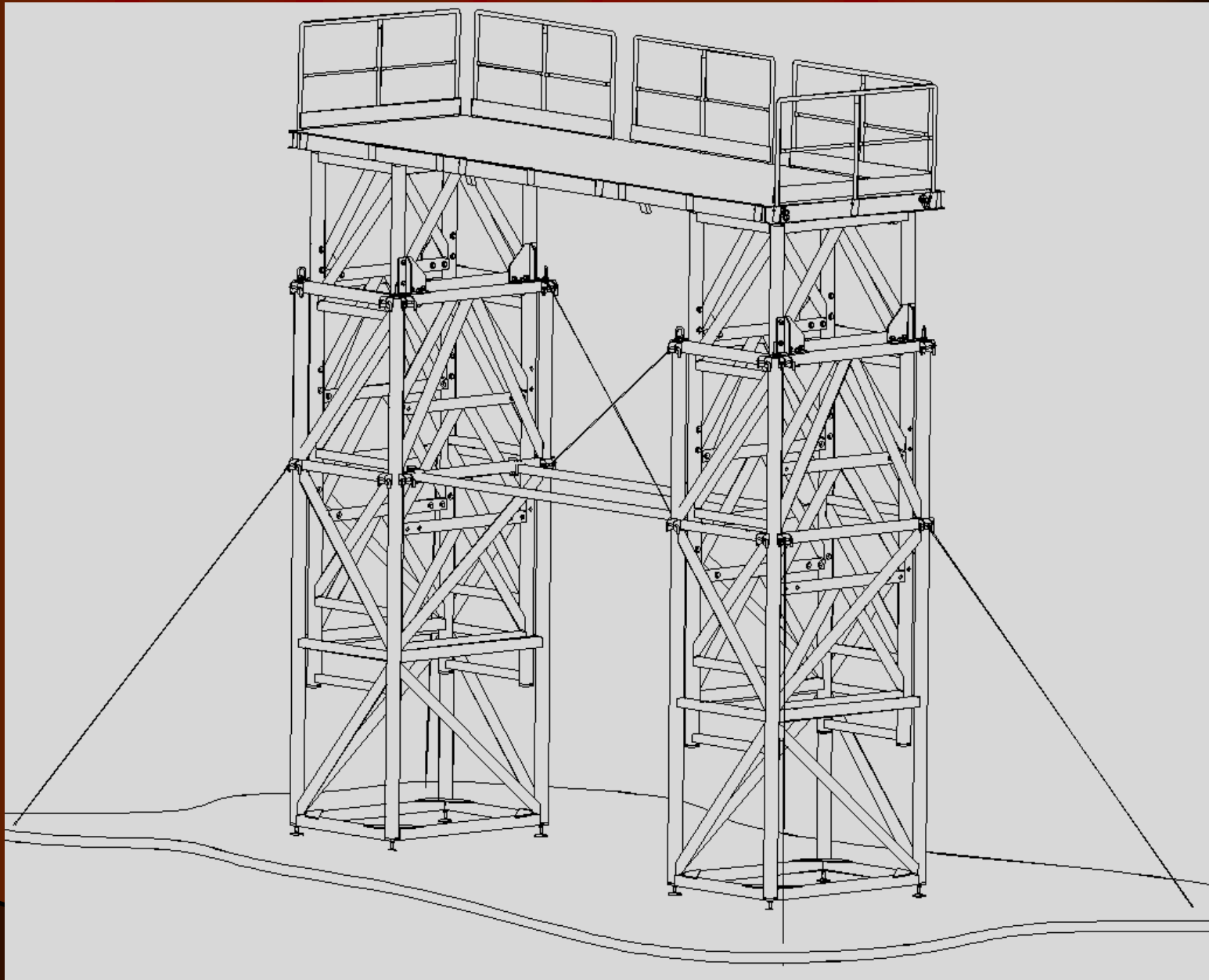
APPENDIX

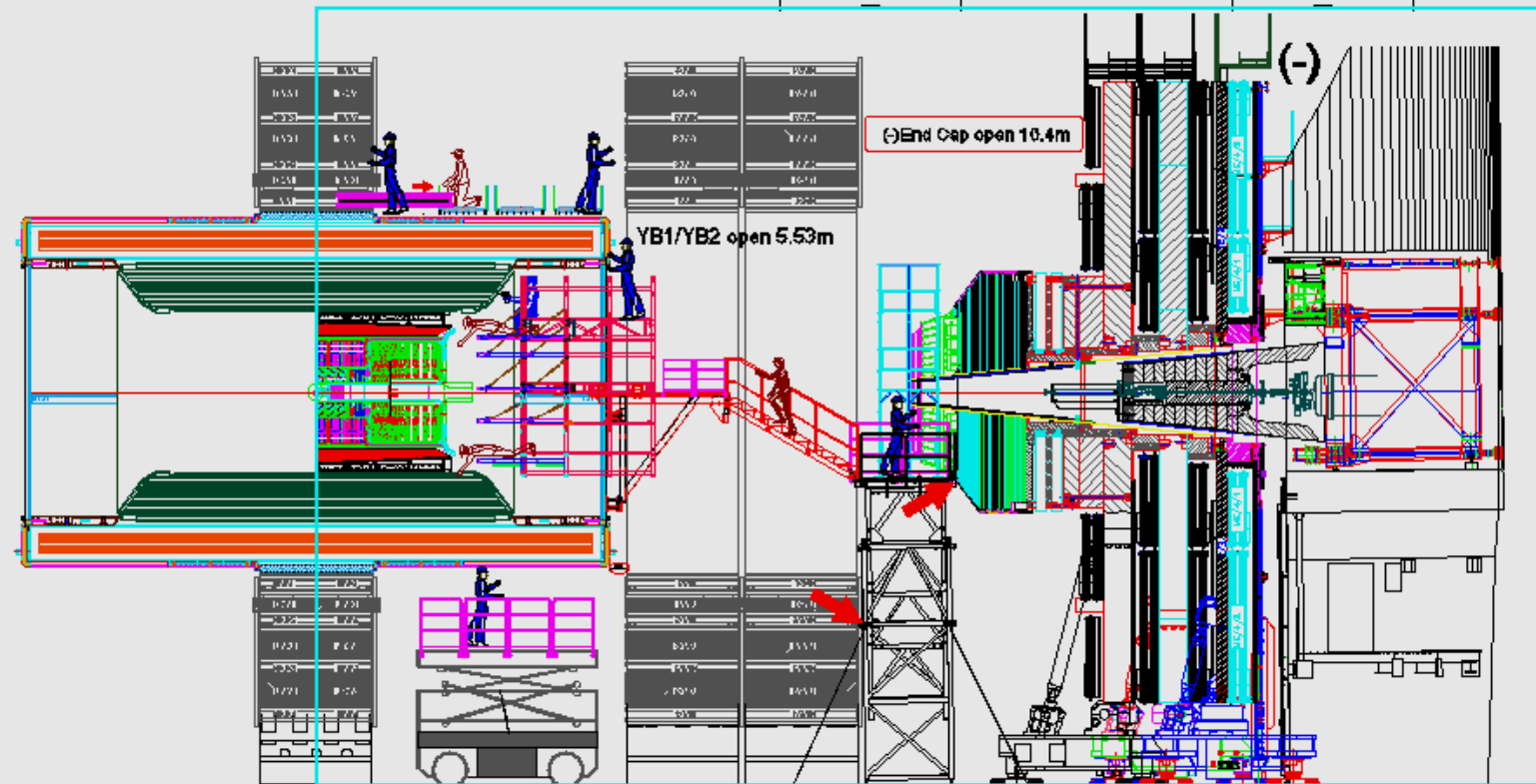
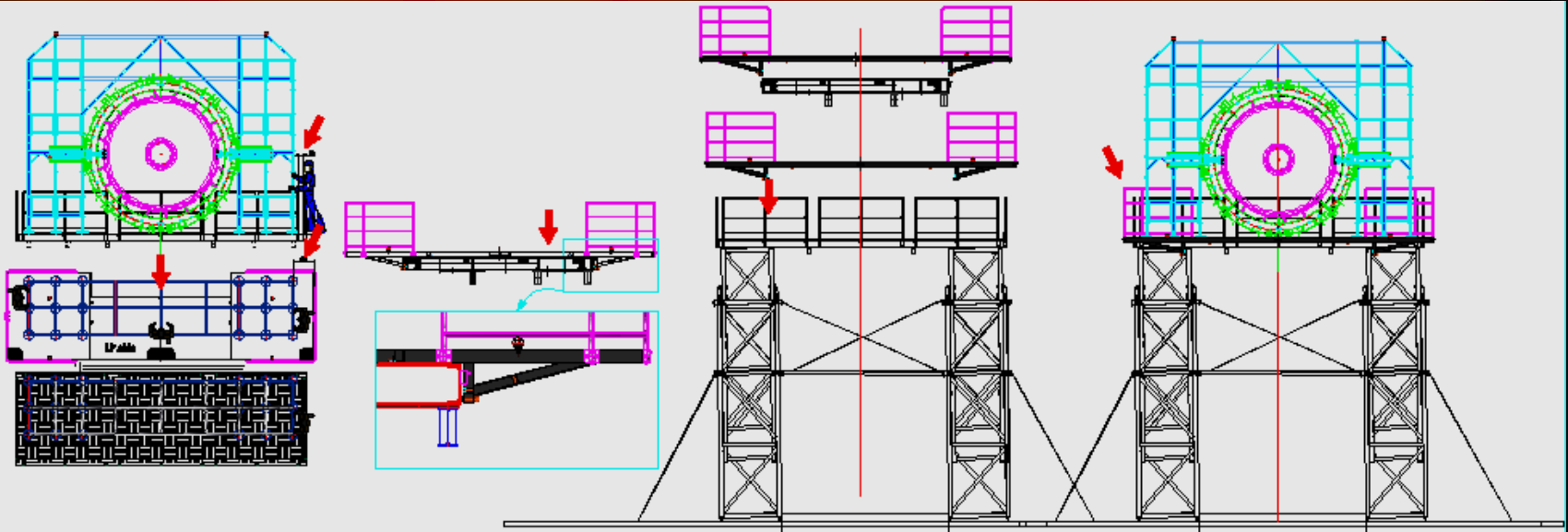
“YELLOW” TOWER SYSTEM USING

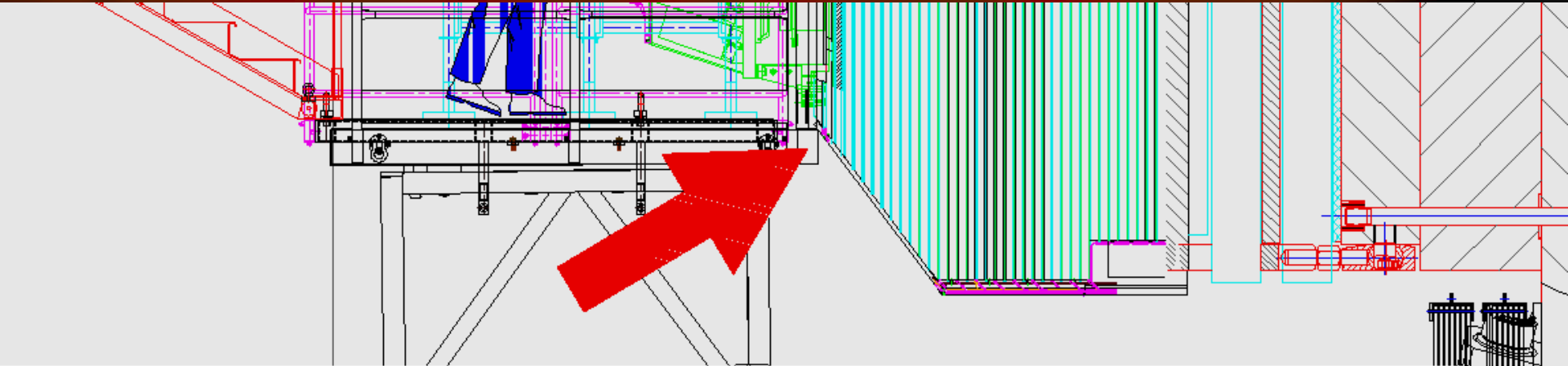
(Boki, J.Boss & G.Faber proposal)

It's reasonable or not?

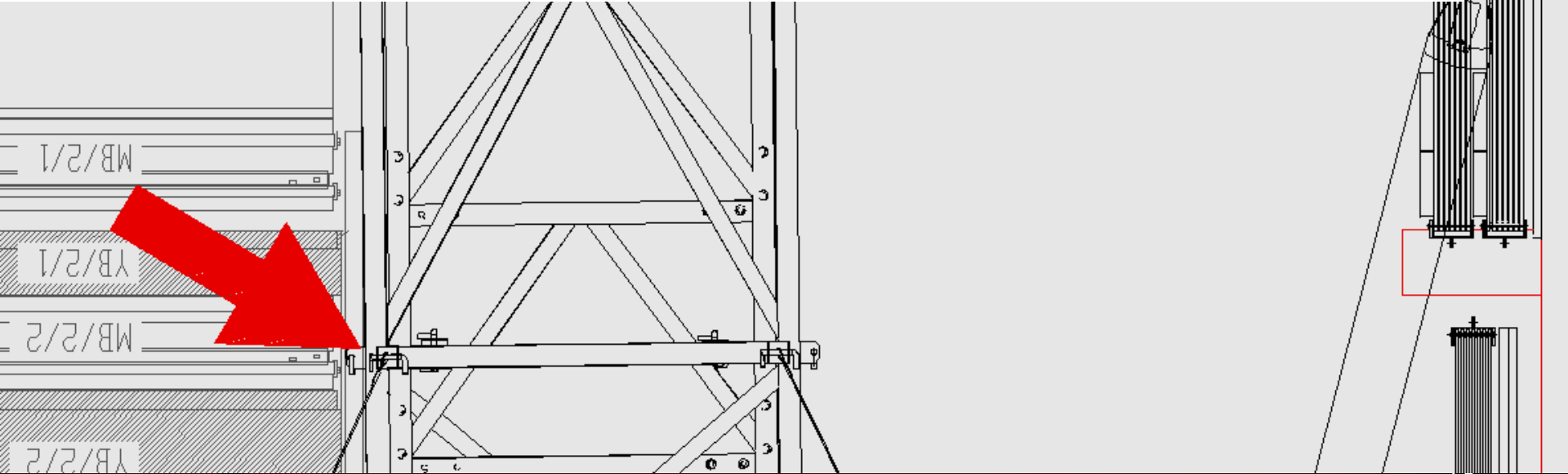
"ELLOW" TOWERS SYSTEM

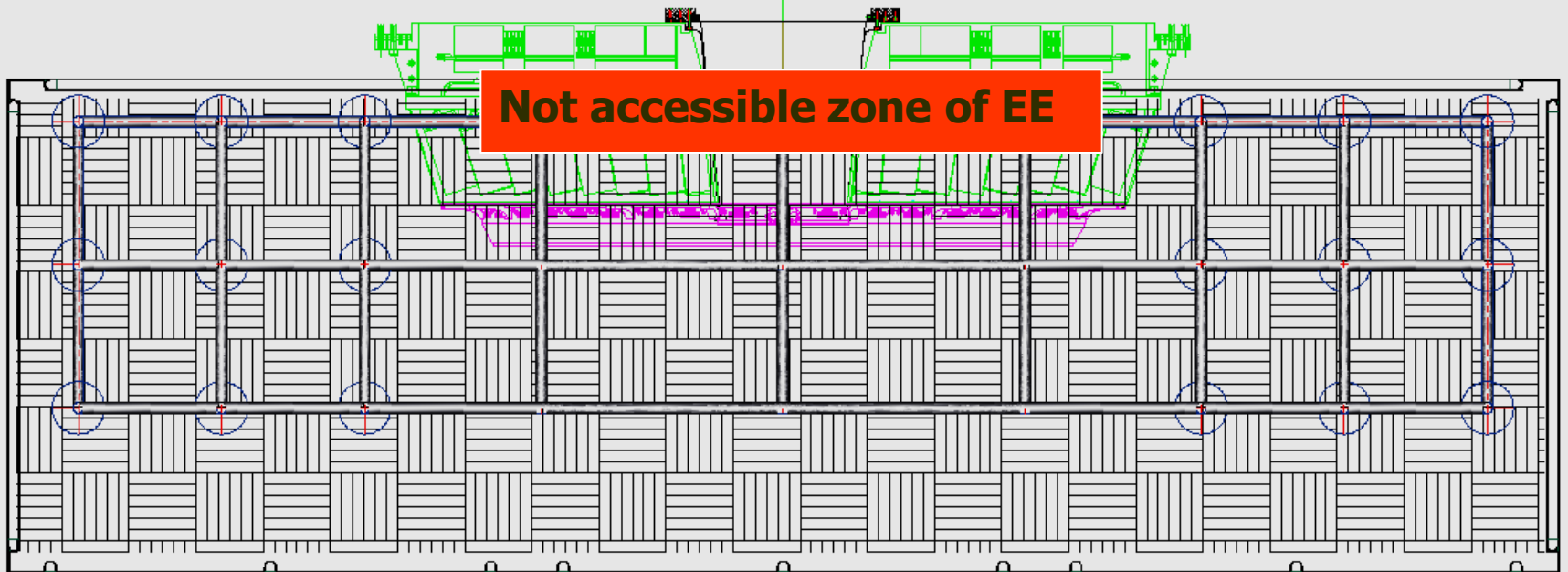
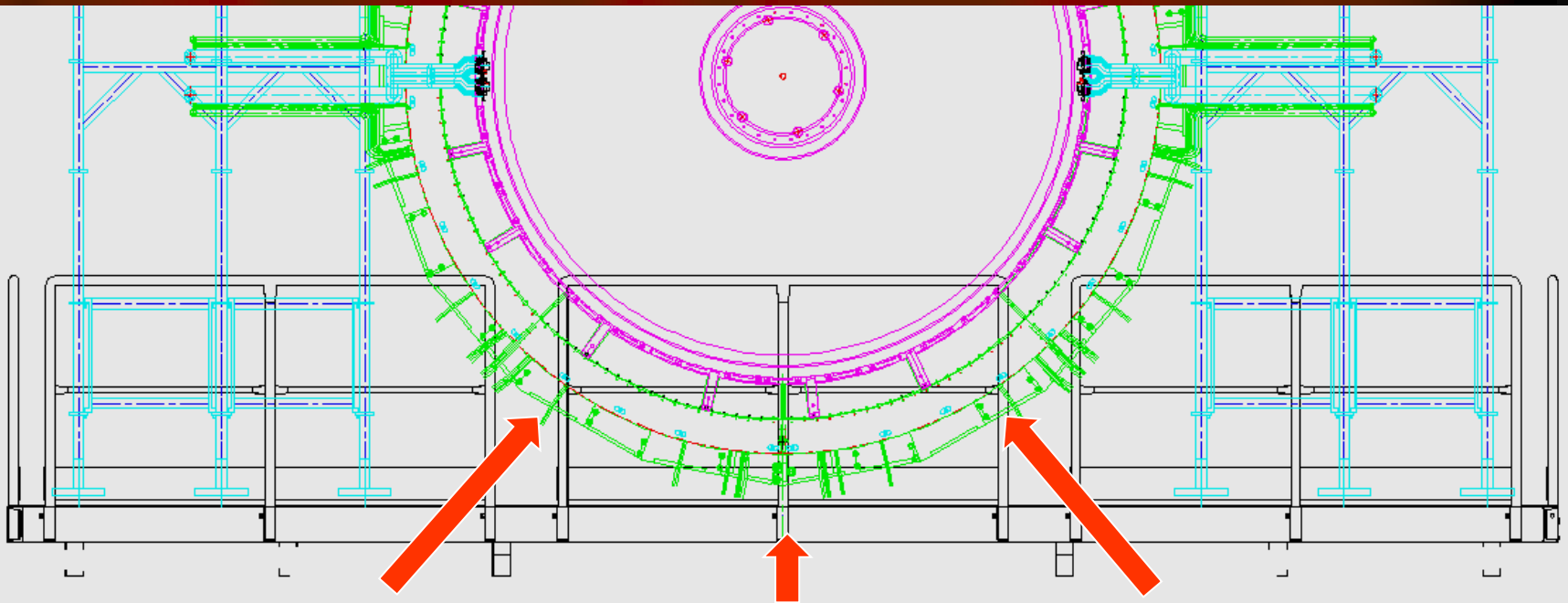




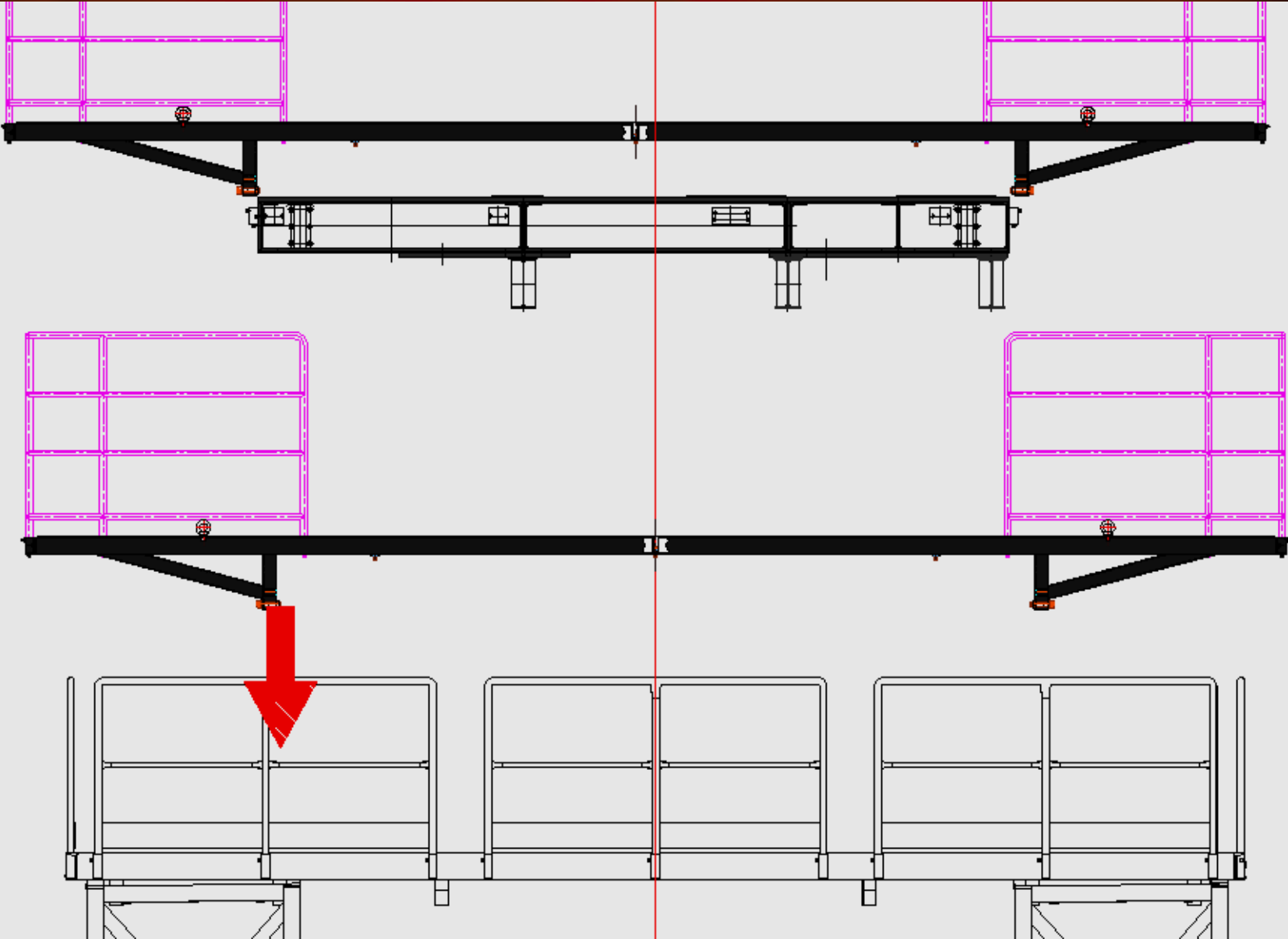


Conflicts & access blocking to EE PP





EE Access platform/Tower interface (not compatible)



EE Access platform/Tower interface (not compatible)

