



WBS 6 Common Projects

Dick Loveless

DOE/NSF Review

19 May 1998



CMS Common Projects

- **Magnet**

	MCHF
• Barrel Yoke	31.2
• Endcap Yoke	21.1
• Superconducting coil	64.7
• Installation	4.8
	<hr/>
	121.9

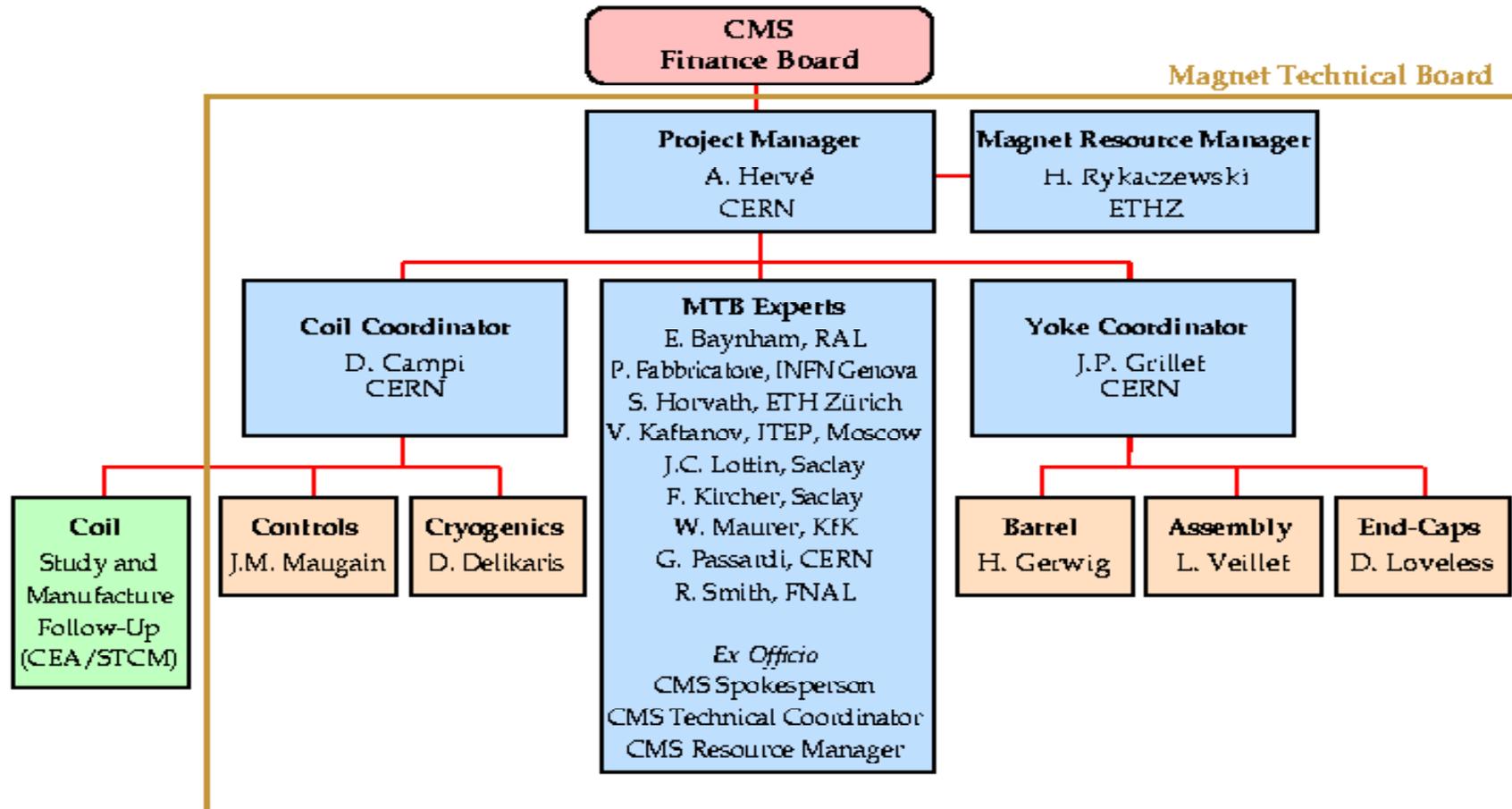
- **Computing**

• Computing infrastructure	3.6
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CMS Magnet Project

Magnet Project



CMS-TS-95.00018-970810



Magnet Project Status

- **TDR written in May '97, recommended by LHCC & RB, approved for construction by DG in Sept. '97**
- **Barrel Yoke contract (package A) signed Apr. '98 for 22.9MCHF**
- **Endcap Yoke bids opened Apr. '98, vendor will be selected by July '98**
- **Coil design contract signed with Saclay for 10.9MCHF**
- **Conductor geometry finalized**
- **Coil winding R & D at Ansaldo**
- **Tenders for coil (including winding) will be issued between July '98 and Mar. '99**



US Common Projects

- **Scope & Responsibility**
 - **Total US Common Projects = 22.25M\$**
 - **Package A (Fermilab) -- Barrel Return Yoke**
 - partial payment toward ETH contract
 - estimate approx. 7.7M\$
 - **Package B (Wisconsin) -- Endcap Return Yoke**
 - design and procurement of major items in endcap
 - estimate approx. 13.8M\$
 - **Computing infrastructure**
 - purchase file servers, licenses, etc.
 - estimate 753K\$ (assuming 1.5\$/CHF)



Endcap Iron Status

- **sent out RFI in July '97**
 - positive response from ~45 companies
- **visited most of larger vendors**
 - USA, France, Great Britain, Russia, China
- **complete reference design**
 - ~150 toleranced drawings
 - several independent FEA analyses
 - iron specifications
 - engineering notes
- **sent out RFP (request for proposal) on 6 Feb '98**
 - sent to 49 potential vendors
 - due 24 April '98



Endcap Iron Bid

- **formed an evaluation committee**
 - 1st meeting 29-30 April '98
 - preliminary look at bid results
 - assignment of homework:
 - design work
 - calculations
 - site visits
- **defined 12 packages of items**
 - 16 vendors bid on at least 1 package
- **package 5 = all disks plus assembly at CERN**
 - 9 vendors bid on package 5
 - 5 vendors were close to estimate or below
 - negotiating with the lowest bidder



Endcap Iron Cost Estimate

	<u>MCHF</u>	<u>M\$</u>
endcap iron disks	14.0	9.3
design	1.2	0.8
engineering supervision	1.0	0.7
carts	1.2	0.8
ancillary parts	1.0	0.7
superbolts	0.8	0.5
spacer rings	0.6	0.4
supports (air pads)	1.0	0.7
HE supports	0.4	0.3
	<u>21.2</u>	<u>14.1</u>

- items in black have bids at or below estimate
- carts may be provided as "in-kind" by China
- ratio of CHF to \$ = 1.5



Endcap Iron Schedule

- **Evaluate proposals** **May-July '98**
- **Sign contracts** **Aug-Sept '98**
- **YE- delivered to CERN** **Mar 2001**
 - **assembly of YE-** **Mar-Aug 2001**
- **YE+ delivered to CERN** **May 2001**
 - **assembly of YE+** **Jul 01 - Jan 02**
- **Magnet test** **Oct 2003**

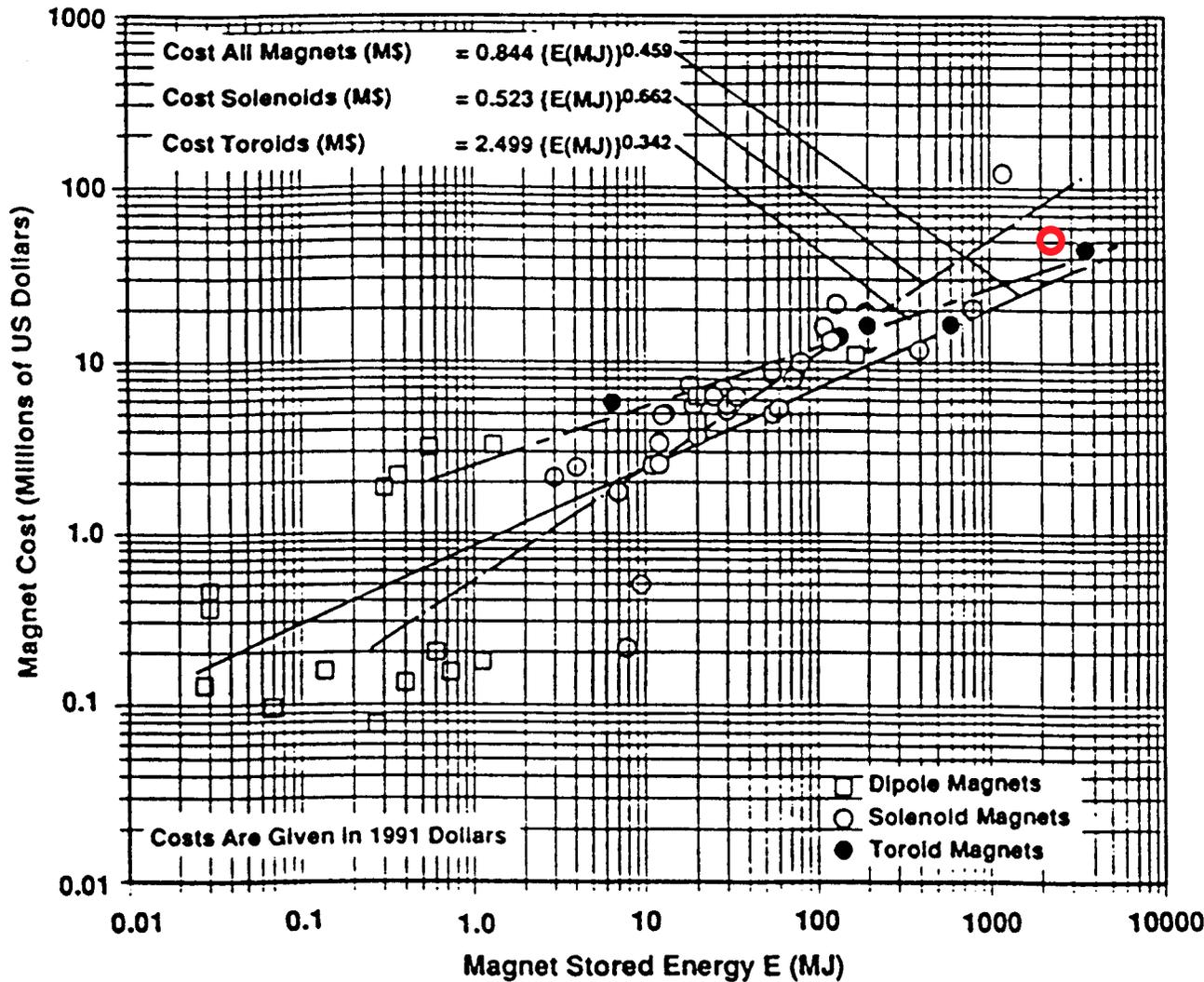


CP Financial Status

- **roughly 1/2 of Magnet is "committed"**
 - barrel yoke contract signed for 22.9MCHF
 - endcap yoke bids below 21.2MCHF estimate
 - coil design contract with Saclay for 10.9MCHF
- **good estimates for remaining large items**
 - coil winding (INFN/Ansaldo) - 15MCHF
 - superconducting cable (ETH-Zurich) - 17MCHF
- **estimate roughly 10MCHF possible overrun on remaining items**



Coil Cost Estimates



stored energy = 2.7GJ

cost = 64.7MCHF = 50M\$
(1998 \$)

cost = 43M\$ ('91\$)

Figure 1. Superconducting Magnet Costs Versus Magnet Stored Energy.



CMS Common Project Risk

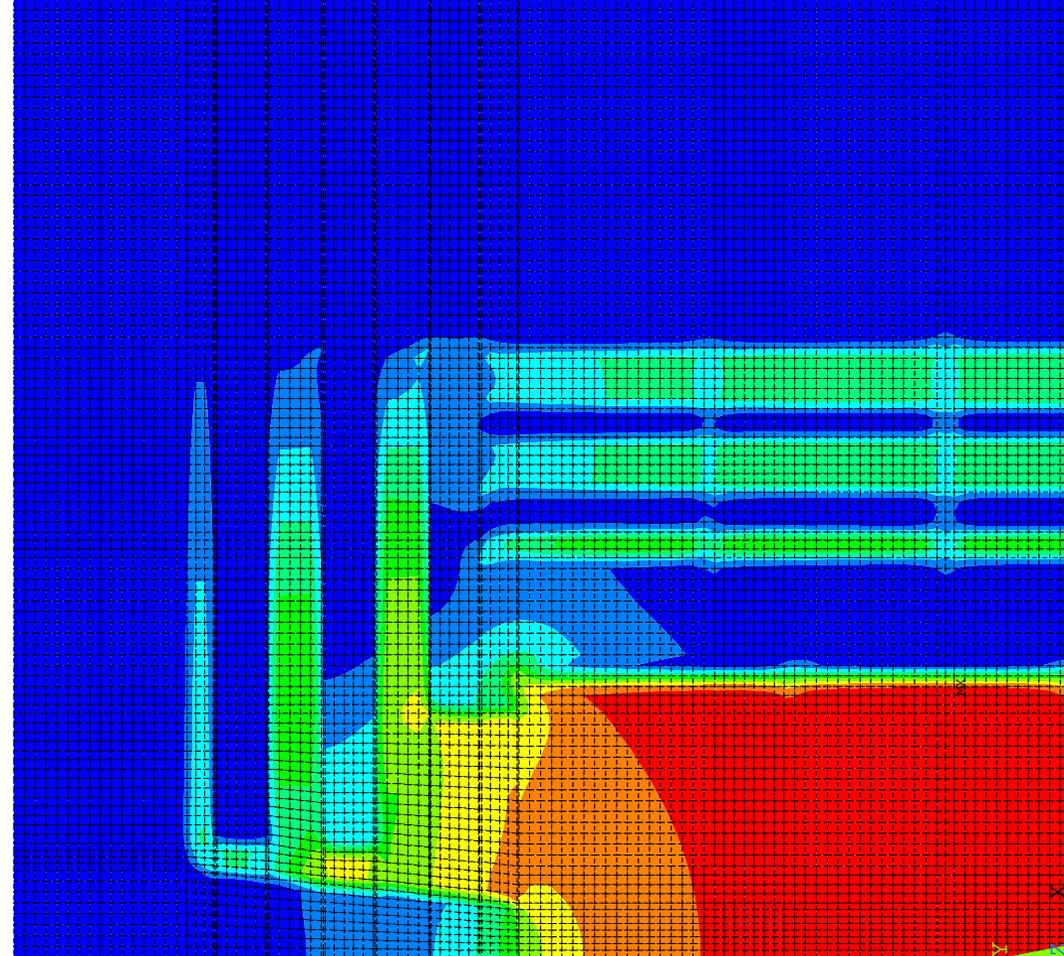
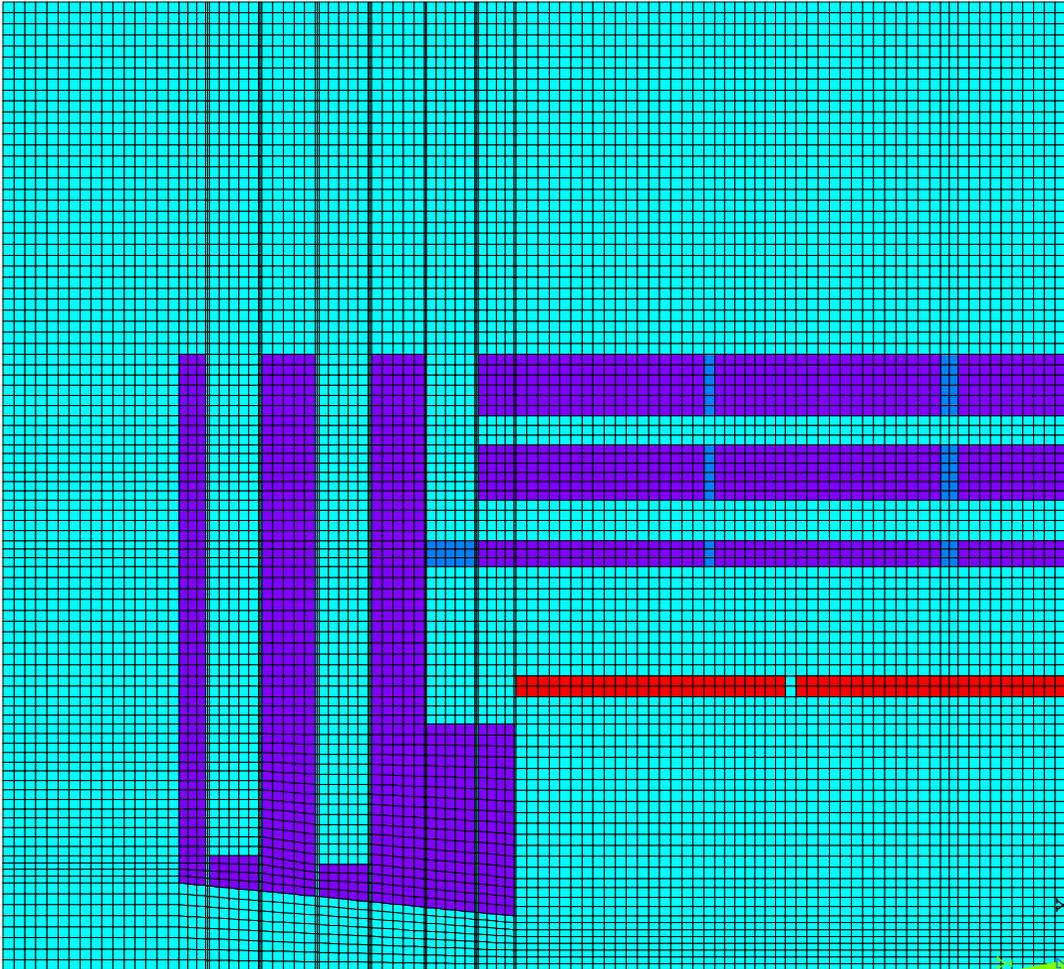
- **CP formula:**

$$\text{CP}\% = \frac{\text{CP costs}}{\text{CMS income} - \text{infrastructure}}$$

- based on present estimates each country must contribute 31%
- infrastructure is a fixed cost - CERN will absorb any increments
- CP costs are almost 1/2 fixed (barrel and endcap yokes, coil design), and risk on others seems small (~10MCHF)
- income risk small - only 5MCHF seems "at risk" (all CERN countries, US will contribute)
- **US responsible for ~20% of Common Projects Risk (~15MCHF)**
- **US contingency now at 5.3M\$ (6.9MCHF) - seems adequate**



CMS Magnetic Field





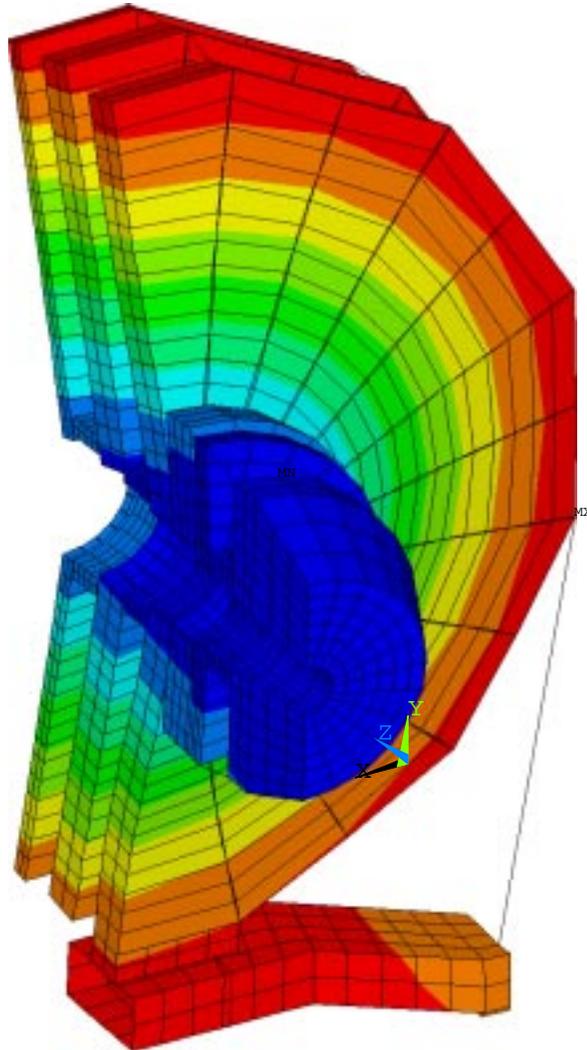
Endcap Magnetic Forces

<u>element</u>	<u>mag force</u>		<u>weight</u>
	(MN)	(tonnes)	(tonnes)
YE1 + nose	-61	6200	700
YE2	-17	1700	700
YE3	-2	150	280



Endcap Distortion

1

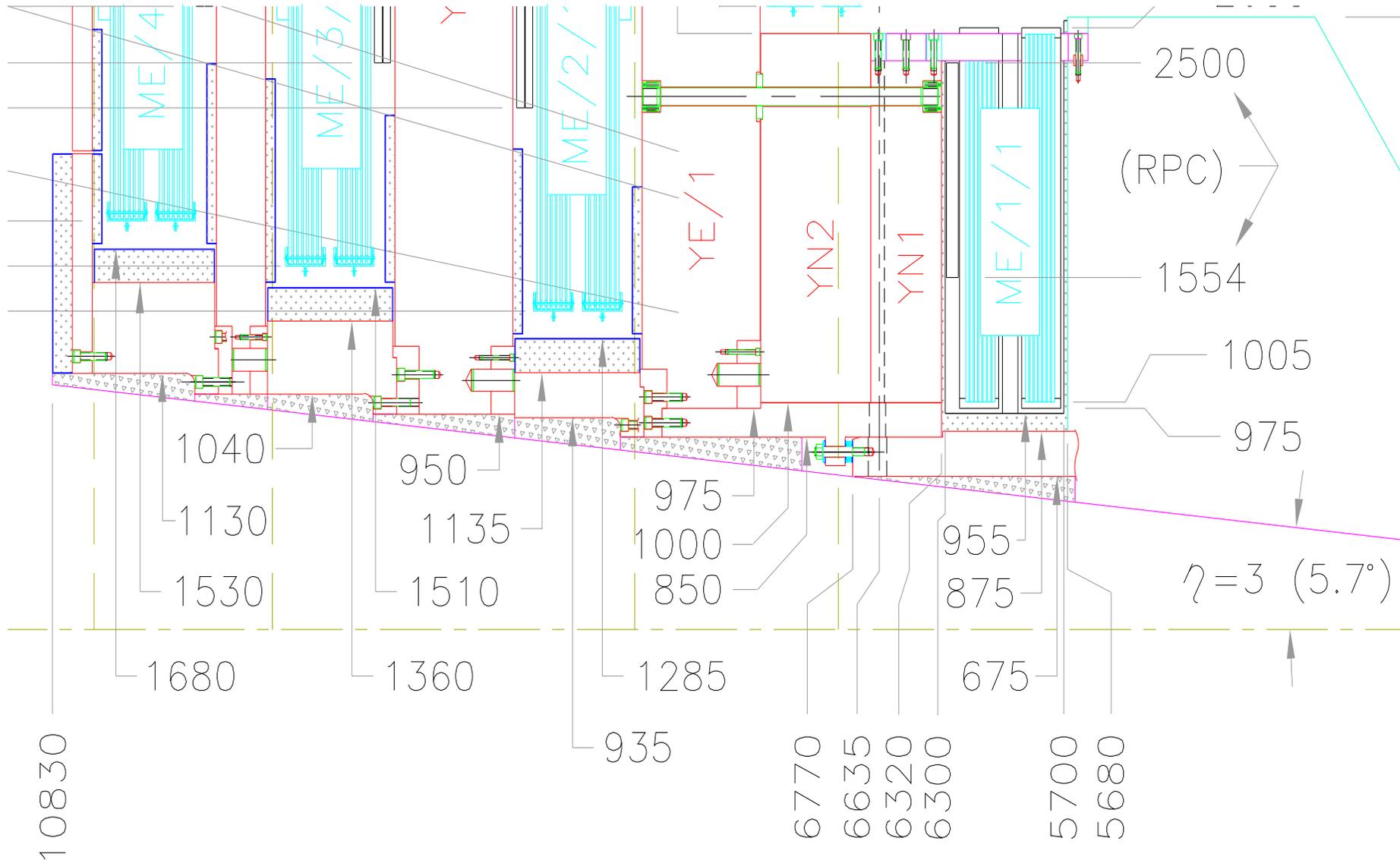


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■ .503E-03  
■ .002967  
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CMS Endcap - Magnetic and Gravity Loads

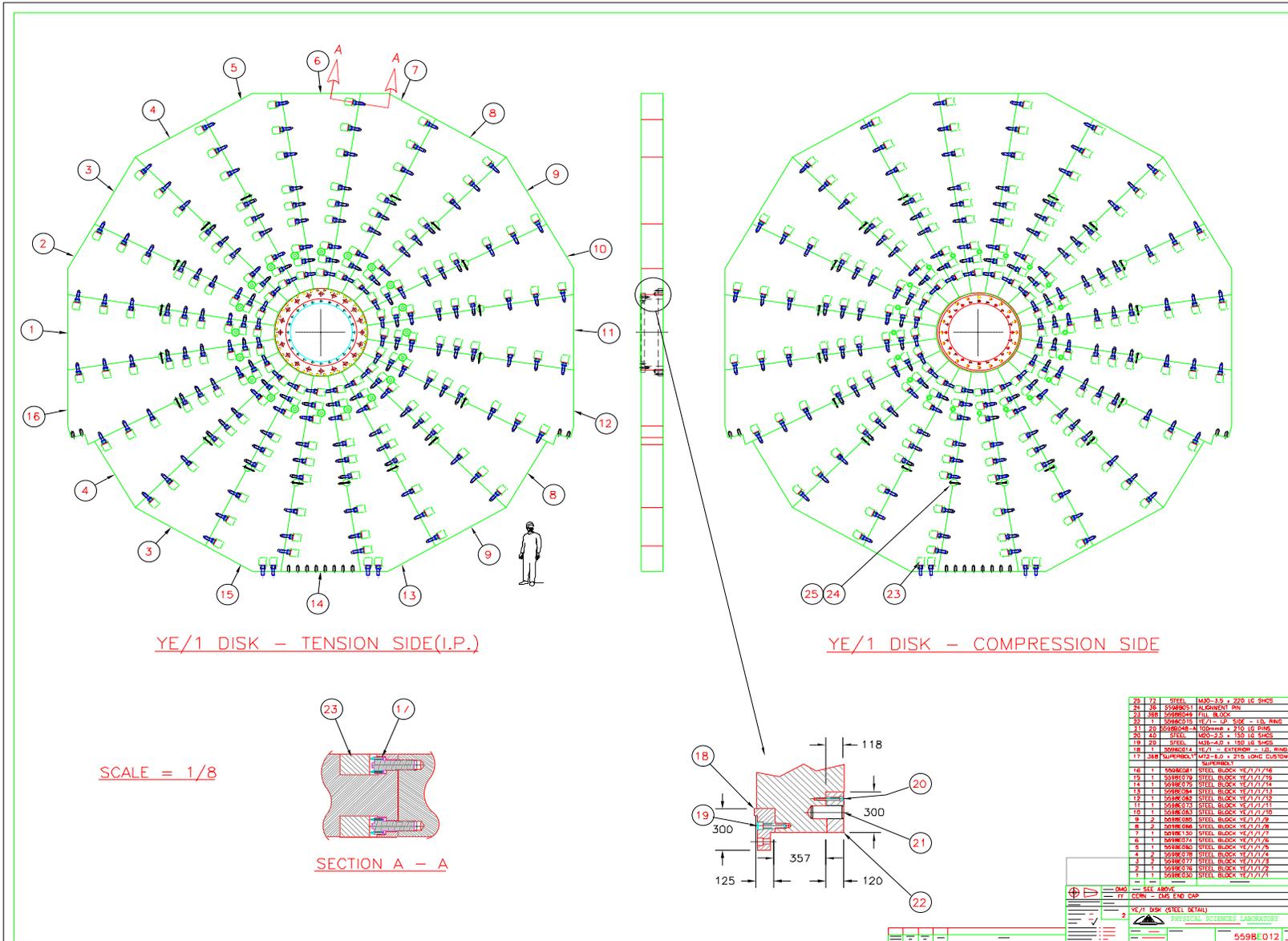


$\eta = 3$ region



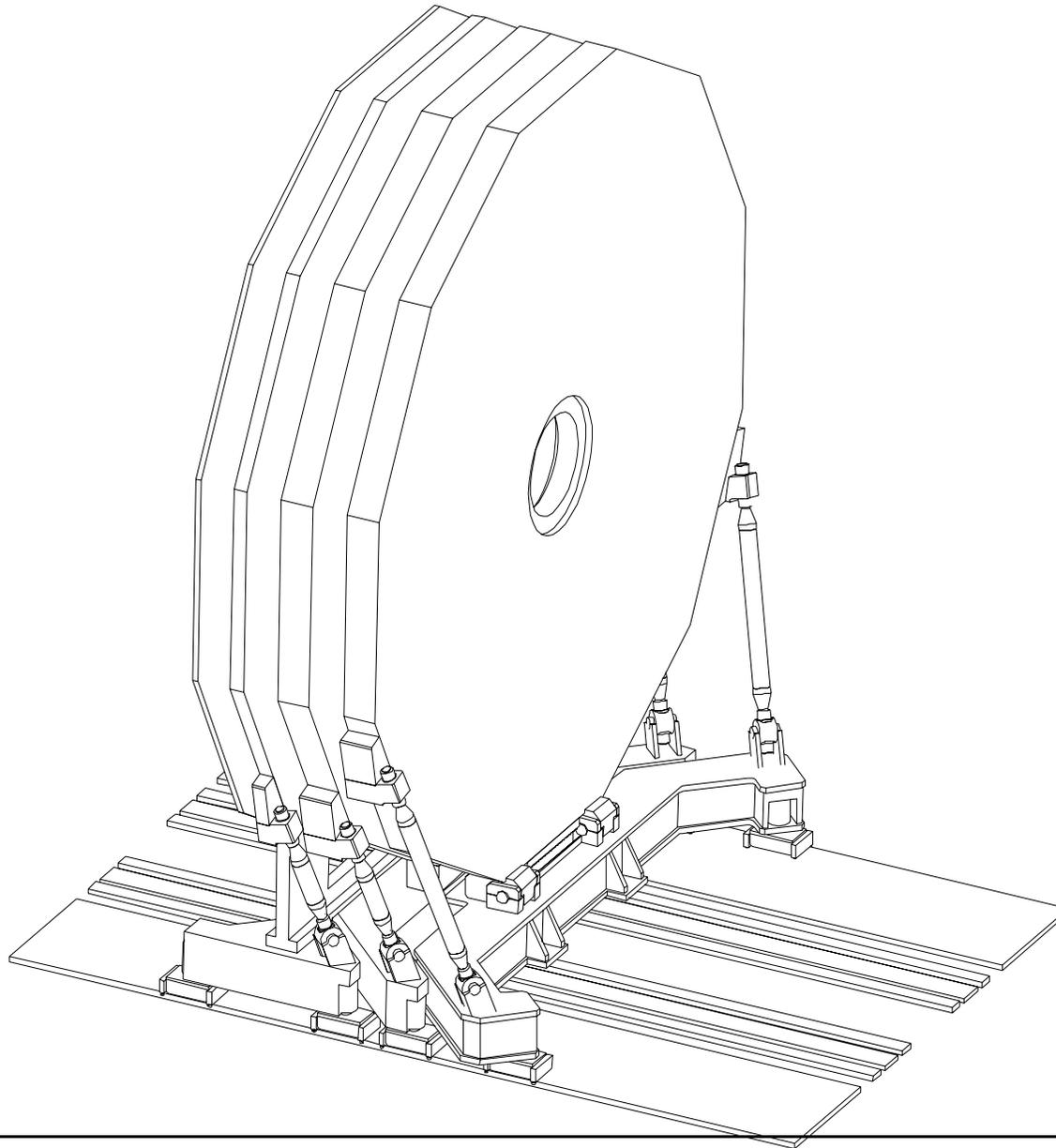


Disk Assembly



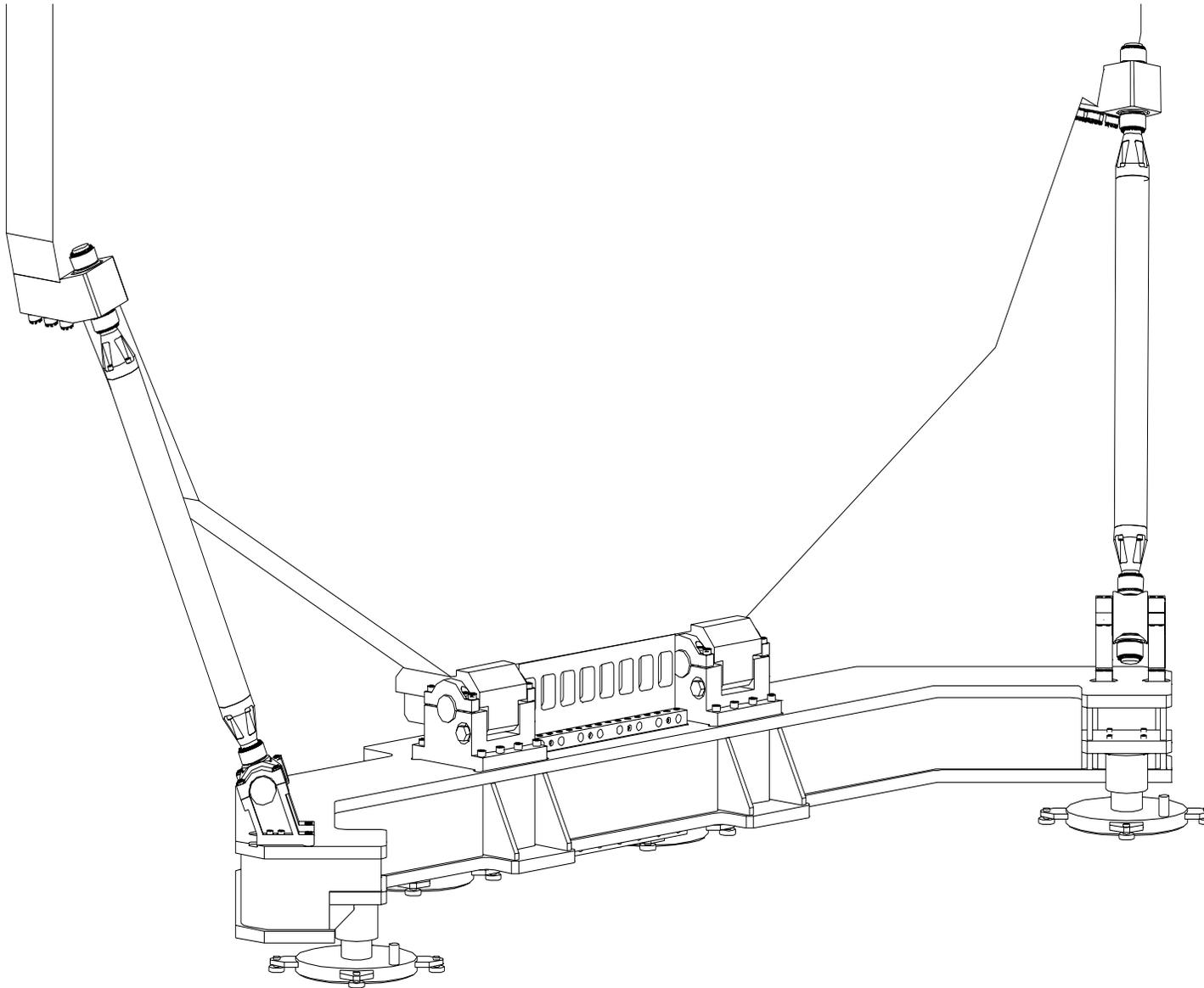


Complete endcap





YE1 Disk and Cart





Endcap carts

