Fermilab

Master Planning Task Force

April 10, 2012

*Members (**P**= Present, **A**=Absent)*

A	Pier Oddone	**A**	Bruce Chrisman	**A**	Steve Holmes	**P**	Greg Bock
A	Vicky White	**A**	Bob Kephart	**A**	Giorgio Apollinari	**P**	Mike Lindgren
A	Roger Dixon	**A**	Steve Wiesenthal	**P**	Randy Ortgiesen	**P**	Young-Kee Kim
A	Patricia McBride	**P**	Paul Czarapata	**P**	Steve Dixon	**A**	Stuart Henderson
P	Katie Yurkewicz						

Guests

P. Garbincius, A. Walters, J. Lewis, D. Harding, K. Collins

A. Infrastructure/Mission Readiness

R. Ortgiesen (RO) provided a general overview of the process for reporting on the facilities and infrastructure for the Annual Laboratory Plan (ALP) submittal. The following specific items were discussed:

1. It was noted that the ALP required a breakdown of the laboratory's core capabilities into three (3) specific areas. These are Particle Physics, Accelerator Science and Large Scale User Facilities. It was recognized that some overlap between these capabilities existed.
2. RO noted that the Facilities Engineering Services Section (FESS) input to the ALP focused primarily on a review the conventional facilities required to support the Laboratory's scientific mission. This is Section 6 (Infrastructure/Mission Readiness) portion of the ALP contained on pages 20-30.
3. The ALP should stress the continued support required for the Science Laboratory Infrastructure (SLI) project for the improvement of the electrical and water systems.
4. The ALP should include discussion of the need for a consolidation of the aging industrial facilities into a modern facility.
5. Of specific interest to this discussion is the table on page 22 which describe the Technical Facilities and Infrastructure. The following comments are specific to that chart:
   a. With the end of the Tevatron run, the use of the term CDF is obsolete. The references to CDF should be changed to B0 to reflect the location on the Main Ring;
   b. The location of the SEAquest experiment should be changed from KTeV to NM4 to reflect the location along the NM beamline;
   c. The Large Scale User Facilities core capability should include the Meson Test Beam Facility;
   d. The Key Core Capability Objective for the Accelerator Science core capability should be appended to include "and industrial applications" to reflect the possible tie in to the IARC project;
   e. The Key Core Capability Objective for the Large Scale User Facilities core capability should be changed from "including high-performance computing to attach highly non-linear problems in lattic QCD, and collective effects in beams and cosmological simulations" to "including high-performance computing to support the physics mission."

B. ORKA Preservation Task Force

P. Garbinicius (PG) and J. Lewis (JL) presentation provided an overview of the ORKA Preservation Task Force (OPTF) efforts to identify the impact of the proposed project on the existing complex.

Background

At the conclusion of Tevatron operations, the original plan was for the CDF detector to remain in place and repurpose the existing counting rooms and access paths to allow for public tours and displays. In addition, the Illinois Accelerator Research Center (IARC) project intended to utilize the B0 Assembly building and Assembly Pit for technical work involving industrial users.

After the initial plan was in place, a group proposed using the existing CDF Solenoid Magnet, along with a reconfigured Main Ring beamline consisting of conventional magnets operating at ~100 GeV and a production target/dump station and a new stopping kaon beam to do an experiment called ORKA. Upon recommendation by the Physics Advisory Committee, ORKA was given Stage 1 approval (they agreed that the science is good). However, at this time there has not been an approved funding plan to install ORKA in the near future. Based on this scenario, the CDF detector components would be removed and ORKA installed most naturally while IARC would be in operations, leading to potential interferences. The OPTF was commissioned to study preserving the option of installing ORKA during IARC Operations. Generally the ORKA components are small and could be installed with minimum impact on IARC operations, but removing CDF components requires lots of time and material moving and crane usage, which is better done before IARC is operational.

The primary question for the OPTF was: if removing CDF is relatively inexpensive, it would be an easy choice to invest those resources now, taking the chance that it might be throwing money away (and precluding the public displays) if ORKA never gets funded. The OPTF results indicate that the cost of the effort is ~$8.5 million. The Directorate is responsible for balancing the immediate cost versus the potential of impacting the IARC operations later.

In addition to a general review of the presentation, the following specific items were discussed:

1. It was noted that the scope of the work included the work in the B0 area only and that the work required to repurpose the existing Main Ring (target station, secondary beam, beam stop or the ORKA experiment) was not included in the scope of the study. Representatives of P. Czarapata's (PC) department are currently investigating this effort. Currently, it appears that the best approach is to completely clear the tunnel prior to the repurposing and reinstallation.
2. C. Moore's department has been charged with developing the beamline design for the ORKA project.
3. JL noted that the installation of the ORKA detector has the potential to impact the use of the B0 Assembly Hall as a display space. A decision on the desired use of the space is needed in May 2012 in order to efficiently use the decommissioning funding available.

C. Action Items from This Meeting

1. Direction on use of B0 Assembly Hall.

D. Next Meeting

To be scheduled

Technical Facilities and Infrastructure

Core Capabilities		Mission Ready Assumes TYSP Implemented				Key Buildings	Key Core Capability Objectives	Facility and Infrastructure Capability Gap	Action Plan	
									Laboratory	DOE
		N[a]	M[b]	P[c]	C[d]					
Particle Physics	Now				X	BØ Assembly (ORKA), DØ Assembly (LAr TPC), NM4 (Seaquest), MI65 & MINOS, NOvA, MiniBooNE, LAr test facilities, Muon Campus	Establish world-class scientific research capacity to advance high-energy physics	The facilities and infrastructure in support of this area are considered adequate. Additional investment in supporting infrastructure (both new and restoration or expanded capacity of existing systems) will be included in each new experiment project scope.	As needed, incremental infrastructure improvements and facility upgrades will continue to be supported with GPP investment.	No dedicated line item infrastructure investments necessary at this time, related facility and infrastructure investments will be needed for future experiments and will be included in future plans
	In 5 Years				X					
	In 10 Years				X					
Accelerator Science	Now				X	Meson Detector Building, NML, CMTF, Wide Band, IARC (including CDF building), Industrial Facilities	Develop the technology & design for future accelerators to expand the research capacity of high energy physics and industrial applications.	The facilities and infrastructure in support of this area are considered adequate. Additional investment in supporting infrastructure (both new and restoration or expanded capacity of existing systems) will be included in each new project scope.	As needed, incremental infrastructure improvements and facility upgrades will continue to be supported with GPP investment. Third-party investment will construct IARC.	ARRA GPP at IB-3, NML & CMTF are complete. Industrial Facilities Consolidation SLI will solidify R&D capability. Related facility and infrastructure investments will be needed for future experiments and will be included in future plans.
	In 5 Years				X					
	In 10 Years				X					
Large Scale User Facilities / Advanced Instrumentation	Now				X	Accelerator complex, beamlines, experimental areas, SiDet detector development facility, Detector Test Beam Facility, FCC, GCC & LCC computing facilities	Establish world-class scientific research capacity to advance high-energy physics including state of-the-art accelerators and beam lines. High-performance computing facilities to support particle physics research.	Tevatron decommissioning and development of Mu2e, LBNE and *Project X* will usher in a new era of accelerator operations. Planning is underway to assure support facilities associated with managing and maintaining the accelerator complex are either incorporated into each project, or identified for other funding. The real property assets are considered adequate including the conventional portions of the underground asset.	As needed, incremental infrastructure improvements and facility upgrades will continue to be supported with GPP investment.	ARRA GPP at MI-8 and FCC are complete. No additional dedicated line item infrastructure investments necessary at this time, facility and infrastructure investments will be needed for future experiments and will be included in future plans.
	In 5 Years				X					
	In 10 Years				X					

N[a] = Not, M[b] = Marginal, P[c] = Partial, C[d] = Capable

ORKA Preservation Task Force

Peter H. Garbincius

@ Master Planning Task Force Meeting

Tuesday, April 10, 2012

http://www.fnal.gov/directorate/OPMO/Projectsns/ORKA/home.htm

http://www.fnal.gov/directorate/OPMO/Projectsns/ORKA/ORKAPreservationReport22march2012.pdf

Taskforce Membership:

1. Peter Garbincius (chair), OPPS
2. Jonathan Lewis, CDF
3. Dave Christian, ORKA
4. Bob Kephart, IARC
5. Kurt Riesselmann, Office of Communication
6. Paul C Czarapata, AD
7. Panagiotis Spenzouris, APC
8. George Velev, TD
9. Rhonda Merchut, FESS
10. Teri Dykhuis, ES&H
11. Angela Sands, PPD ES&H

January 31, 2012

ORKA Preservation Taskforce

Dear Taskforce

ORKA (P-1021) is a proposal for an experiment to measure the rare $K^+ \rightarrow \pi^+\nu\nu$, with the sensitivity to record of order 1000 signal events if the branching ratio is that expected in the Standard Model. The best option for siting the experiment appears to be in the CDF collision hall. The science case (~1000 $K^+ \rightarrow \pi^+\nu\nu$ signal events) was strongly supported by both P5 and Fermilab PAC. The Fermilab PAC feels that even in the constrained budget scenario, the Laboratory should explore how ORKA could be included in the full complement of Intensity-Frontier experiments.

The laboratory, therefore, would like to preserve an option to mount the ORKA experiment in the CDF collision hall.

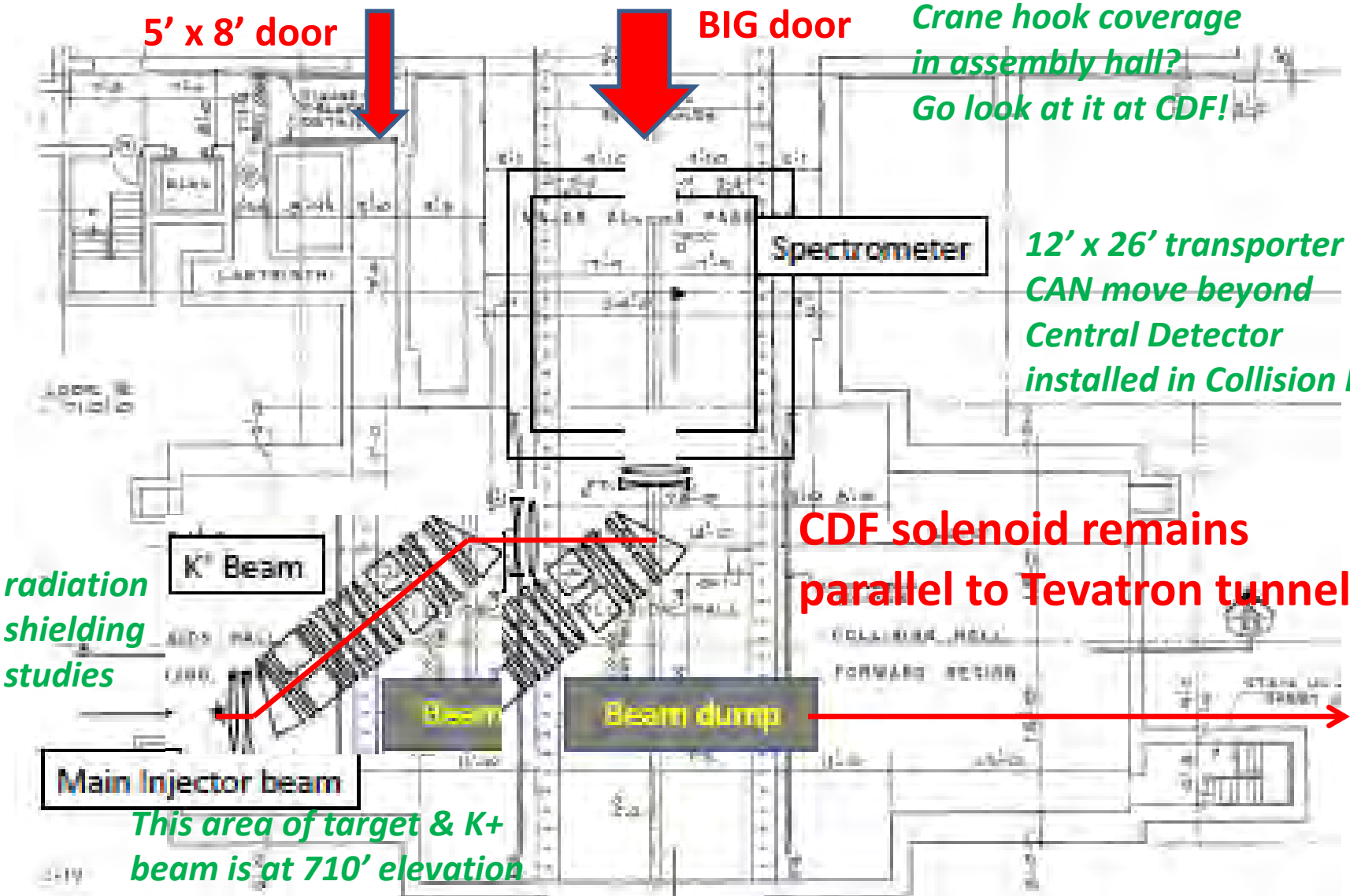
I would like to ask this taskforce to analyze various scenarios for the ORKA detector to be installed in the CDF hall in the future. For each scenario, you are asked to provide a rough cost estimate and an analysis of technical difficulties.

I would greatly appreciate it if you could report to me your analysis with a written report by March, 2012 (this date will be discussed and determined at the Kick-off meeting).

compatibility with IARC activities

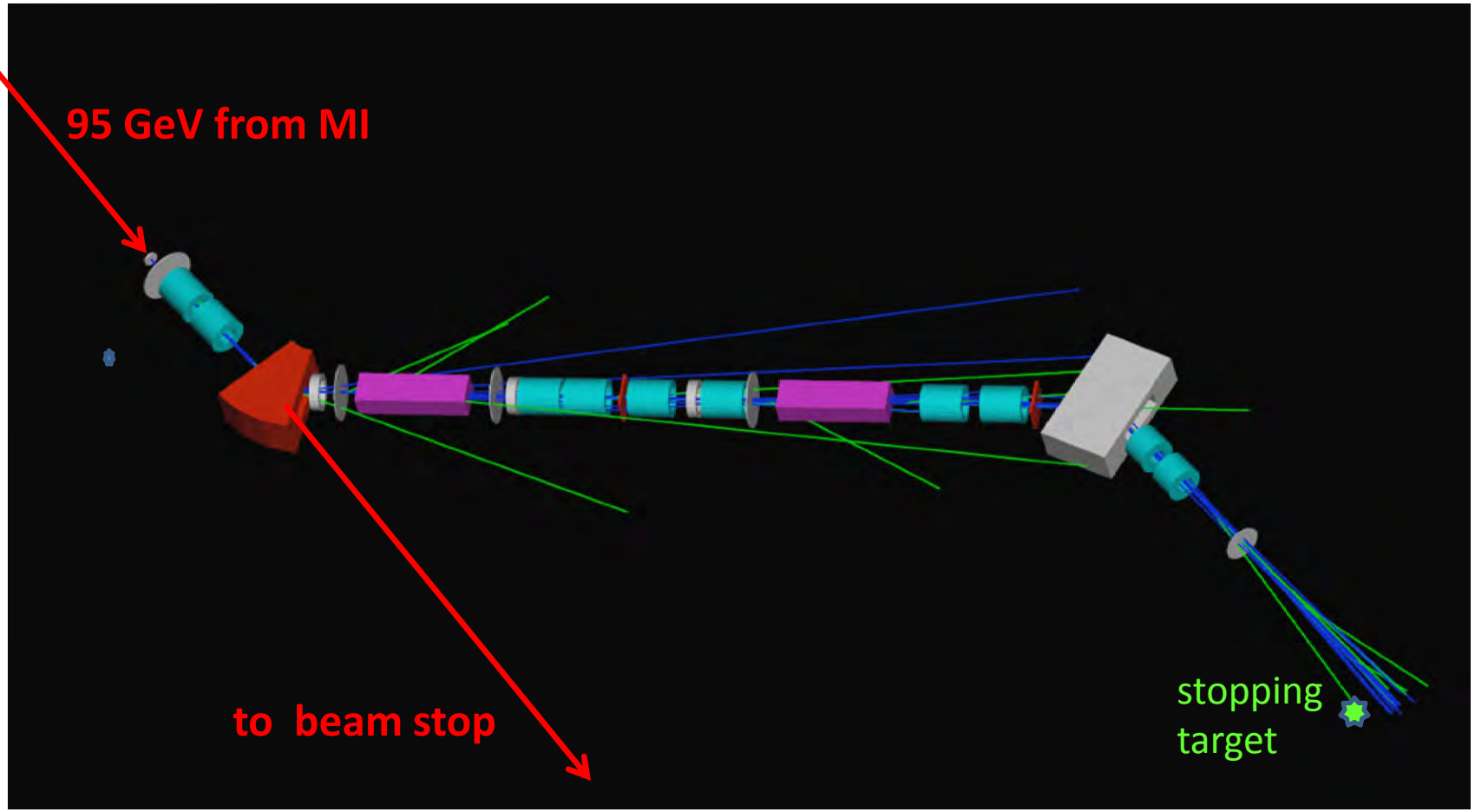
Sincerely Yours,
Young-Kee Kim
Deputy Director, Fermilab

CHANGES from ORKA proposal



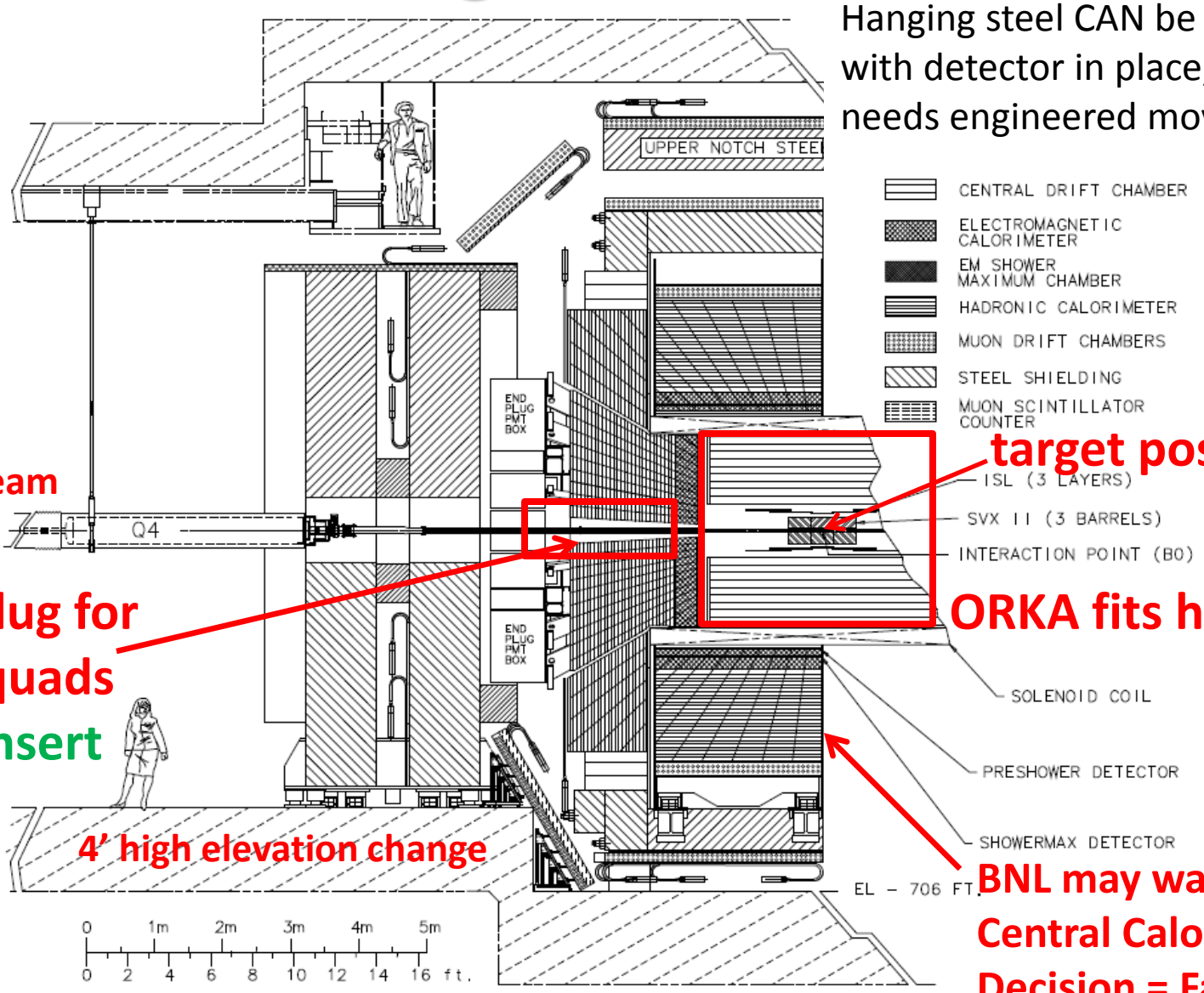
Doug Jensen working on design of a *short 14 m* 0.6 GeV/c enriched K^+ beam are low-p components availability from BNL?

Very likely, except for two 600 KV separators.



What does ORKA need from CDF?
What has to go? How? When?

Hanging steel CAN be removed with detector in place, needs engineered move



Tevatron beam
723'-4.25"

target position

modify plug for close-in quads

note SS insert

3°-10°

ORKA fits here!

4' high elevation change

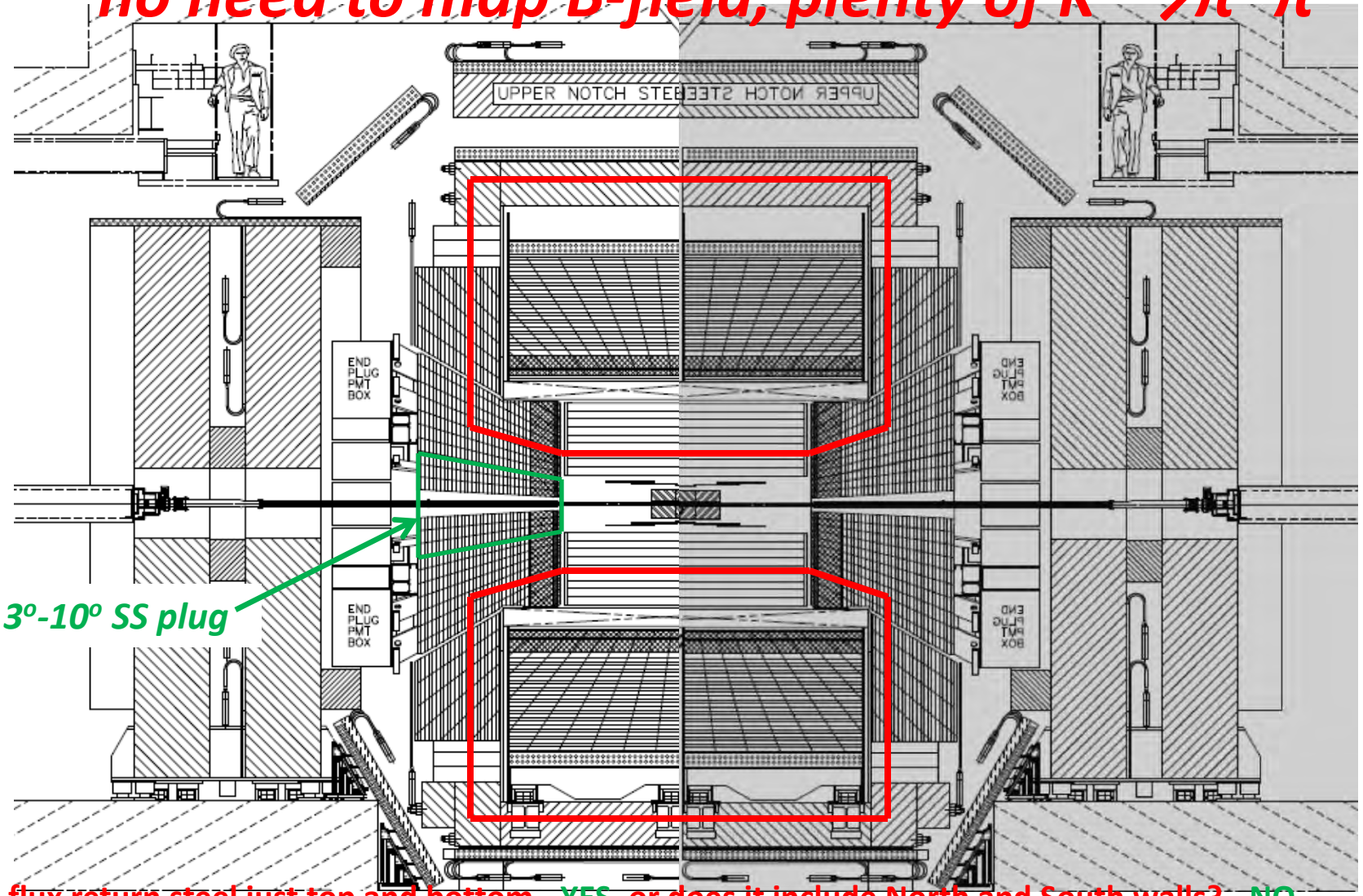
BNL may want Central Calorimeters

Decision = Fall 2012?

Magnetic Circuit

small contribution from central calorimeters

no need to map B-field, plenty of $K^+ \rightarrow \pi^+ \pi^o$

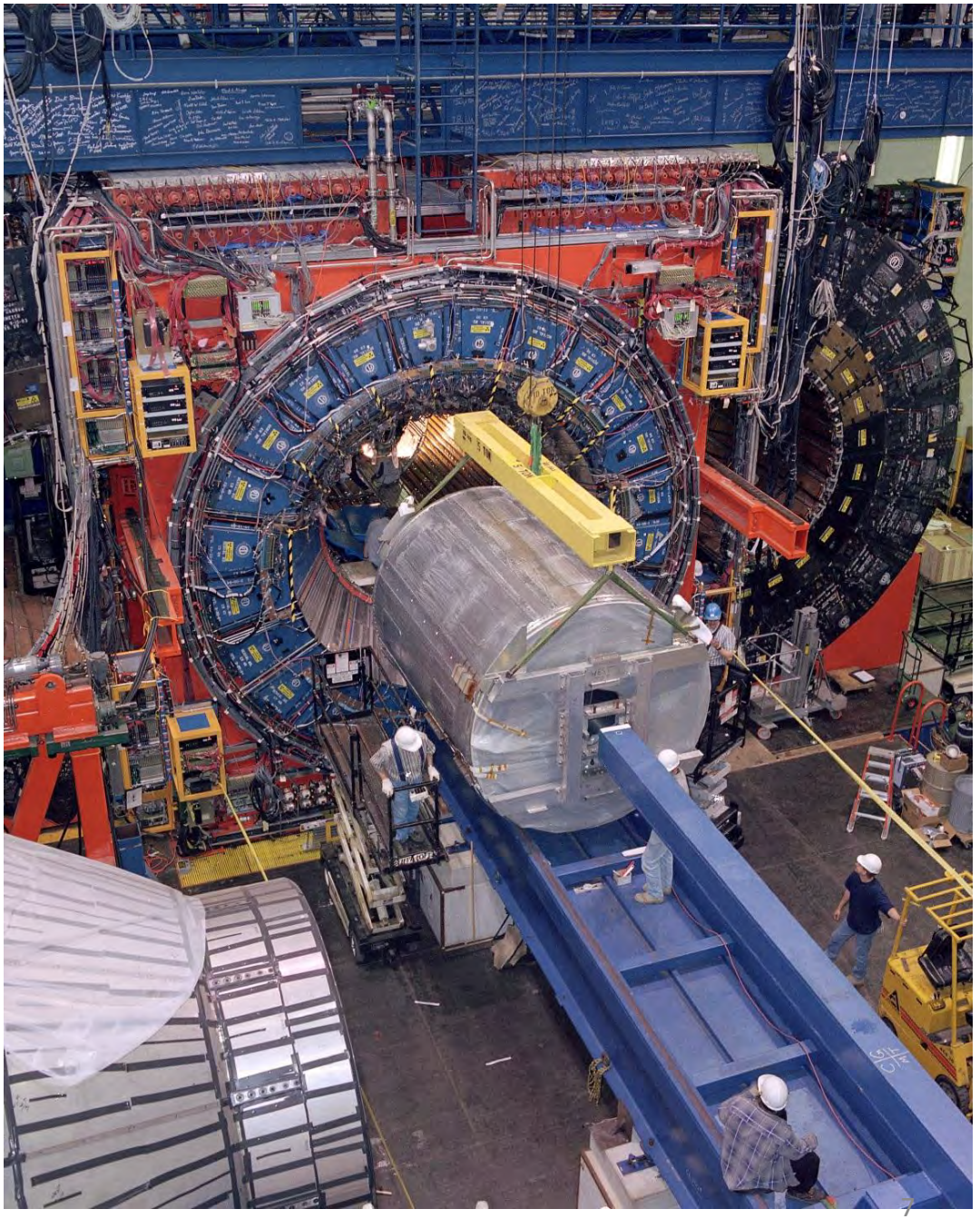


Is flux return steel just top and bottom - YES, or does it include North and South walls? - NO

comparable installation:

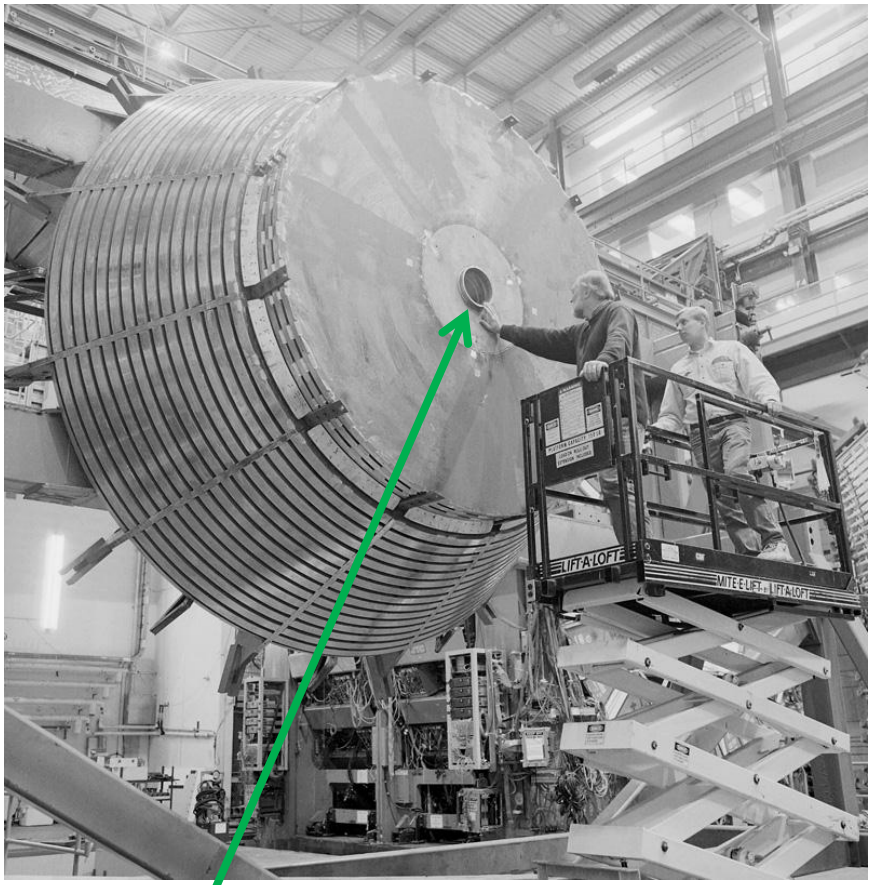
Remove CDF SVX & CTC intact?

Install ORKA in pieces in collision hall?



Can plug be modified for input beam quads while in collision hall?

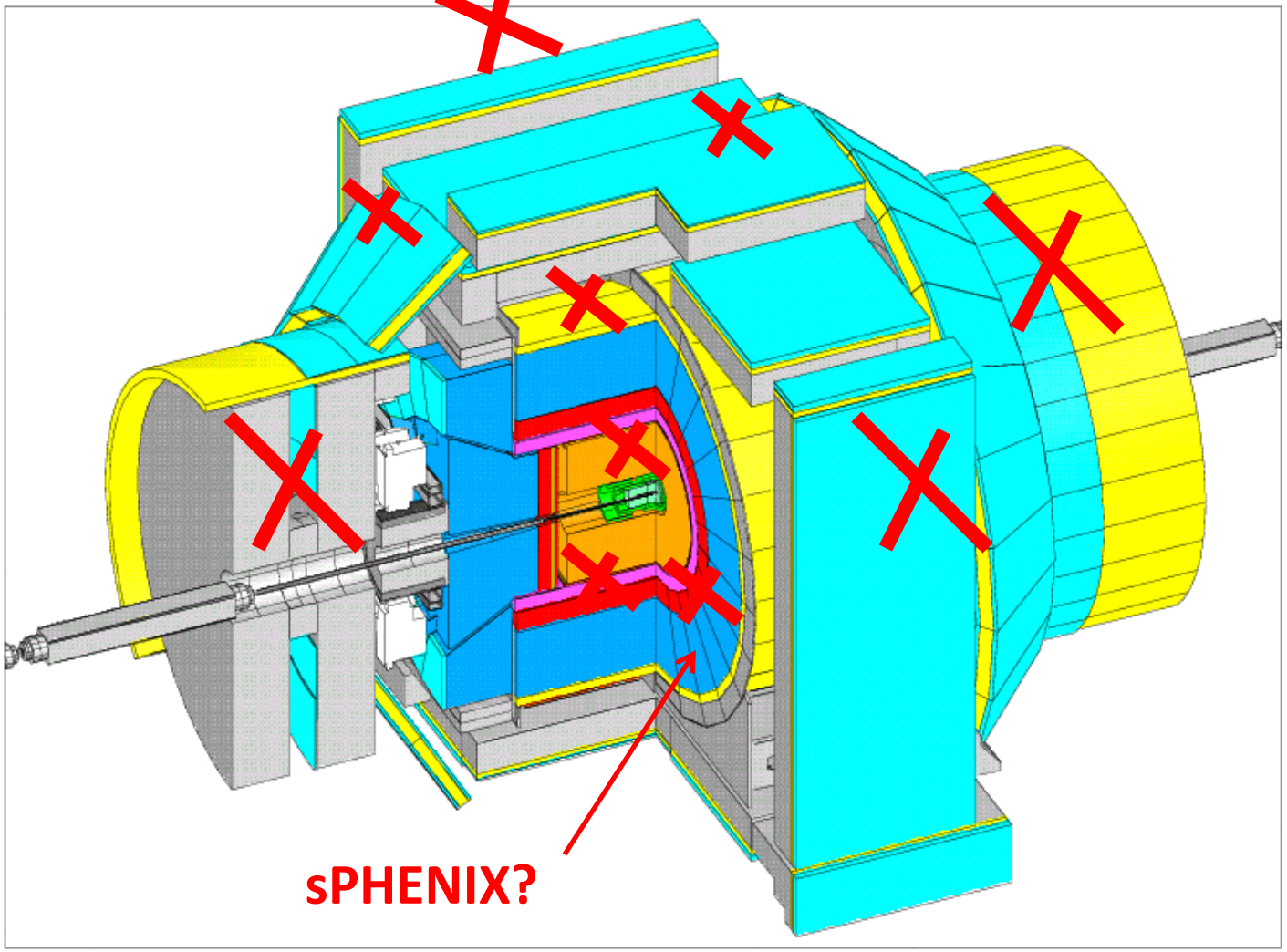
NO, must be done in Assembly Hall



Non-magnetic Stainless Steel Plug 3º-10º.

Does removing it provide enough room for Quadrupole Magnets?

Should I stay or should I go?



Scope

- Remove CDF
- Demolish all external muon walls
- Dismantle central calorimeter
- Refit plugs
- Remove trackers
  - Excludes dismantling
- Dismantle cable bridge
- Refurbish Solenoid
- Minor fixes to collision hall
  - Ignores filling 706’ area of assembly hall
- Return to collision hall

Assumptions and Caveats

- This is a very raw first pass
  - Attempt to include all labor
  - Not fully scheduled
    - Many hanging tasks
- Mostly my estimates
  - Input from Dave Erikson on time per foot to cut welds
  - Input from Dervin Allen on some demolition tasks from earlier scheduling work
- Included labor for 1.5 year assumed duration
  - Full time building manager
  - Full time supervisor
  - 50% physicist

More caveats

- Some short cuts
  - Iron workers treated as straight labor
    - Probably want fixed-price contracts
  - Minimal M&S
    - WAGs for crane rentals, etc.
- Lots of things neglected
  - No ES&H
  - Assumes truck drivers, etc. covered by overhead
- All costs are unburdened!
- Given this level of understanding:

  100% Contingency

WBS	Task Name	Duration	Work hrs	Cost	sub-cost
1	**ORKA Preservation**	375 days	36,987	**$4,263,852**	
1.1	Project Management	375 days	8,250	$1,026,750	
1.2	Experimental Facilities	67 days	3,081	$369,394	
1.2.1	Detector Roll-Out	26 days	964		$86,870
1.2.2	Remove Cable Bridge	45 days	1,440		$176,640
1.2.3	Refurbish Collision Hall	14 days	448		$85,320
1.2.4	Detector Roll-In	8 days	228		$20,563
1.4	Counting Rooms	27 days	496	$48,500	
1.5	Muon System	294 days	10,784	$1,361,784	
1.5.1	CMP - Central Muon Upgrade	199 days	3,856		$514,824
1.5.2	CMX - Central Muon Extension	142 days	3,296		$366,720
1.5.3	IMU - Intermediate Muon System	152 days	3,632		$480,240
1.6	Tracking Detectors	119 days	1,712	$182,072	
1.6.1	Silicon	115 days	856		$78,480
1.6.2	COT - Central Outer Tracker	15 days	616		$81,512
1.6.3	TOF - Time-of-Flight	5 days	240		$22,080
1.7	Calorimeters	102 days	11,992	$1,212,072	
1.7.1	Central	35 days	9,120		$837,664
1.7.2	Plug	102 days	2,872		$374,408
1.8	Central Detector (Endwalls)	40 days	672	$63,280	

$ 4.26 M + 100% Contingency => $ 8.5 M

Personnel

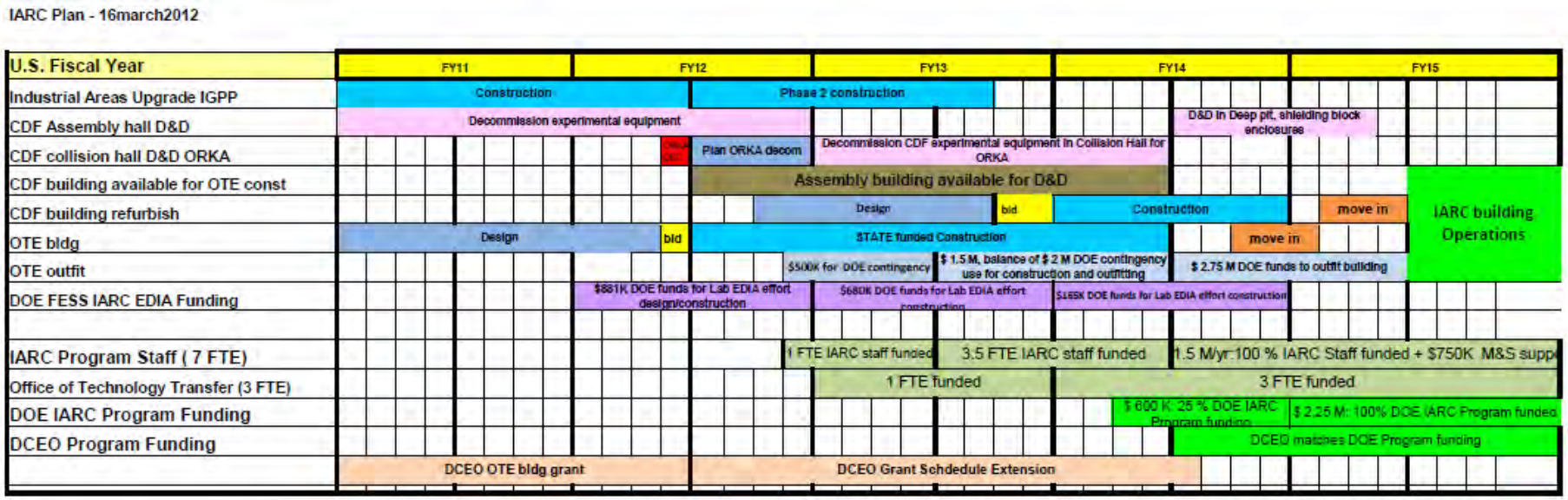
crane availability => two shift operations?

ORKA Preservation Labor Category	Rate/hr Burdened	# hours	Cost in FY 2013 $
Engineer - Mechanical	$145	750	$108,750
Scientist	$170	1,556	$264,520
Technican - Monthly	$131	3,000	$393,000
Tech - Electrical - Weekly	$92	12,176	$1,120,192
Tech - Mechanical - Weekly	$90	12,329	$1,109,578
Tech - ES&H - Monthly	$105	48	$5,040
Electrician - Foreman	$115	16	$1,840
Machine Shop	$136	264	$35,904
Iron Worker - Foreman	$161	6,848	$1,102,528
Materials & Services *			$122,500
totals		**36,987**	**$4,263,852**

+ 100% contingency

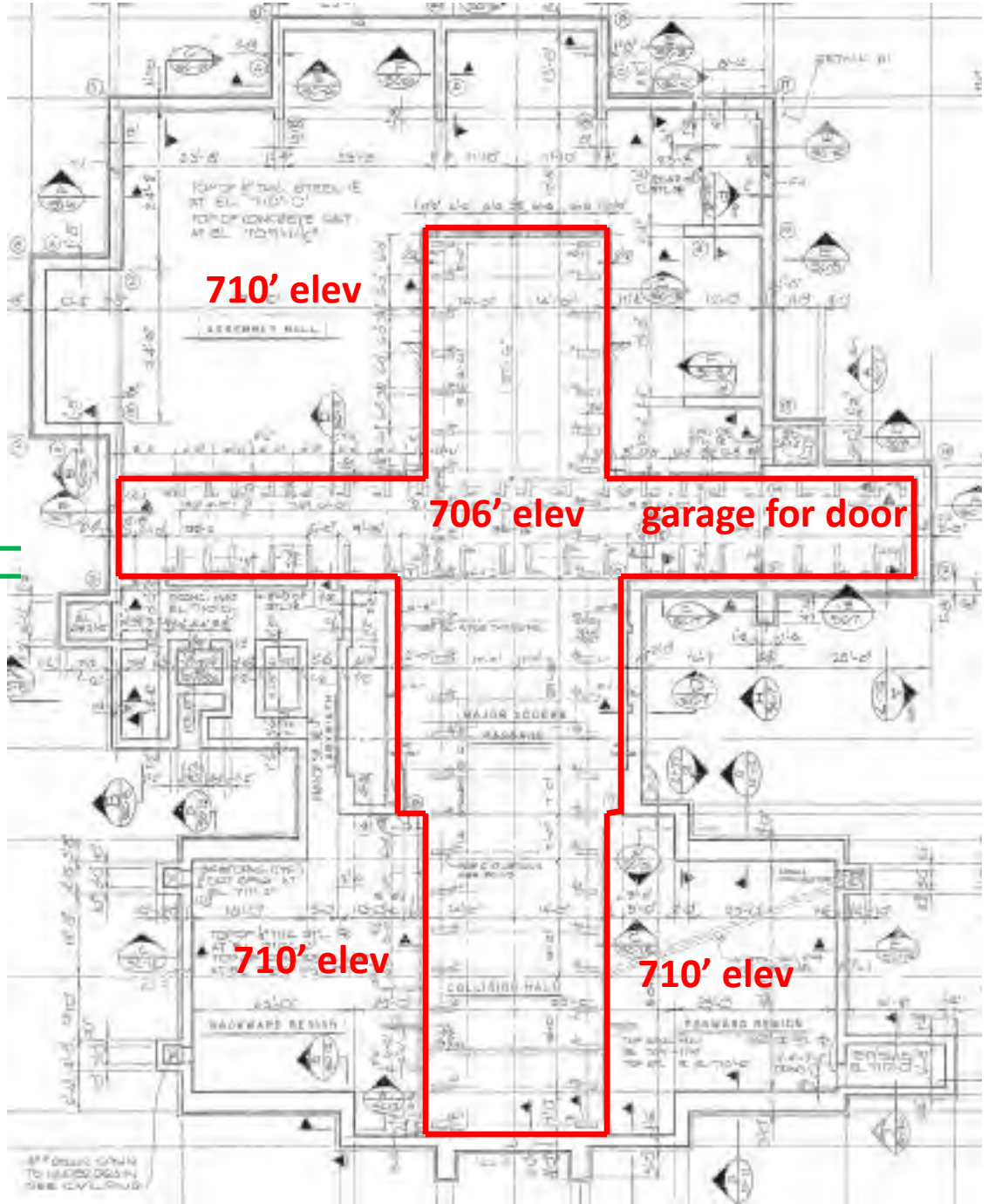
* M&S did not include $ 25 K Overheads & Escalation

schedule wrt IARC



Overlap of ORKA Preservation and
CDF Building Refurbishment
in first half of FY 2014

Limit of 50 ton
crane coverage
~ 4.5’ from wall
PHG – 4march2012



questions?