



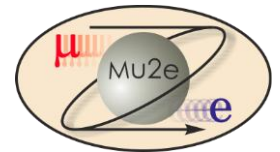
WBS 475.04.09 Ancillary Equipment

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DOE CD-2/3b Review

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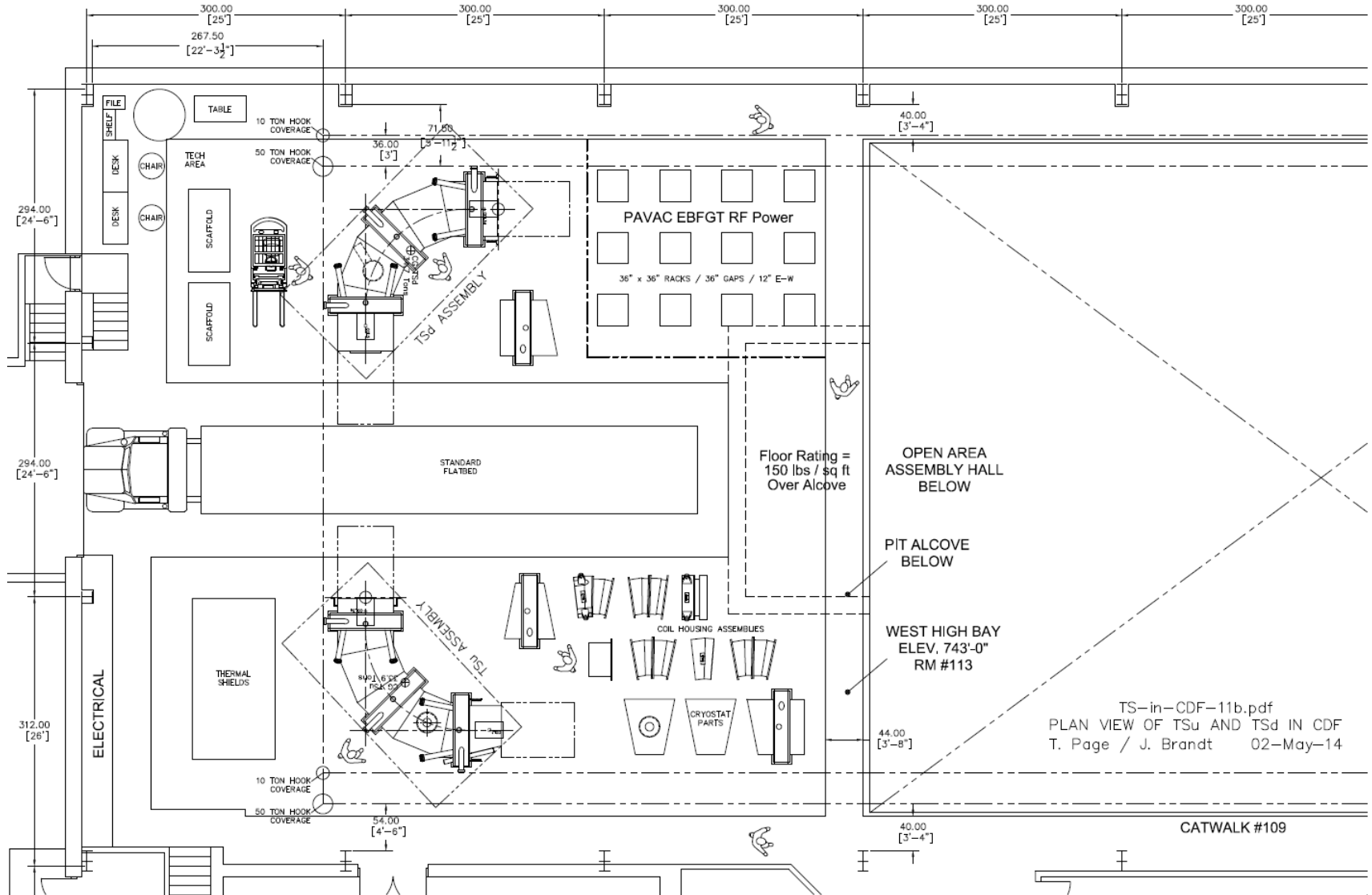
Requirements

- Transport Solenoid Magnet Assembly Area
 - Assembly area must have minimum 40 T crane, 18 ft hook clearance.
 - Enough room for TSu and TSd assembly in parallel with staging area for components.
- Below-the-Hook (BTH) Lifting fixtures
 - Capacity: 60T, using two tandem cranes in Mu2e building.
 - Must fit through hatches in Mu2e building.
- Installation equipment capable of moving magnets around within the lower level of the Mu2e building without crane coverage.

Transport Solenoid Magnet Assembly

- TSu and TSd final assembly will take place in the Heavy Assembly Building (HAB, formally CDF), west end.
 - TS coil modules and cryostat components procured from industry.
 - Final magnet assembly completed at Fermilab.
- Workflow for TS coil modules
 - Coil modules arrive at FNAL in Industrial Building 4.
 - After initial QC, coils will be moved to Industrial Building 2.
 - Magnetic measurements and testing preparations are performed in Industrial Building 2.
 - Coil modules are moved to the Solenoid Test Facility for testing.
 - After testing, coil modules will be moved to HAB for assembly preparation and staging.

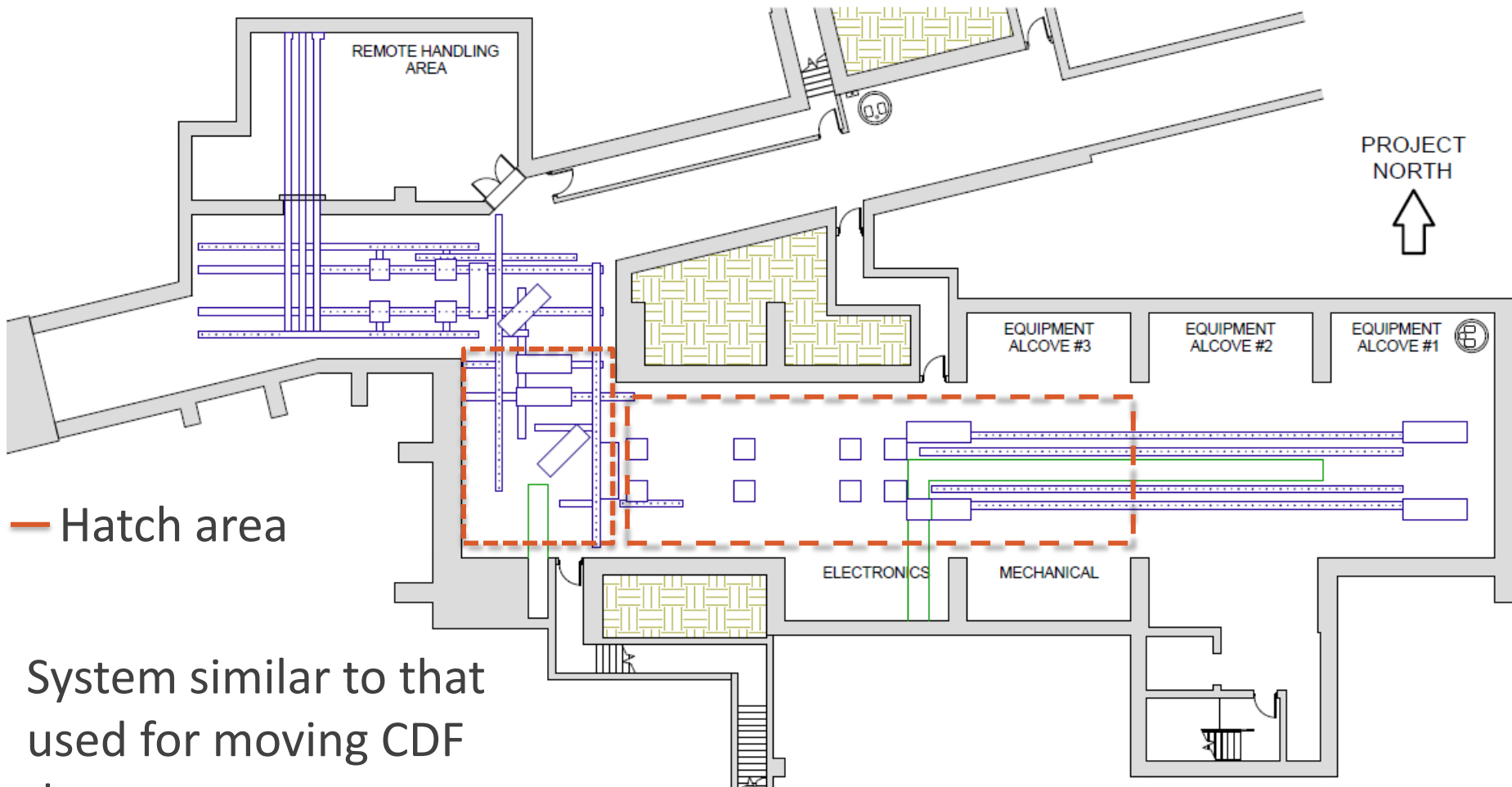
HAB (formally CDF) TS Assembly Layout



Tooling for Magnet Installation

- Detector solenoid can be placed in final position by crane.
- Production solenoid and transport solenoids are not fully under crane coverage so they must be moved into place using tooling.
- Method for moving magnets will be similar to that used for moving the CDF detector.
 - Track plates integrated into the building floor
 - Hillman rollers placed under the magnet frame
 - Large hydraulic cylinders used to push or pull the magnet and frame along the track plates
- This tooling will be shared with the Muon Beamline (WBS 475.05) to save costs.

Mu2e Building Transport Rail Layout



System similar to that used for moving CDF detector.

Improvements since CD-1

- Production Solenoid lowered through TS hatch instead of separate outside hatch.
- Assembly space was moved from the Industrial Center Building to HAB.

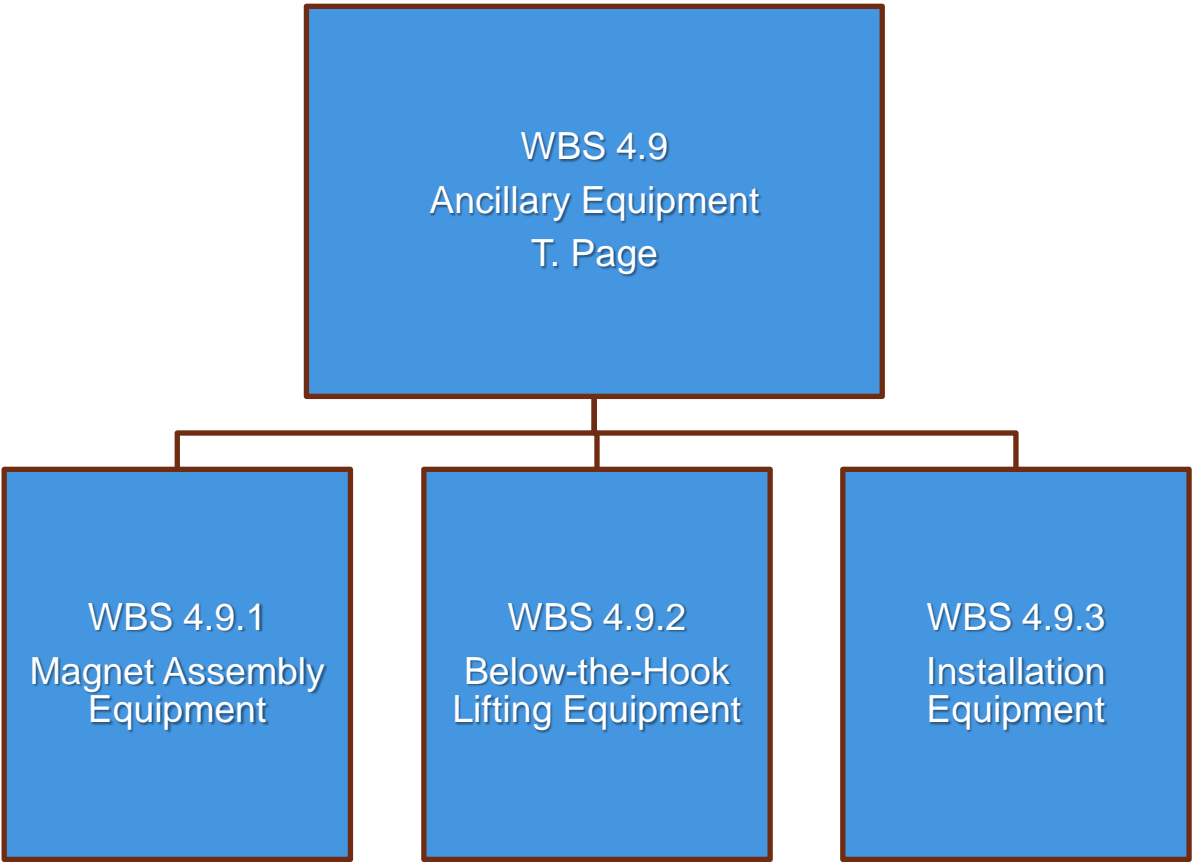
Value Engineering since CD-1

- Muon Beamline is using a similar rail system to allow for sharing of the magnet installation tooling.

Remaining work before CD-3c

- Final tooling designs need to be completed when the magnet details are known.

Organizational Breakdown



Quality Assurance

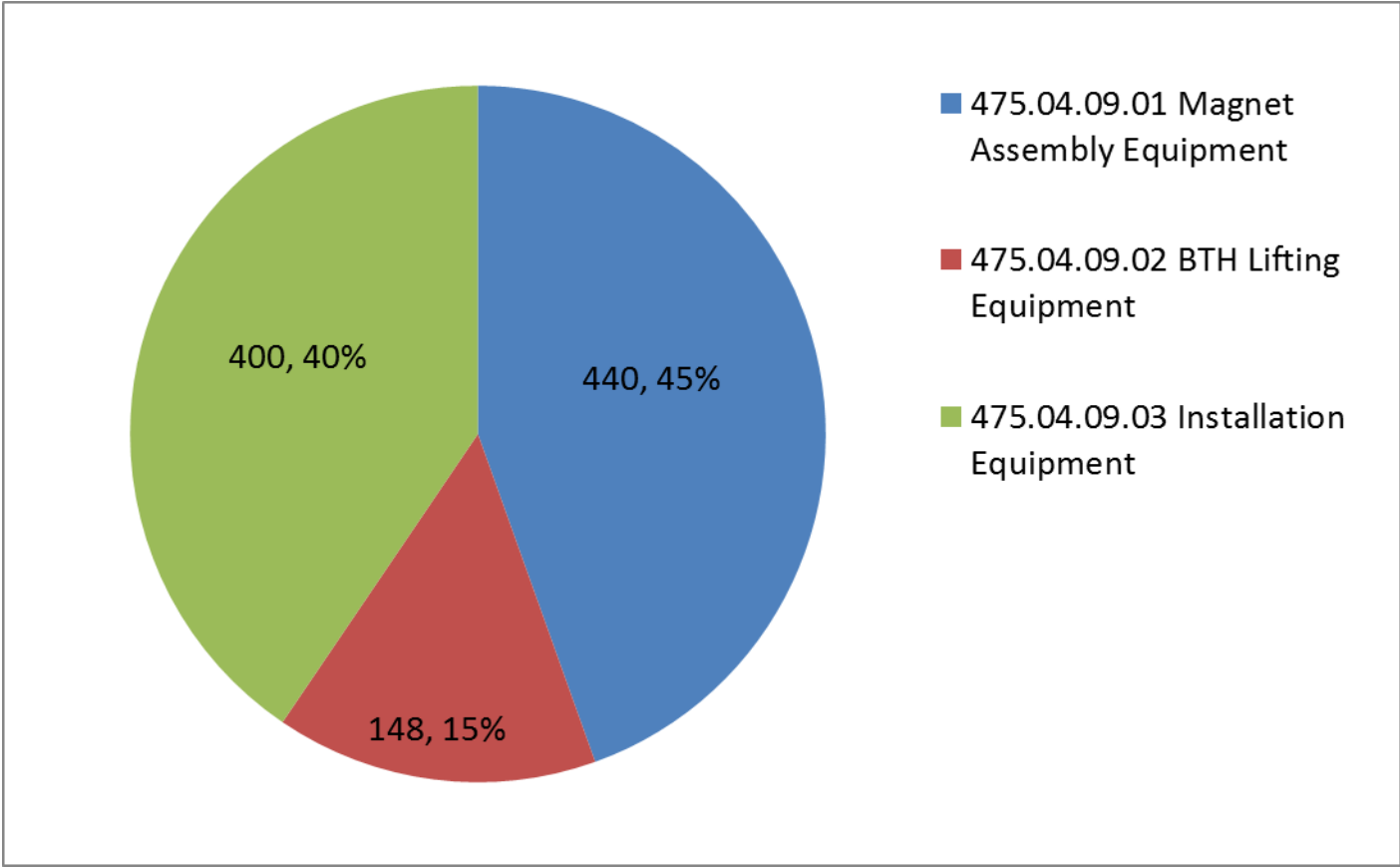
- Tooling components will be fully tested and qualified before use in production.
- BTH lifting fixtures will be load tested to 125% of capacity per FESHM 5022.

ES&H

- BTH Lifting Fixtures will comply with the Fermilab ESH&Q Manual, Chapter 5022.
- HA's will be written and followed by workers covering the following:
 - Manipulating heavy objects
 - Personnel allowed to operate cranes
 - Personnel allowed to operate fork trucks
 - Proper PPE
 - Any special considerations

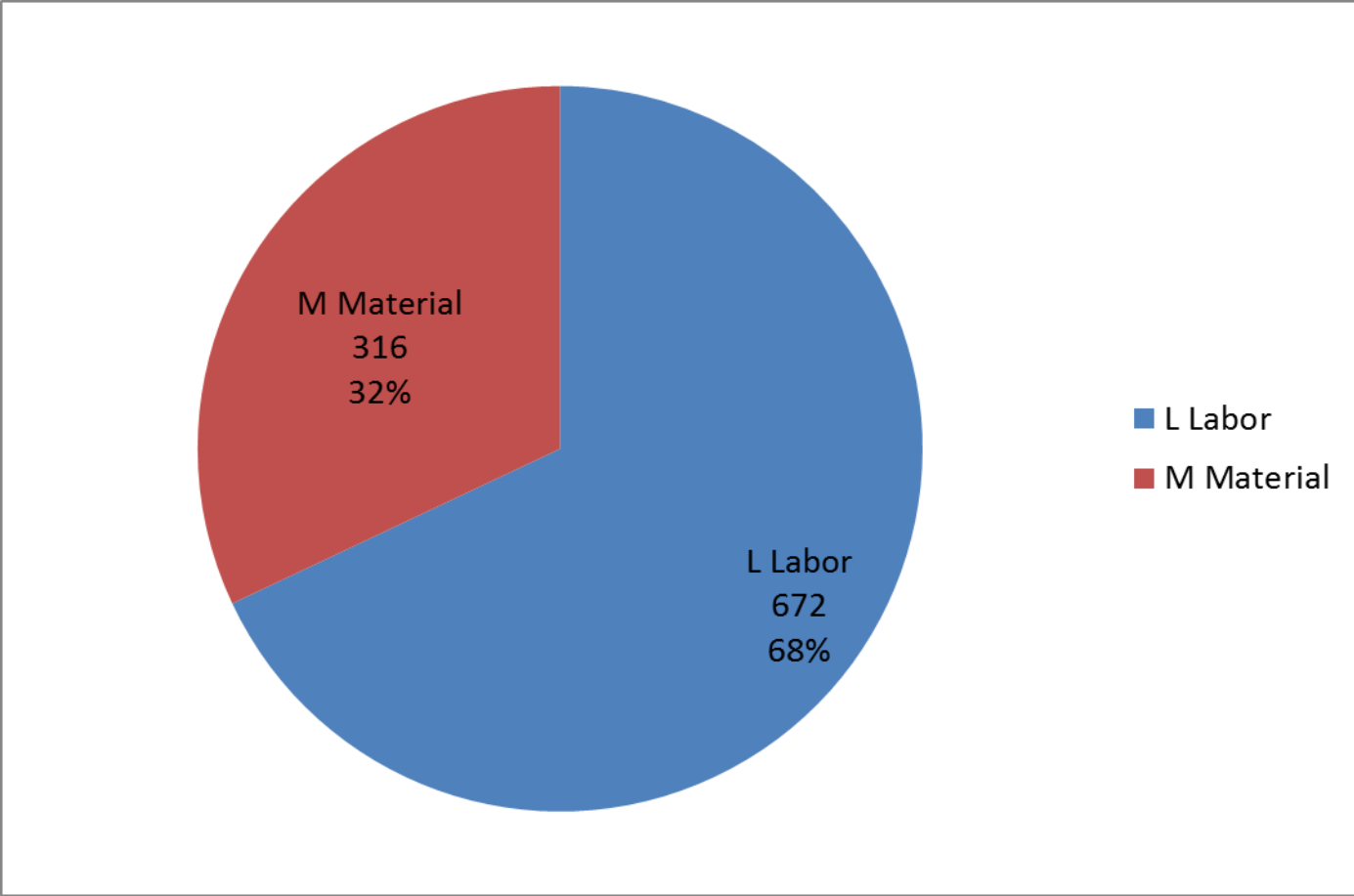
Cost Distribution by L4

Base Cost by L4 (AY \$k)



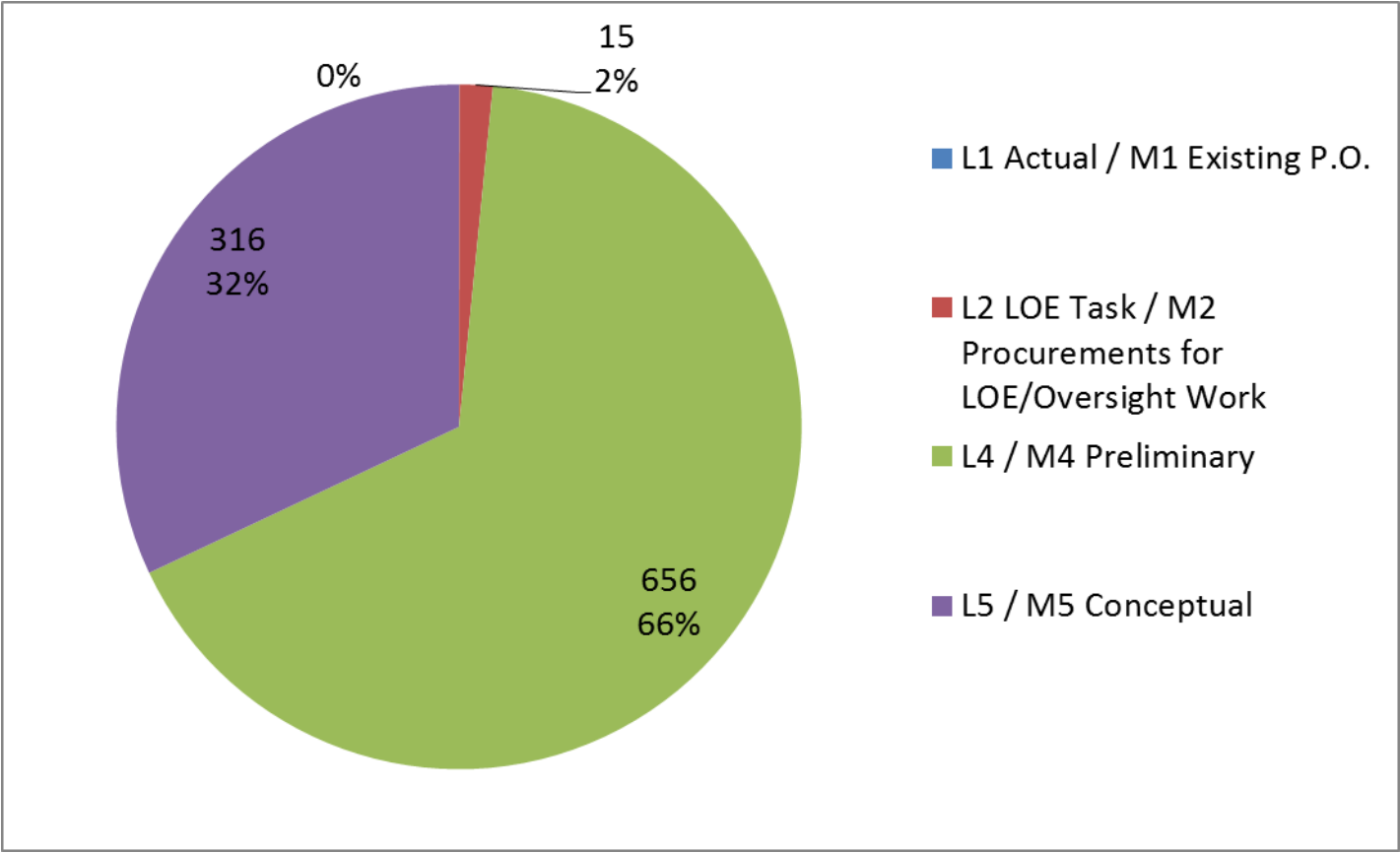
Cost Distribution by Resource Type

Base Cost (AY \$k)



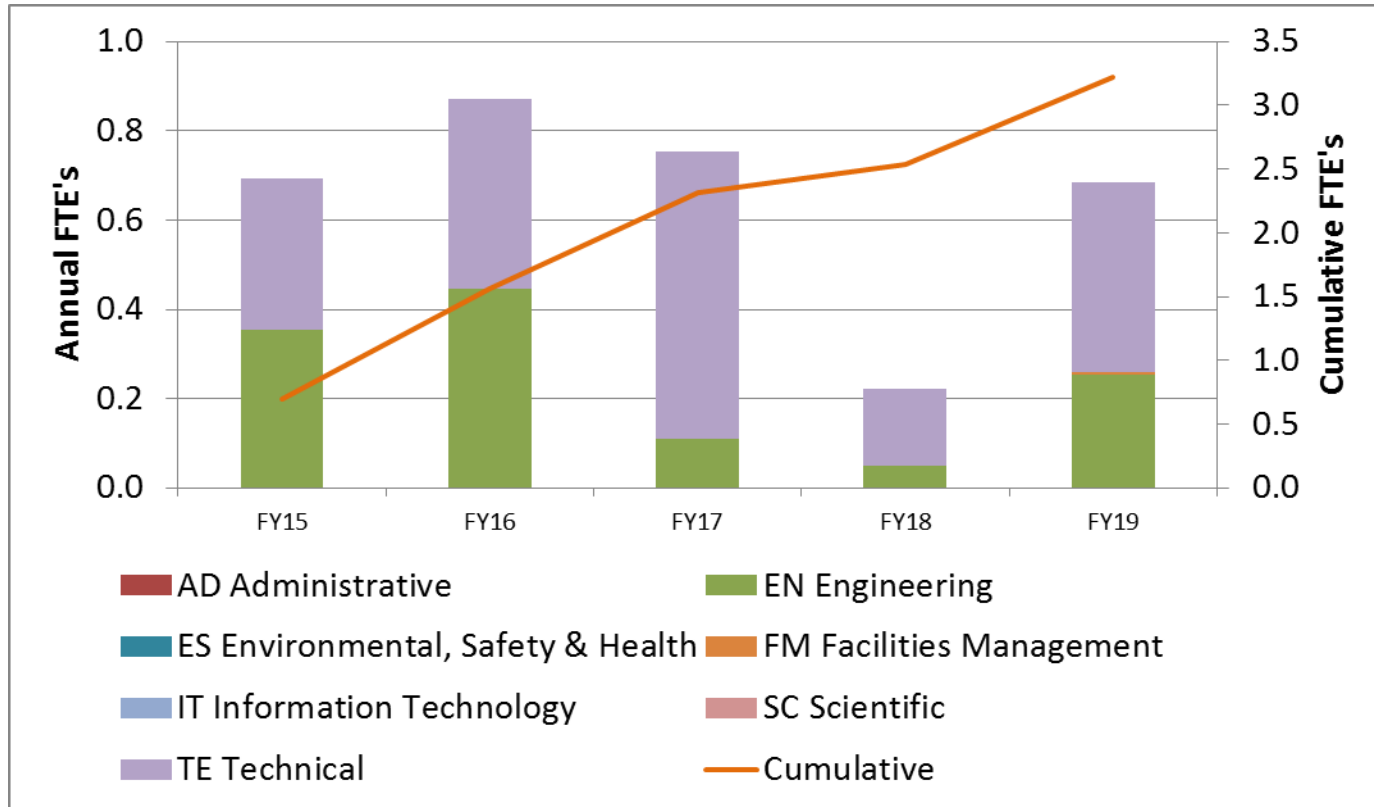
Quality of Estimate

Base Cost by Estimate Type (AY \$k)



Labor Resources

FTEs by Discipline



Cost Table

WBS 4.9 Ancillary Equipment

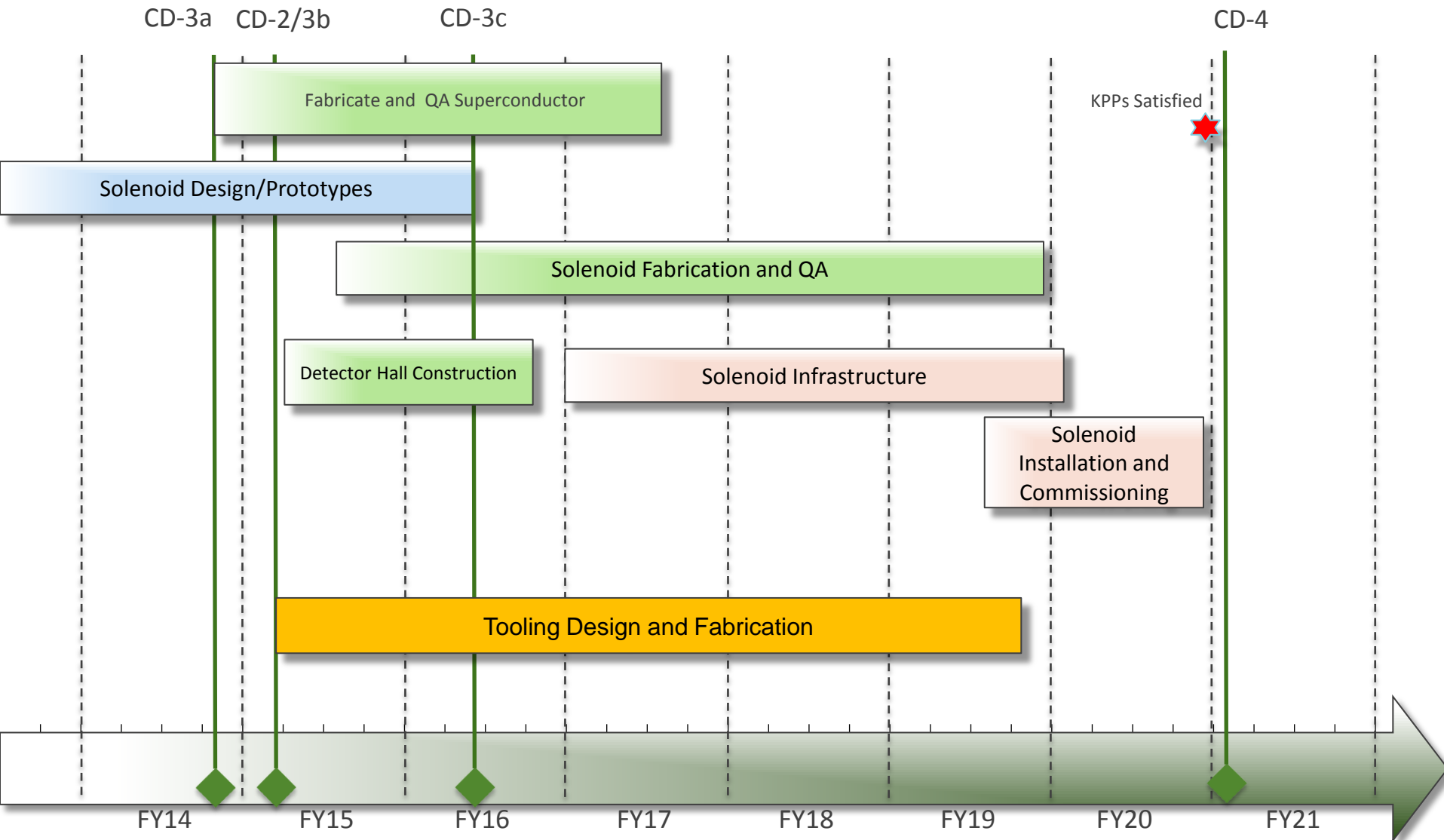
Costs are fully burdened in AY \$k

	Base Cost (AY K\$)			Estimate Uncertainty (on remaining budget)	% Contingency on (on remaining budget)	Total Cost
	M&S	Labor	Total			
475.04.09 Solenoids Ancillary Equipment						
475.04.09.01 Magnet Assembly Equipment	109	332	440	187	44%	627
475.04.09.02 BTH Lifting Equipment	53	95	148	61	42%	208
475.04.09.03 Installation Equipment	155	245	400	176	44%	576
Grand Total	316	672	988	423	44%	1,411

Major Milestones

Activity ID	Activity Name	Date
47504.9.1.001120	T5 - Final design of Magnet Assembly Equipment complete	6/23/2016
47504.9.2.001120	T5 - Final design of BTH Lifting Equipment complete	11/5/2015
47504.9.3.001080	T5 - Final design of Installation Equipment complete	4/18/2016

Schedule



Summary

- Components will comply with all applicable FESHM Chapters.
- Tooling components are ready for CD-2.