



U.S. DEPARTMENT OF  
**ENERGY**

Office of  
Science

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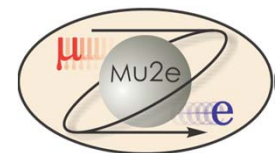
# Conventional Construction

## Mu2e Independent Cost Estimate

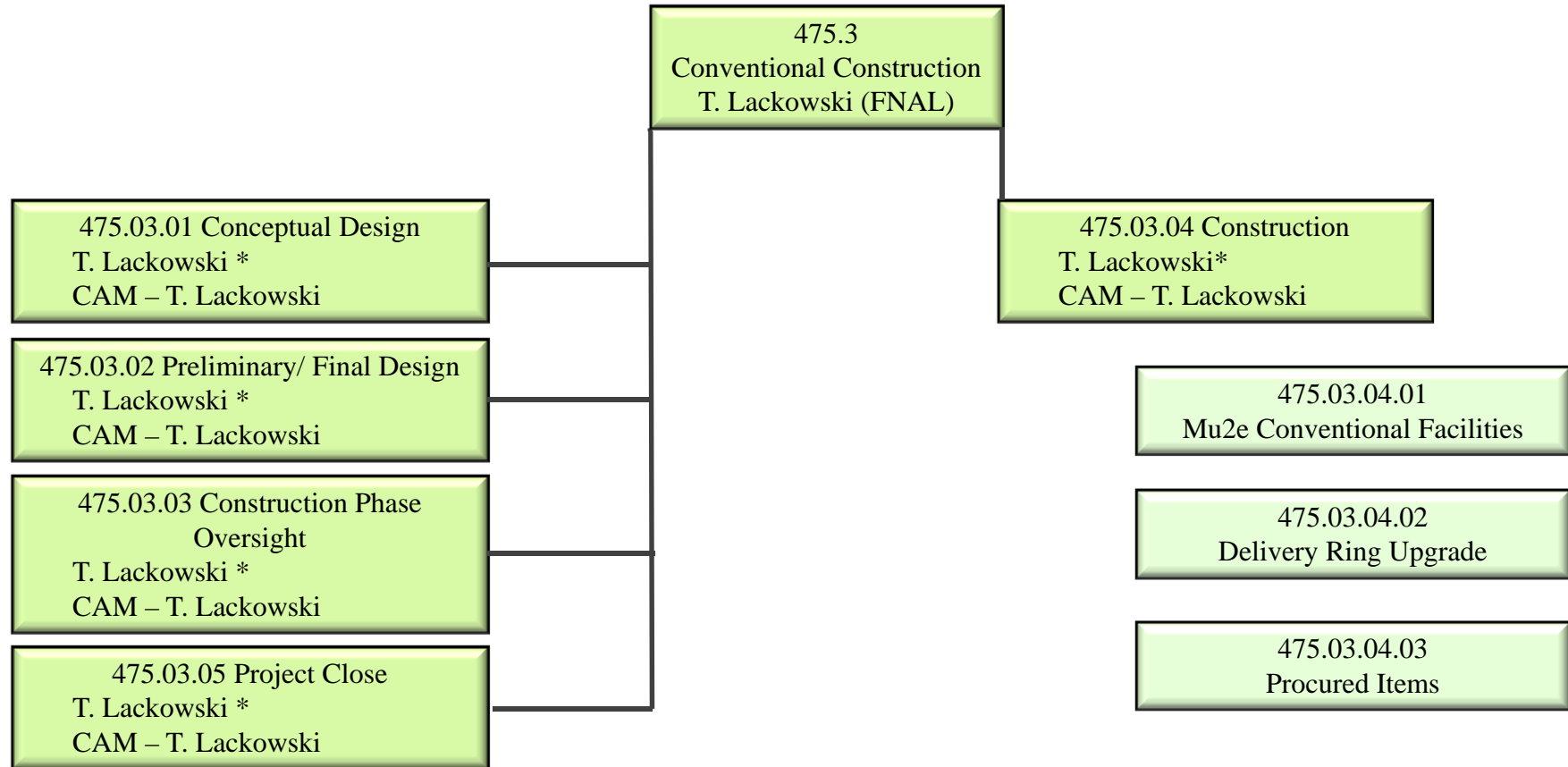
T. Lackowski

L2 Manager

8/26/2014



# Organization



\* Project Team

Design Coordinator – R. Jedziniak; Civil – C. Federowicz; Architectural – Steve Dixon; Structural – T. Lackowski;  
 Mechanical - E. Huedem; Electrical – R. Wielgos;  
 Construction Coordinator - R. Foutch; Construction Safety Consultant – Environmental Resource Management  
 Consulting A&E - Middough Inc.; Consulting Life Safety Eng.- AON; Commissioning - Premera

# Requirements

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- The Conventional Construction produces the facilities that satisfies the physical and environmental needs of the other sub-projects.
  - The requirements were developed via a series of meeting that included representative from the other sub-projects.
  - The requirements were translated into drawings which formed the basis for the A&E, Middough Inc. to produce the contract documents.
  - The project team reviewed drawings at 30%, 60% 90% and 100%. The 90% review was also issued as a Lab Wide Comment and Compliance Review.
- Conform to applicable environmental and organizational standards.
  - Life safety code (NFPA 101), IBC Building Code, DOE Guiding Principles, Fermi standards and requirements.
- Requirements posted in Mu2e-doc-1088

# Summary Requirements

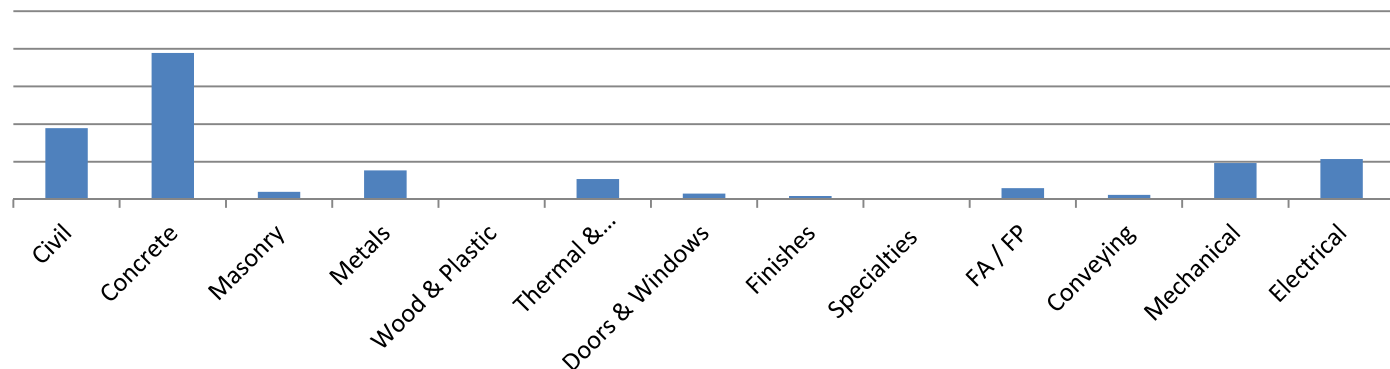
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- Space Requirements
  - Mu2e Conventional Facilities Square Footages:
    - Grade Level 12,600 SF
    - Detector Level 9,640 SF
    - surface building divided into a high bay with two 30 ton cranes and a side bay to house support equipment.
- Mechanical
  - HVAC ~300KW HVAC load (about 50% process load)  
~88KW CHW for detector cooling, vacuum pump, and electronic racks
  - ODH Ventilation: 7000 CFM each for the two lower area & 6300cfm for solenoid power supply room
  - LCW is in WBS 2.0 (Accelerator)

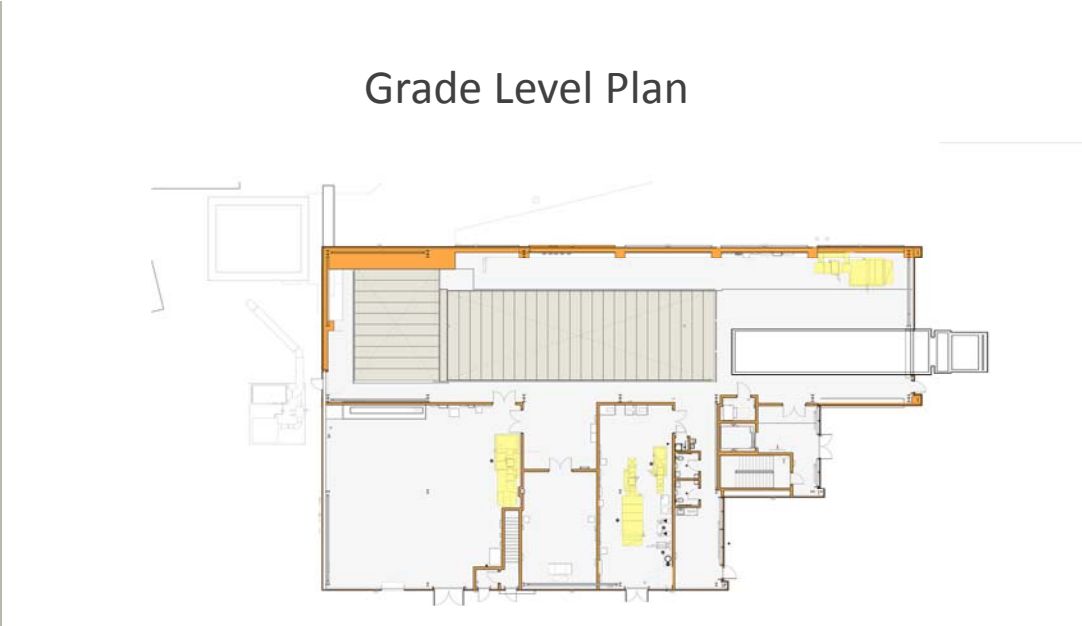
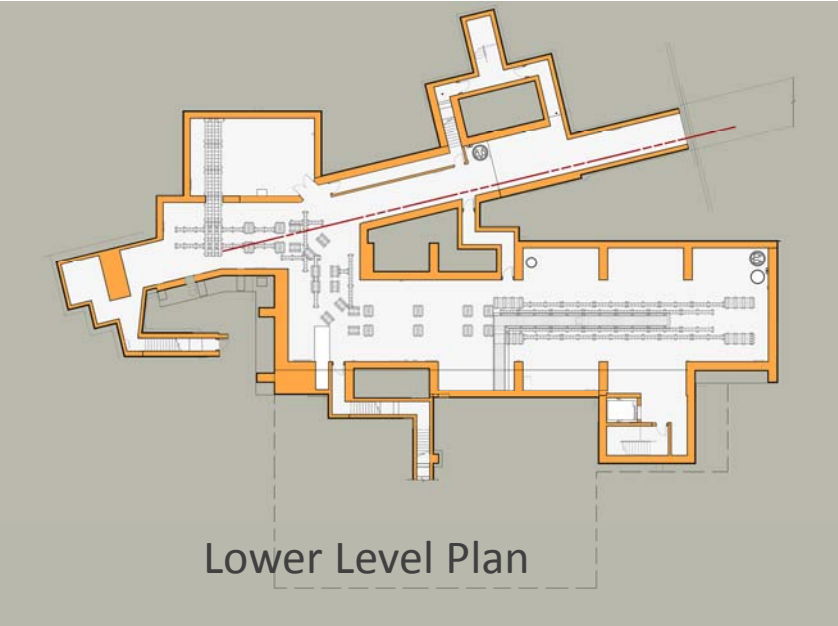
# Summary Requirements / Design

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- Electrical
  - Mu2e Conventional Facilities
    - 1,500 KVA for solenoid and beam line power supplies
    - 750 KVA house Power
  - The Delivery Rings Upgrade(AP-30)
    - Beamline power supplies require new secondary feeds from the primary transformer to an new 1200 Amp distribution panel.
- Cost Distribution by Trade
  - Civil and Concrete dominate.



# Design



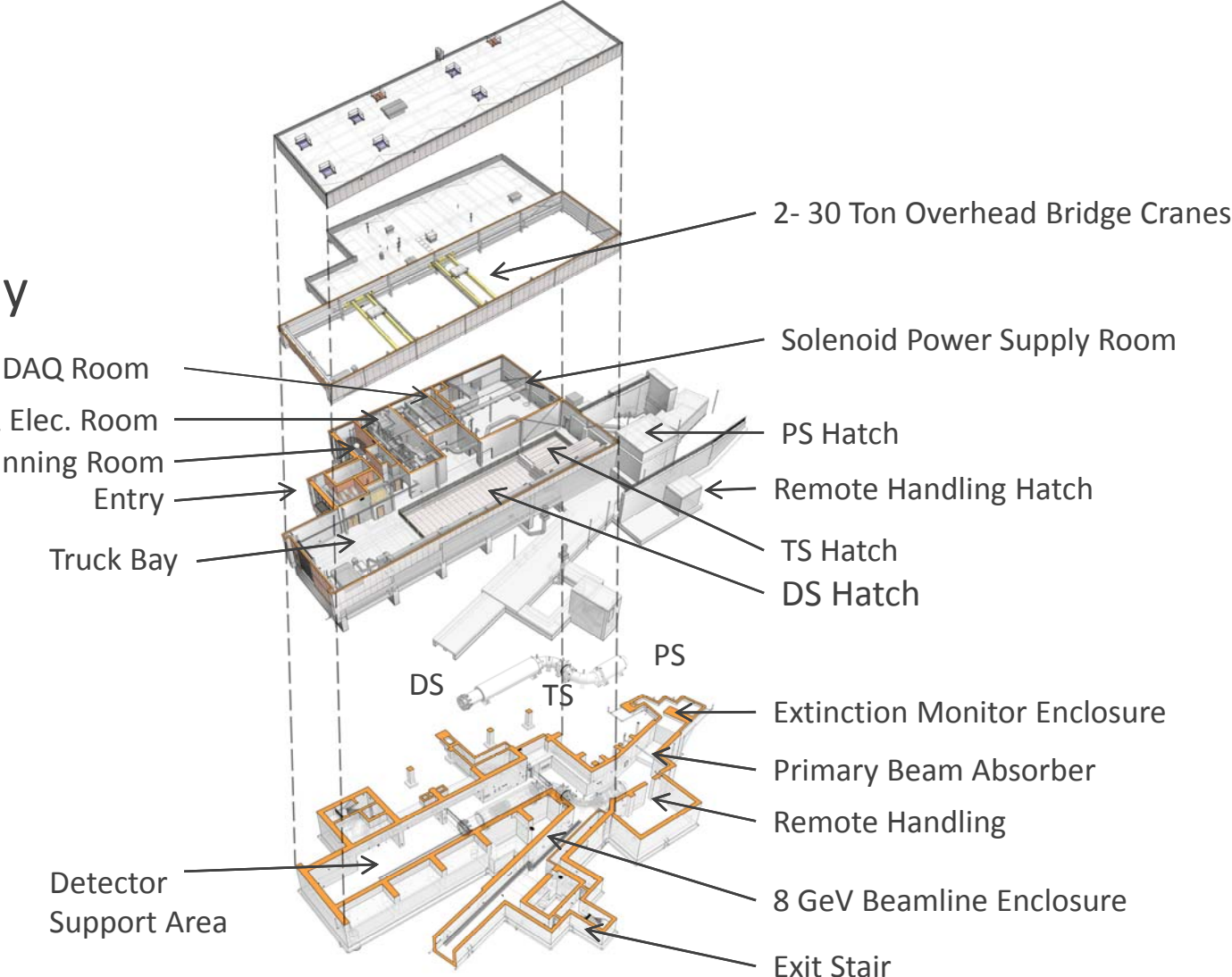
# Design- Mu2e Conventional Facilities

Roof

Crane Runway

Grade Level

Lower Level



## WBS 475.03 Engineer, Design, Inspection & Administration

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- 475.03.01 Conceptual Design
- 475.03.02 Preliminary Final Design
- 475.03.03 Construction Phase Oversight
- 475.03.05 Project Close
- BOE's. include Budget to Complete from end of April, 2014.
- Mythology for estimating engineering, management and consultant budgets is from the "Cost estimating Guide", DOE G 413.3-21 chapter 5.4.3 Percentage Method, dated 5-9-2011.
- EDIA budgets were generated separately for Mu2e Conventional Facilities, Delivery Ring Upgrade and Procured Items;
  - Separate budget estimates for Preliminary / Final Design, Construction Phase Oversight and Project Close
  - Budget proportioned to Fiscal years
  - Budget for items not traditionally included in base EDIA added (Survey QA and utility locates)



## WBS 475.03 Construction

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475.03.04 Construction

475.03.04.01 Mu2e Conventional Facilities

475.03.04.02 Delivery Ring Upgrade

475.03.04.03 Procured Items

- BOE

- Mu2e Conventional Facilities was substantially estimated by Middough Inc. using RS Means, recent quotes and proprietary data.
  - Middough used their construction management arm to assist with the estimate.
- Delivery Ring Upgrade used RS Means unit costs.
- Procured Items used recent procurements or RFQ for to establish budgets.

# Risks

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- Conventional construction bids are lower than estimated cost.
- Conventional construction bids exceed estimated cost.
  - Proposals will be received prior to the DOE CD2/3 review, one risk will be retired and one accepted.
- Unforeseen/undocumented subsurface conditions discovered during excavation for conventional construction.
  - Performed soil exploration to help characterize site
- Significant injury or death associated with Mu2e construction/assembly. (this risk is listed under PM but Conventional Construction has significant ownership)
- Severe Weather impacts civil construction.
- Civil contractor cannot complete work satisfactorily or defaults on contract.

# Cost

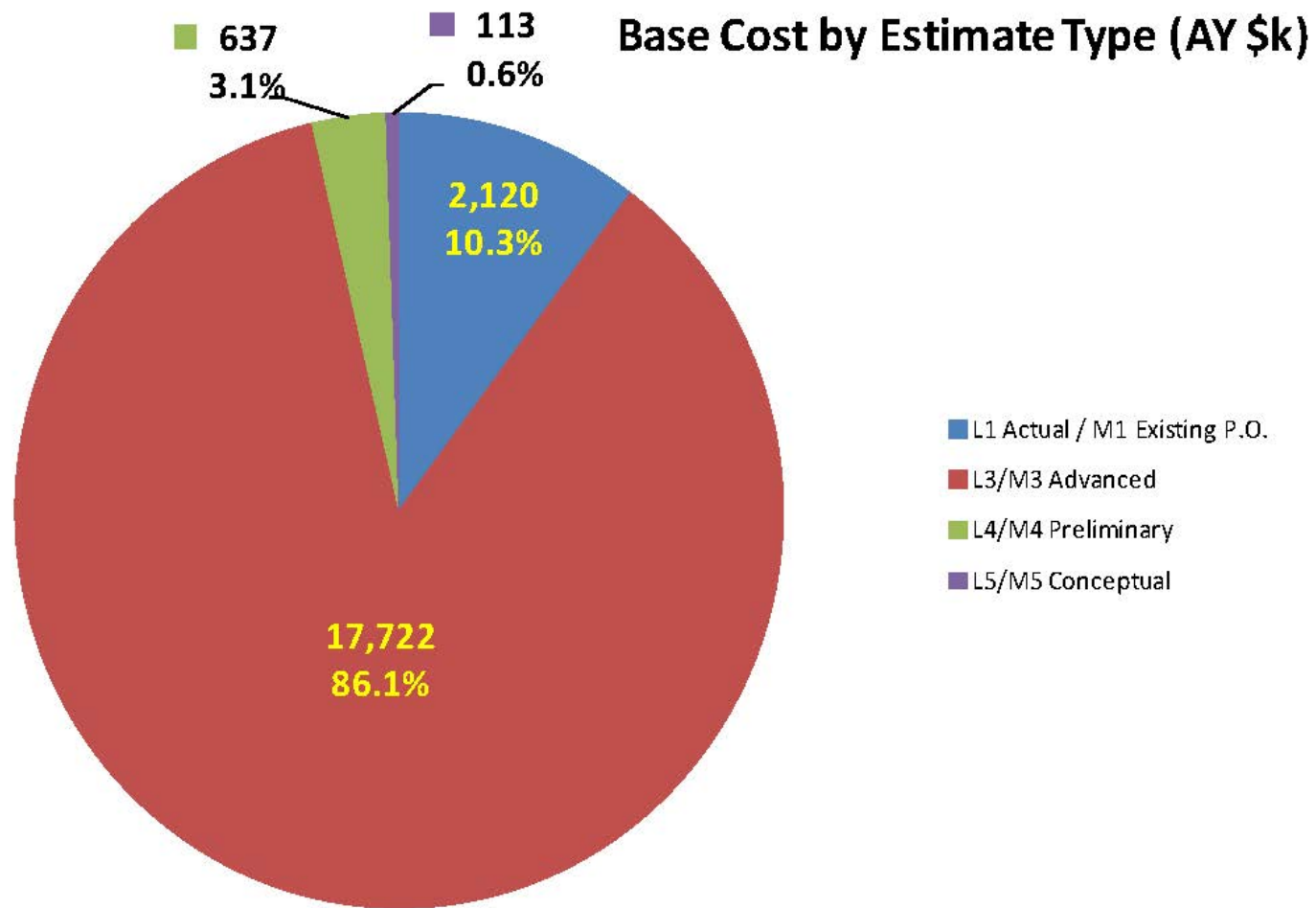
## 475.03 Conventional Construction

Costs are fully burdened in AY \$k

	M & S	Labor	Base Cost	Estimate Uncertainty	% Contingency on ETC	Total
475.03.01 Conceptual Design	211	222	433			433
475.03.02 Preliminary/Final Design	1,424	941	2,365	116	22%	2,481
475.03.03 Construction Phase Oversight	517	1,968	2,485	505	20%	2,990
475.03.04 Construction	14,941		14,941	2,995	20%	17,935
475.03.05 Project Close	157	212	369	74	20%	443
475.03.99 Risk Based Contingency				-510		-510
<b>Total</b>	<b>17,250</b>	<b>3,343</b>	<b>20,592</b>	<b>3,180</b>	<b>17%</b>	<b>23,772</b>

# Quality of Estimate

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# Summary

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- Proposals for Mu2e Conventional Facilities received 8/12/14.
  - Proposals evaluated 60% technical and 40% cost.
    - Management team
    - Experience is similar types structures
    - Quality and Safety Plans
    - Support of Small Business
    - Acceptability of Technical Clarifications and Assumptions
  - In the process of performing technical evaluation.
- We will see the cost proposals once the technical review is complete.