

Project Organization, Schedule, Budget and Deep Site Issues

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} “Summary” talk

COUPP-60 Proposal Sept. 2006 (approved as E961)

- What we proposed:

“The ultimate goal of the COUPP collaboration is to mount a one ton scale dark matter search experiment based on continuously sensitive bubble chamber technology. Here we ask for staged approval to proceed with the development of a 60 kg search experiment”

- Stage I (FY07-FY08): Construction of chamber and testing in NuMI tunnel, including a physics data run. Engineering and preparation of MOU for a deep site.
- Stage II (*requiring new approval*): Deep underground site installation and commissioning. possible upgrades to 60-kg apparatus, depending on NuMI results.

COUPP R&D Review, Dec. 19, 2008

- Review of the R&D achievements and prospects for COUPP
- Committee: Kephart, Stanek, DeJongh, Estrada
- The talks and final report are available on docdb and at http://www-ppd.fnal.gov/DivOffice/internal_rd/Reviews.html

COUPP R&D Review. Dec. 10, 2008

12:30-5:00 pm, Hornet's Nest, Wilson Hall

12:30 Introduction to dark matter detection (Sonnenschein)
12:50 Overview of COUPP (Collar)
1:20 Operations and results from 2 kg chamber; plans for 4 kg upgrade (Crisler)
1:50 Break
2:00 COUPP-60 design and construction (Rucinski)
2:30 NuMI and deep underground site installations (Ramberg)
2:50 Video, trigger and DAQ for COUPP-60 (Cooper)
3:10 Background discrimination using acoustic sensors (Levine, by video hookup)
3:30 Schedule and resources (Sonnenschein)
4:00 Committee executive session
5:00 end

Conclusions of R&D Review

- “Science is compelling”; “approach is promising”
- Challenges:
 - lack of nuclear recoil energy measurement on single event basis means that alpha backgrounds must be controlled– we need several orders of magnitude reduction to exploit science potential of COUPP-60 and more for larger detectors.

Required R&D:

- Demonstration of reduced wall rate with synthetic quartz
- Fluid purification to reduce alpha rate in bulk.
- Acoustic background discrimination

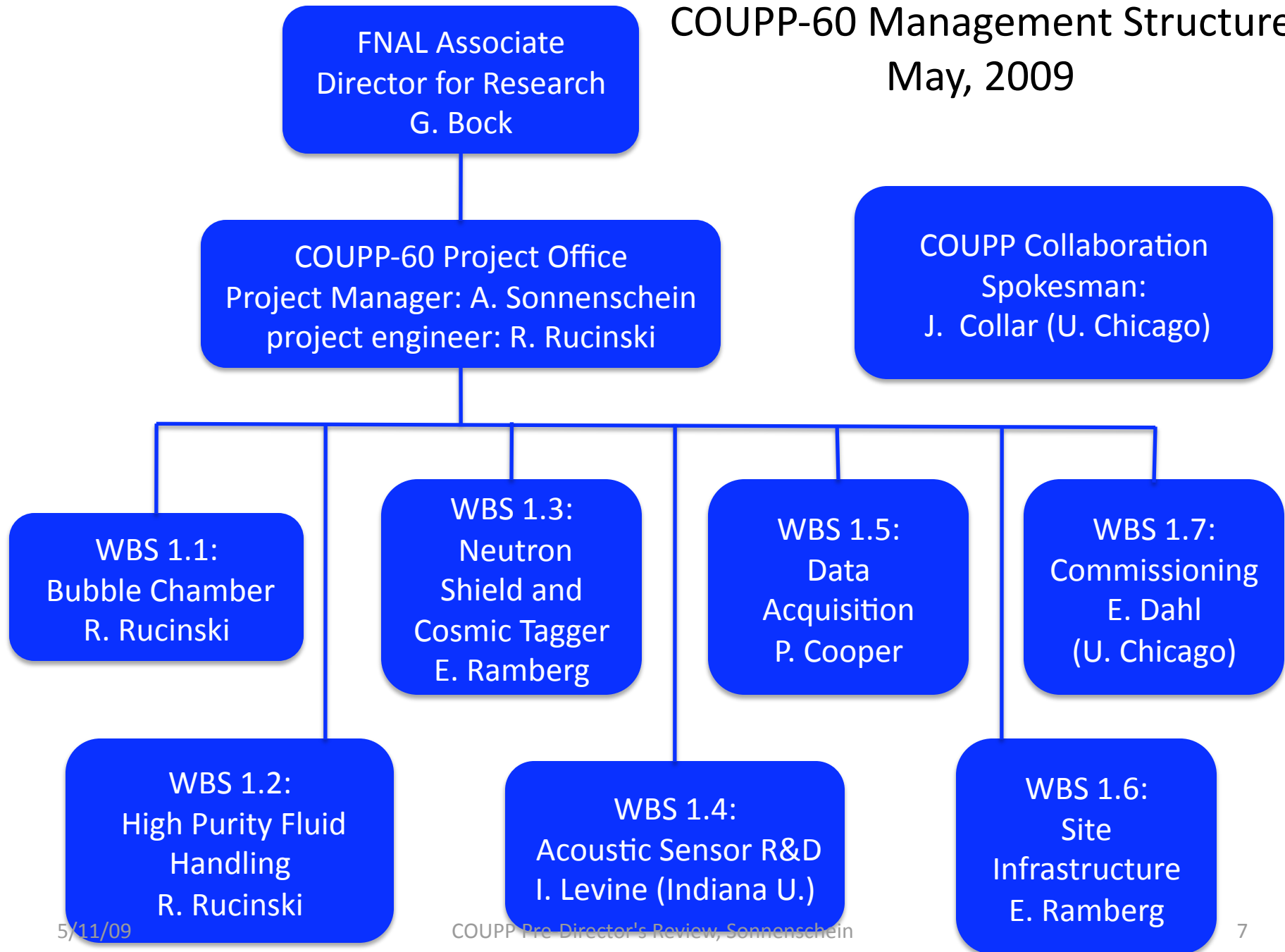
Concern:

- Not realistic to begin engineering of 500-kg device before results of COUPP-60 are available. Collaboration needs to prioritize between 4-kg, 60-kg and design of 500-kg.

Scope of This Review

- We will try not to repeat most of material from previous review.
- Most of preparation work has been to define WBS and schedule and most of the talks are organized to give update on WBS items.
- We are diving COUPP-60 kg into 4 sub-projects:
 1. COUPP-60 construction and commissioning
 2. COUPP-60 maintenance and operations (M&O) in NuMI
 3. COUPP-60 deep underground site installation
 4. COUPP-60 deep underground M&O
- Focus here is on Project 1: Construction and commissioning
- To address the committee's charge, we will more briefly discuss the status of our planning for physics running at NuMI and a deep underground site installation.

COUPP-60 Management Structure May, 2009



Work Breakdown Structure (WBS)

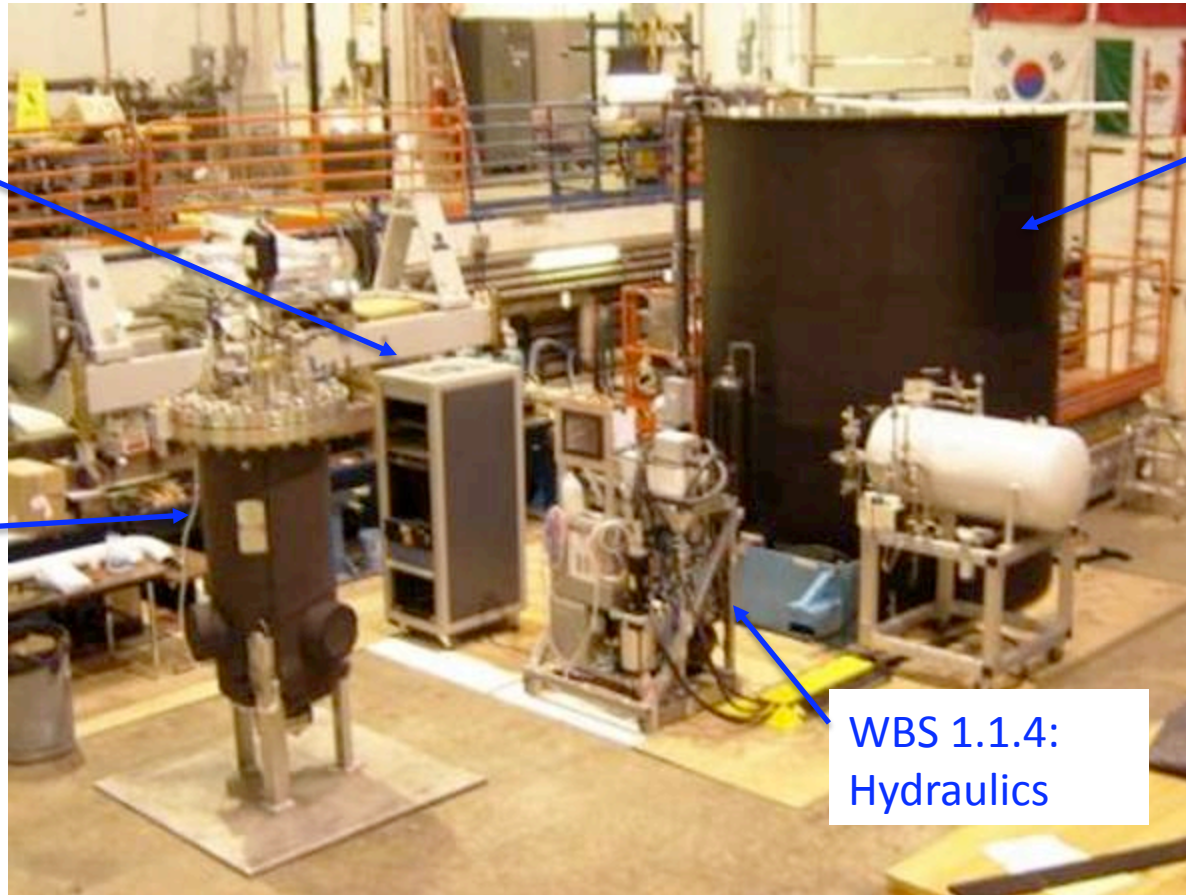
WBS 1.5:
Data
acquisition

WBS 1.1:
Bubble
Chamber

WBS 1.6:
Site
Infrastructure

WBS 1.2: High Purity
Fluid Handling

WBS 1.7:
Commissioning

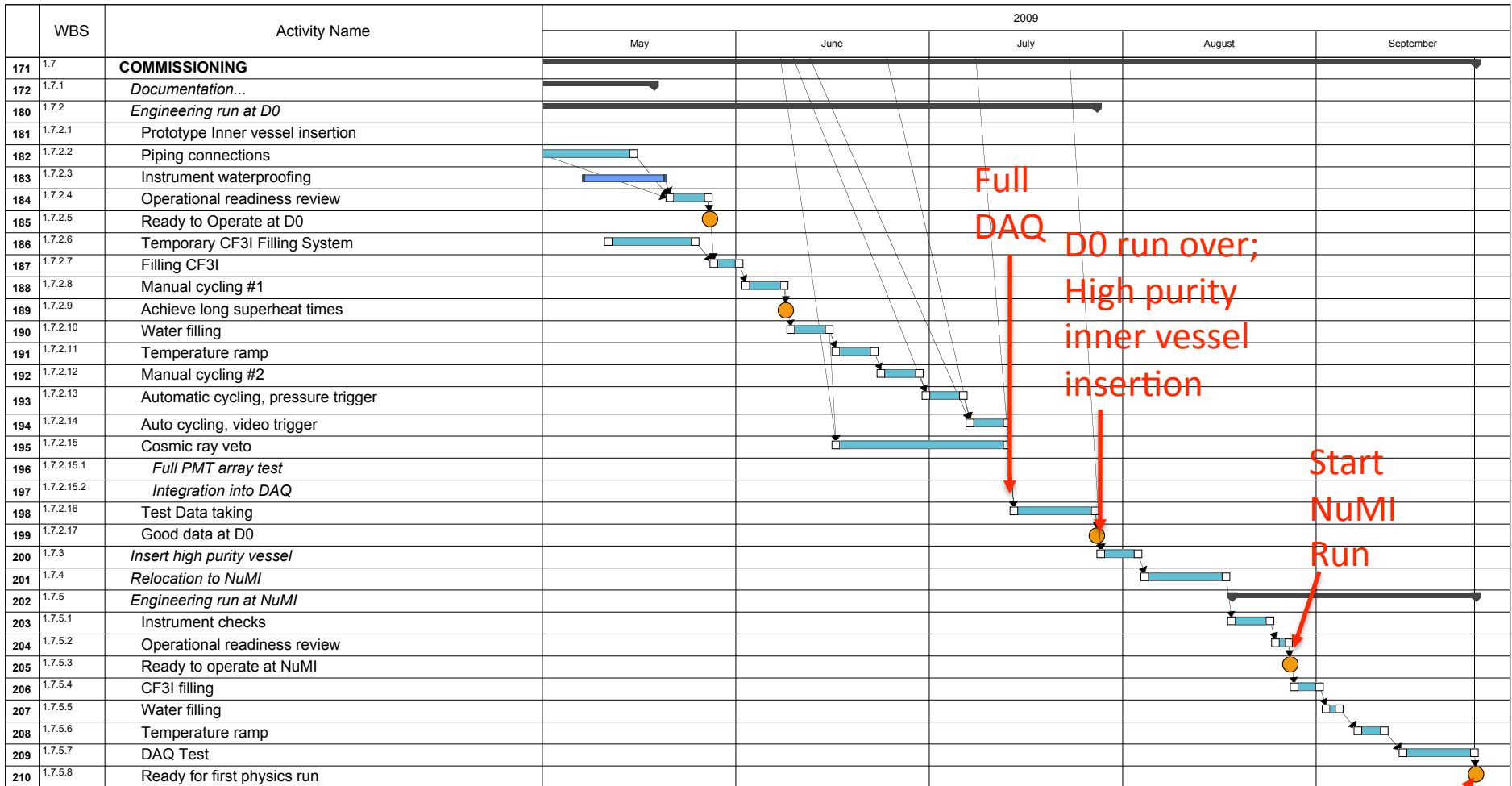


WBS 1.3:
Neutron Shield
And Cosmic
Tagger

WBS 1.4:
Acoustic
Sensor R&D

WBS 1.1.4:
Hydraulics

WBS 1.7: Commissioning



End of WBS 1: Construction and Commissioning
Start NuMI physics run

COUPP Fermilab Effort FY2009

FY2009 AVG REPORTED FTEs

	CD	AD	PPD	TOTAL
Admin			0.14	0.14
Comp professional			0.03	0.03
Designer/Drafter			0.23	0.23
Engineer	0.13		1.84	1.97
Scientist	0.33	0.69	1.57	2.59
Technician	0.05	0.08	3.32	3.45
Total FTEs	0.51	0.77	7.13	8.41

Notes:

- This table is based on reported effort from Oct. 2008- March 2009.
- We don't separately track effort on R&D and the COUPP-60 project, so the table above includes both. Rough estimate: COUPP-60 is 2/3 of the total effort shown above.

COUPP People at Fermilab FY09

Scientists (8, 2.6 FTEs):

BRICE
BROEMMELSIEK (AD)
COOPER (CD)
CRISLER
HU (AD)
RAMBERG
SONNENSCHIN
TSCHIRHART (CD)

Engineers (10, 2.0 FTEs)

HANSEN
SCHMITT
MATULIK
PUSHKA
RUCINSKI
SARYCHEV
LINDENMEYER
KIPER
DEUERLING (CD)
KWARCIANY (CD)

Admin (1, 0.14 FTEs)

VOIRIN

Computer Professional (1, 0.03 FTEs)

ZIMMERMAN

Designer/Drafter (4, 0.23 FTEs)

CATALANELLO
KINDELBERGER
SCHELLPFEFFER
TILLMAN

Technicians (25, 3.5 FTEs)

BONIFAS (AD)
MURANYI (AD)
WILCER (CD)
BARGER
BUTLER
DANNER
GREEN

Technicians ctd.

LIPPERT
RUSCHMAN
TAHERI
TWEED
KORIENEK
MARTIN
FLORES
SHOUN
KUBINSKI
GRADO
HARDIN
CARLSON
MONTES
WILSON
TACCKI
NEBEL
FAGAN

COUPP FY2009 Projected Costs

FY2009 ESTMATED SWF (K\$)

	CD	AD	PPD	TOTAL
Admin	0	0	15	15
Comp professional	0	0	5	5
Designer/Drafter	0	0	34	34
Engineer	36	0	404	440
Scientist	112	273	421	806
Technician	6	12	329	347
Total SWF fully burdened	154	285	1,208	1,647
Scientific SWF	806			
Technical SWF	841			
M&S	268			
Total Estimated FY09	1,915			

Notes:

- Fermilab only, including both COUPP-60 and R&D.
- Based on average reported effort and occupational categories, not actual salaries.
- Includes all appropriate overheads– “fringe, vacation, opto, indirect costs”

When Are We Ready for Deep Site?

- Technical criteria
 - High live time fraction ($> 50\%$)
 - Implies that wall rate is low, good gas handling and good quartz surface
 - Efficient triggering on small bubbles
 - Implies high-quality video system, debugged DAQ software
 - Reliable unattended operation
- Physics criteria
 - Goal: 1 untagged background event/kg-day
 - Alpha rates must be lower than this.
 - $>90\%$ efficiency for tagging cosmic-related events
- Deep site infrastructure needs to be ready
 - Utilities (water, compressed air, electricity)
 - Possible safety equipment
 - Water tank, lifting equipment

Erik Ramberg's talk covers progress on defining infrastructure needs

Deep Site Milestones

- Deep underground site report, mid-July.
 - Report will describe possible installations at Snolab and Soudan and explain why not Homestake.
 - Estimate installation and operations cost in each case.
 - Report will go to Fermilab directorate with a letter asking for an approval of the collaboration's choice of site.
- Deep underground site selection by lab directorate
- Deep site (Stage II) proposal and approval.
- Begin site infrastructure work.
- Install detector (before the competition)

Documentation

What we have

1. Approved proposal (2006) covering construction and commissioning at NuMI.
2. Work Breakdown Structure (WBS)
 - 225 items (5/10/09)
 - Coarse grained for items already complete.
 - Fine grained for future items, especially those believed close to critical path.
 - No details beyond construction and commissioning phase (WBS 1.x)
3. Schedule
 - PPD schedulers Rich Krull and Ken Domann are helping to make sure we do this right.
 - For future only– no attempt made to reconstruct history.
 - For WBS 1.x only
 - Not yet resource loaded. Based on a constant level of effort by key people.
4. Budget
 - Through FY09 only (end of commissioning)
 - Based on assumption of continuation of level of effort at average FY09 value, since schedule is not resource loaded.

Documentation: Continued

5. Design documents and drawings

- We have a growing collection, now being organized in Docdb.
<http://projects-docdb.fnal.gov>.
- We have documentation of most of the pieces.
- Level of detail not uniform.
- We do not have a “design report” or similar document which puts together all the pieces.

6. Testing reports

- Completeness and level of formality varies across subsystems.
e.g. formal writeups of leak checking results on flanges, emails describing acoustic sensors and muon veto tests.

7. Operations manuals, procedures

- We have formal, reviewed procedures for the fluid handling operations, which are based on procedures that were developed and tested on the 2 kg chamber.
- Data acquisition electronics “user’s manuals”.
- DAQ software to be documented as it is written over the summer.

Documentation Continued: ES&H

8. ES&H related documentation.

- We use the PPD Operational Readiness Clearance (ORC) procedure to assure safety of the installation and operations.
- PORC and ORC reviews have been performed for the 2 kg setup and its upgrades, for the water tank and muon tagger and for testing of the 60 kg chamber at the PAB building.
- Information packages for these reviews have included mechanical and electrical drawings, operating procedures, pressure vessel notes and Job Hazard Analysis (JHA) forms.

See

<http://projects-docdb.fnal.gov:8080/cgi-bin/ShowDocument?docid=506> for the contents and Part 1 of the current 60-kg document package.

- Failure Mode and Effects Analysis (FMEA) for 60 Kg mechanical system.
- We have a paper/email trail of recommendations of the safety committees and corrective actions taken.

User:
coupp,
password:
UChicago1234

Additional Documentation We May Need

1. Resource-loaded schedule
 - Appropriate given scale of project and state of completion?
2. WBS dictionary needs work.
 - Scope and deliverables should be clearly identified for each item.
 - Should be linked to design documents.
3. Additional design documents and basis of estimate documents for WBS items.
4. WBS, schedule and budget for deep site activities.
 - Existing WBS and schedule only covers NuMI installation in any detail (WBS 1.x)
 - We don't yet know M&S or labor costs for deep site.
5. Deep underground site report and recommendation (July?)
6. Deep site proposal to Fermilab directorate.
7. Proposal to Snolab, in case Snolab is chosen (Soudan less formal)
 - Snolab EAG and Director have been very encouraging
8. MOUs with deep underground lab and university groups.