

Experiment Operations and Support

John Cooper

Fermilab

March 16, 2004

Particle Physics Division (PPD)



- Mission Statement

The Particle Physics Division supports experimental and theoretical research in particle physics and the development of new research techniques, provides management and technical resources for the construction and operation of particle physics experiments, and promotes the exchange and communication of new results.

(Founding mission statement from October, 1996)

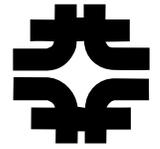
- 2002 add: Helps the Accelerator Division with technical resources for accelerator projects and in accelerator Shutdowns

Also from 1996: **PPD Core Competence**



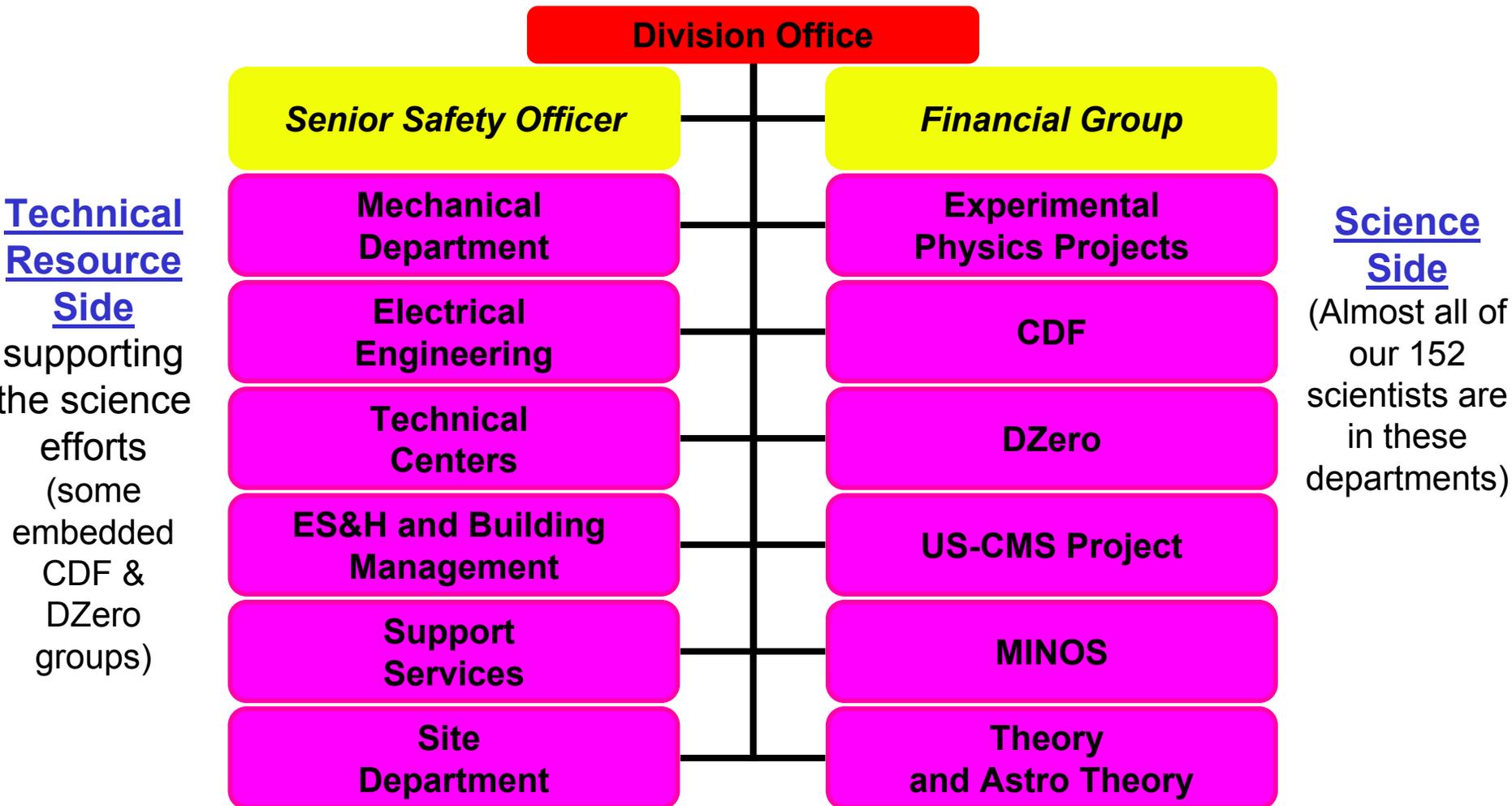
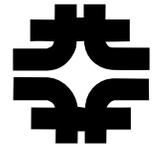
- Expertise in experimental research in particle physics
- Expertise in theoretical research in particle physics
- Expertise in mechanical, electrical and electronics engineering for development, design, construction, installation and commissioning of experiments
- Expertise in fabrication, installation and operations of detectors and experiments
- Facilities for research and development of new technologies for particle physics experiments
- Expertise in project management, integration & coordination

PPD Mission and Priorities applied to Experiment Operations and Support



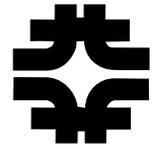
- Operate CDF and DZero
 - Upgrade CDF and DZero for Run II
- Install MINOS (and some of NuMI)
 - Operate MINOS (Soudan is running)
- Assist the Accelerator Division on projects & in shutdowns
- Operate Booster and SY120 experiments
 - MiniBooNE
 - MIPP (Main Injector Particle Production) & MTest (testbeam)
- Other tasks:
 - Operate CDMS, Sloan, Auger
 - Theory and Astro Theory groups
 - US-CMS, preparing for operations as Host Lab
 - R&D on BTeV, Linear Collider, Future Kaons, Off-Axis Neutrinos, future Experimental Astro, Neutrino Factory

PPD Organization Chart



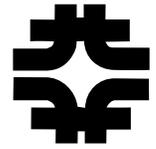
Numbers of People by category

(Feb 29,2004 snapshot of PPD)



-
- 152 Scientists
 - 90 Engineers
 - (31 Mechanical, 27 Electronics, 19 Engineering Phys, 13 Eng Assoc)
 - 24 Designers / Drafters
 - 24 Computing Professionals
 - 117 Mechanical Techs
 - 44 Electrical Techs
 - 9 ES&H Professionals
 - 31 Administrative / Financial
-
- **491** **TOTAL**
 - **+84** **Guests and Visitors** (not all are paid)

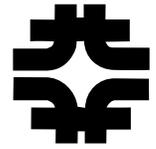
Distribution of PPD people by labor type over the projects



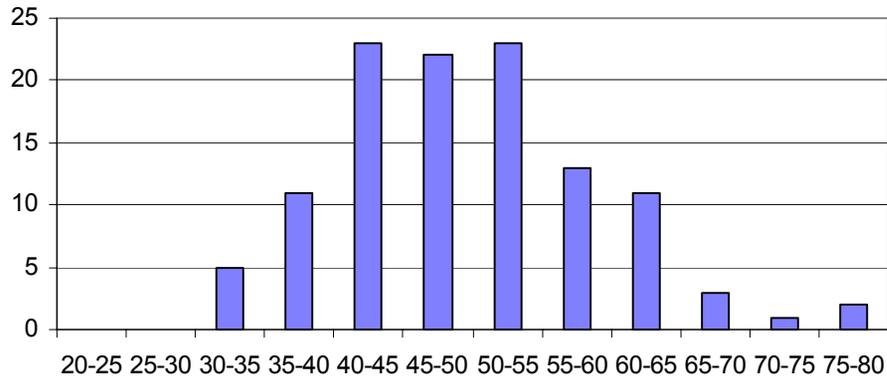
- This is our FY04 plan - not the same as the previous slide's snapshot

FY04		Monthly						Weekly / Hourly					TOTAL
		Admin & Management	Computer Professionals	Engineering Physicists	Engineers	Scientists	Other Technical Support	Clerical & Secretarial	Drafters	Service Workers	Skilled Trades	Technicians	
TOTAL		21.9	24.0	18.0	68.5	152.9	72.6	8.5	13.0	0.0	0.0	107.2	486.6
Experimental		8.2	16.0	11.7	59.0	105.7	44.0	2.0	7.5	0.0	0.0	50.4	304.6
	CDF	4.5	4.0		10.7	32.7	9.8					11.5	73.2
	D0	1.5	9.0	5.7	12.5	32.8	13.0	0.5	4.3			13.7	93.0
	MINOS				1.5	3.3	5.5		1.0			11.8	23.1
	MiniBooNE					2.5							2.5
	CMS	2.0	2.0	2.0	10.0	8.6	7.8	1.0	2.0			2.6	37.9
	BTeV			2.0	17.3	6.3	5.0	0.5				4.3	35.4
	Future Kaons			1.0	2.5	1.6	0.7					0.5	6.3
	SDSS			1.0	1.5							4.8	7.4
	CDMS	0.2			0.5	0.9	2.1					1.0	4.7
	Auger				0.0	4.0							4.0
	Fix target exp		1.0		1.5	7.2	0.2					0.2	10.1
	New Initiatives				1.0	5.8			0.3				7.0
Theory		2.0				33.0							35.0
LHC Accelerator													0.0
Accelerator operation		0.0	0.0	4.2	7.1	3.7	12.1	0.0	2.5	0.0	0.0	42.1	71.7
	Run 2			3.2	0.8	2.7	10.0					39.6	56.3
	MiniBooNE												0.0
	NuMI			1.0	6.3	1.0	2.1		2.5			2.5	15.4
Accelerator R&D		0.0	0.0	0.0	0.8	5.4	0.0	0.0	0.0	0.0	0.0	1.4	7.6
	NLC				0.8	2.2						1.4	4.4
	TESLA												0.0
	FNPL												0.0
	Muon Facilities					2.7							2.7
	New Proton Source					0.5							0.5
	VLHC												0.0
	Generic R&D												0.0
Other Direct		11.7	8.0	2.1	1.6	5.1	16.5	6.5	3.0			13.4	67.7
Indirect													0.0

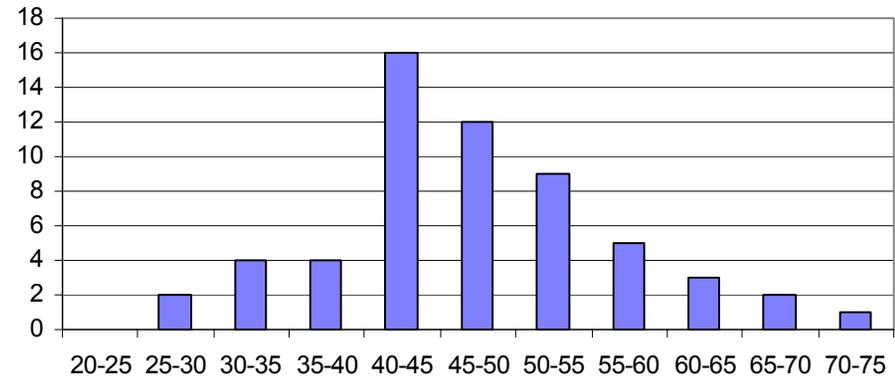
PPD – ages of technical staff



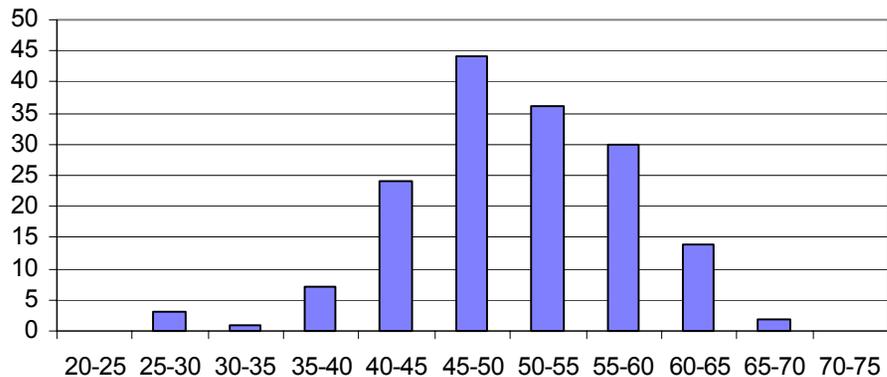
106 Scientific Staff - average age = 49.8



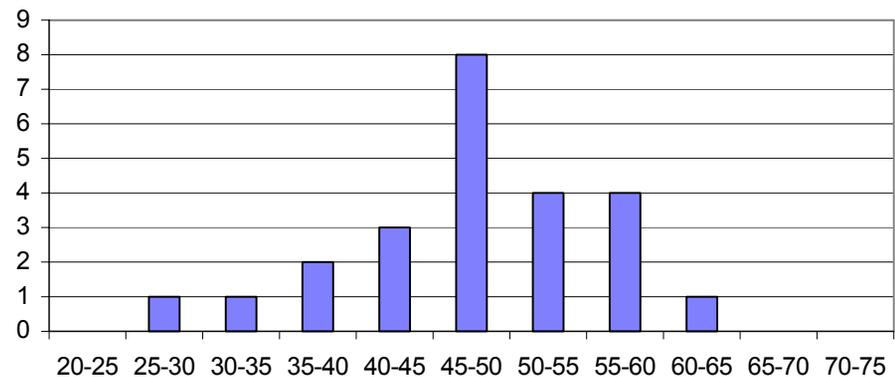
58 Engineers - average age = 47.1



161 Technicians - average age = 50.3



24 Computing professionals - average age = 47.9



PPD Budget Planning



- One, it's dominated by the SWF costs on the previous slides
- Two, the M&S is a bottom up exercise every year
 - in the context of our priorities
 - I ask for requests from PPD Departments
 - giving general guidance within my guidance from the Directorate
 - Departments return lists with line items at the \$ 5 – 20 K
 - I mark up their requests, line by line – you will see 3 in the breakout
 - We discuss the markup and adjust
 - I present the results to the Directorate, flagging my shortfalls
 - They mark up my presentation
 - allocate some relief if I made a good case (and they have any \$?)
 - We live with the result, often modifying our plan somewhat as we go
 - when new things come up
 - unexpected roof, ..., opportunity to invest in equip and save ops \$

FY04 PPD Budget

at Lab WBS level 3 or 4



1.0	TOTAL									63,787.9	46,136.7	17,651.2
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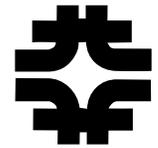
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B&R Control Level							(All)	FY04 TOTAL	Total Labor	Total M&S
1.1	<u>Accelerators</u>							4,077.7	4,077.7	0.0
1.2	<u>Collider Experimental Program</u>							21,691.9	16,522.9	5,169.0
1.2.1	CDF							9,732.9	7,266.9	2,466.0
1.2.1.1	CDF Operations							7,835.5	6,258.5	1,577.0
1.2.1.4	CDF Run IIb							1,897.4	1,008.4	889.0
1.2.2	DZero							11,892.7	9,189.7	2,703.0
1.2.2.1	Dzero Operations							8,615.0	6,937.0	1,678.0
1.2.2.4	Dzero Run IIb							3,277.7	2,252.7	1,025.0
1.2.4	Si-Det Facility Support for Run IIb							66.3	66.3	0.0
1.3	<u>LHC</u>							8,954.2	3,798.0	5,156.2
1.3.2	CMS							8,954.2	3,798.0	5,156.2
1.3.2.1	CMS Project							4,412.0	1,260.0	3,152.0
1.3.2.2	Related Research (Base Support)							2,220.4	1,905.4	315.0
1.3.2.3	Si-Det Facility Support for CMS							132.6	132.6	0.0
1.3.2.4	CMS Maintenance and Operations							2,189.2	500.0	1,689.2

Projects
&
Shutdown
Help

Shared
Labor
cost

PPD Budget, Lab WBS level 3 or 4, continued



B&R Control Level	(All)	FY04 TOTAL	Total Labor	Total M&S
1.4	BTeV	4,393.1	3,493.1	900.0
1.4.2.1	Ops, Support & R+D	4,223.7	3,323.7	900.0
1.4.2.2	Si-Det Facility Support for BTeV	169.4	169.4	0.0
1.5	Experimental Initiatives	2,307.0	2,153.0	154.0
1.5.1	Future Kaons	675.9	625.9	50.0
1.5.2	External Beamlines & Fixed Target Exps	1,060.1	1,036.1	24.0
1.5.2.2	Prior Fixed Target Runs - 1997	10.0	0.0	10.0
1.5.2.3	Prior Fixed Target Runs - 1999	470.1	466.1	4.0
1.5.2.6	Meson 120 (E906 and 907)	520.0	520.0	0.0
1.5.2.7	External Beamlines	60.0	50.0	10.0
1.5.3	Off-Axis Neutrinos	571.0	491.0	80.0
1.6	Neutrino Experiments	5,825.2	3,541.2	2,284.0
1.6.1	NuMI / MINOS	5,496.2	3,282.2	2,214.0
1.6.1.1	Beamline	1,356.1	1,356.1	0.0
1.6.1.2	MINOS	2,840.1	1,926.1	914.0
1.6.1.6	Soudan Operations	1,300.0	0.0	1,300.0
1.6.4	MiniBooNE	329.0	259.0	70.0

Shared Labor cost

KTeV

MIPP

Testbeam

PPD Budget, Lab WBS, more details



B&R Control Level	(All)	FY04 TOTAL	Total Labor	Total M&S
1.7	<u>Future Accel. & Advanced Accel. R&D</u>	840.7	720.7	120.0
1.7.3	Muon Storage Ring	295.0	275.0	20.0
1.7.4	Linear Collider	493.8	393.8	100.0
1.7.5	Site Studies	0.0	0.0	0.0
1.7.6	Advanced Accelerator Concepts	0.0	0.0	0.0
1.7.7	New Proton Driver	51.9	51.9	0.0
1.8	<u>Theory</u>	5,025.0	4,555.0	470.0
1.8.1	Particle Theory	3,580.0	3,260.0	320.0
1.8.2	Astrophysics Theory	1,445.0	1,295.0	150.0
1.8.3	Lattice Gauge Theory Computing	0.0	0.0	0.0
1.9	<u>Experimental Particle Astrophysics</u>	2,690.7	1,675.7	1,015.0
1.9.1	SDSS	514.0	506.0	8.0
1.9.2	CDMS	1,394.3	533.3	861.0
1.9.3	Pierre Auger	558.8	412.8	146.0
1.9.5	JDEM	223.6	223.6	0.0

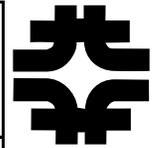
Travel
Some R&D

Apache
Point
Crew

321
Ops

Travel

PPD Budget, Lab WBS, last bit



B&R Control Level	(All)	FY04 TOTAL	Total Labor	Total M&S
1.10	Programmatic Support (Direct)	3,533.8	2,181.9	1,351.9
1.10.5	Technical Facilities	1,809.6	1,328.6	481.0
1.10.5.1.1	Computer Numerically Controlled Routing	150.3	145.3	5.0
1.10.5.1.2	Plastics and Thin Film Coating	102.7	87.7	15.0
1.10.5.1.3	Scintillator Detector Development	76.6	51.6	25.0
1.10.5.1.4	Silicon Detector development	259.0	0.0	259.0
1.10.5.1.5	Winding and Detector Support	87.3	82.3	5.0
1.10.5.1.6	Detector Assembly Machine Development	205.0	200.0	5.0
1.10.5.1.7	Carbon Fiber Facility	112.0	82.0	30.0
1.10.5.1.8	Electronic Assembly Support	190.5	167.5	23.0
1.10.5.1.9	Mechanical Assembly Support	519.7	425.7	94.0
1.10.5.1.10	Extrusion Facility	101.5	86.5	15.0
1.10.6	Engineering Support	735.9	178.9	557.0
1.10.7	TV System Support	170.0	160.0	10.0
1.10.8	Survey & Alignment	315.1	165.1	150.0
1.10.11	Travel for Conferences	55.0	0.0	55.0
1.10.12	U.S. Particle School Office	186.6	149.0	37.6
1.10.13	Conference/Workshop Support	261.6	200.3	61.3
1.11.2	Work For Others	145.0	145.0	0.0
1.12	Other Support (Direct)	1,359.3	1,147.3	212.0
1.12.1	Buildings/Facilities	900.5	746.5	154.0
1.12.1.1	Maintenance	320.9	240.9	80.0
1.12.1.2	Management	234.6	194.6	40.0
1.12.1.3	Cleanup and Restoration	345.0	311.0	34.0
1.12.2	ES&H	458.8	400.8	58.0
1.13	Division Management and Support (Direct)	2,944.3	2,125.2	819.1
1.13.1	Management/Supervision	1,989.1	1,336.0	653.1
1.13.2	General Purpose Equipment and Support	16.0	0.0	16.0
1.13.3	Computing Support/Information Systems	720.0	575.0	145.0
1.13.4	Training and Education	219.2	214.2	5.0
1.0	TOTAL	63,787.9	46,136.7	17,651.2

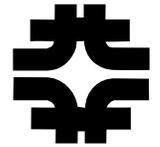
Part of mission, heavily used

Core costs not shared

ASICs

Lab-wide functions

PPD Risks & Challenges



- **Mitigated**

- We are in the midst of rearranging our workforce to match the changes from last fall's decisions (BTeV, CKM, CDF/DZero silicon) and this year's anticipated completion of NuMI / MINOS
 - Specific impact on our Silicon Facility
 - Downsizing across the division by moving people to cover tasks in other divisions (e.g. Voluntary ERP)

- **Forseen, thinking about them**

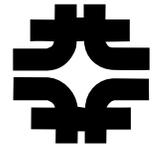
- Operations of one-of-kind custom detectors
 - In Breakout: [CDF Drift Chamber](#), [Protecting CDF & DZero silicon](#)
- Other [Potential Risks](#):
 - Components becoming a high maintenance load (MXs in Run I)
 - Long term operations of CDF and DZero if / when the collaboration members begin to shift their focus to LHC
 - [US-CMS Host Lab function may allow people to double count their efforts. Space on WH11](#)

Tracking Progress, Resolving Problems



- Weekly meetings with most PPD Department Heads
 - 3 are on the same WH floor and we meet more often
 - topics avoid overlaps with All Experimenter's Meeting, Run II Strategy Meeting, PMGs run by the Directorate
- Self-Assessments (see the PPD website)
 - In FY02 did 22 formal assessments, 365 pages
 - set metrics, assigned grades
 - Grades: 7 Outstanding, 9 Excellent, 5 Good, 1 unsatisfactory
 - In FY03 the lab decided on a shorter format, 21 pages total
 - In FY04 - CDF, DZero, MINOS operational efficiencies
in tomorrow's breakout (and in weekly All Experimenter's Meeting)

PPD FY02 Self-Assessments



PPD Self Assessments for FY02

Status and grade

(there are 64 total assessments spread over a 3 year cycle, 22 for FY02)

J. Cooper

5-Oct-02

Number and Title

Done

pages

Grade

Outstanding Excellent Good Marginal Unsatisfactory

1	#2 ProCard Use in PPD	1	7		1			
2	#4 PPD Financial Reports	1	16	1				
3	#5 Foreign Travel	1	13			1		
4	#6 Review the Mech. Dept CDF Operations Log	1	10		1			
5	#7 Review the Mech. Dept DZero Operations Log	1	14		1			
6	#10 Uptime on the Mech. Dept CAD Server	1	7	1				
7	#15 EE Dept Experiment Assembly Group Work Requests	1	10					1
8	#16 EE Dept Printed Circuit Board Work Log	1	24		1			
9	#17 Tech Centers Alignment Group Work Log	1	12	1				
10	#22 PPD Integrated Safety Management	1	36	1				
11	#26 ITNA Status	1	50	1				
12	#27 ES&H Training Status	1	7		1			
13	#33 Domestic Travel	1	9			1		
14	#36 Desktop Computing Operations	1	39	1				
15	#38 Experimental Research Associate Hiring	1	16		1			
16	#43 Experimental Scientific Output	1	9	1				
17	#44 CDF Detector Uptime	1	27			1		
18	#48 DZero Detector Uptime	1	14			1		
19	#52 CMS Construction Project	1	15		1			
20	#56 MINOS portion of the NuMI Construction Project	1	12			1		
21	#59 Theory Research Associate Hiring	1	6		1			
22	#62 Astrophysics Research Associate Hiring	1	12		1			

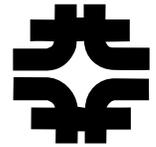
Totals:	22	365	7	9	5	-	1
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March 16-18, 2004

DOE Tevatron Operations Review

16

PPD FY03 Self-Assessments



- New shorter format
- 21 pages total
- Topics shown at the right
- Clear metrics in several
 - Increased % Training Needs Assessments done and increased training completed
 - Completed Tripartite Assessments
 - Increased Collider detector operating efficiencies

1. Security

a. Cyber Security

- DZero Critical System
- CDF Critical System
- Desktop Cyber Security

b. Access Security

2. ES&H

3. Experiments

- CDF Experiment
- DZero Experiment
- CMS Experiment

4. Operations

- CDF Experiment Operations
- DZero Experiment Operations

5. Electrical Engineering

- Review of the EED CDF Support Group log
- Review of the EED Job Request database

6. Mechanical Engineering

Communication with Stakeholders



- PPD stakeholders are
 - Associate Director for Research – Montgomery
 - We have a weekly meeting on PPD business
 - And see each other in at least 3 other meetings every week
 - Whole Directorate – regular meetings at lower frequency
 - Users
 - Spokespersons of running experiments
 - Occasional meetings in relevant PPD Department meetings or one-on-one
 - Assorted other users, typically on R&D questions
 - Recall one PPD mission is development of new research techniques, so I try to support ideas using our facilities
 - Part of my job is to encourage many flowers to bloom, then let the Directorate ruthlessly weed them out !

Integrated ES&H in PPD



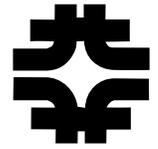
- PPD has its own “local” ISM procedure (see our website)
 - 30 people within PPD helped write and maintain this procedure
 - We focus on when and how to write a Hazard Analysis
- PPD has an Operational Readiness Clearance procedure
 - For experimental and facilities operations, sign-off by SSO, Div Hd
 - Standing committees to review such apparatus for the ORCs
- When we have a “recordable” injury
 - Follow-up meeting with employee, supervisor, group leader, department head, PPD Senior Safety Officer, and me
 - Has lead to several internal compilations of real lessons learned
 - 2000: “I Can’t Believe I Did That”, examples of cutting incidents
 - 2001: “Who is Dr. Foxen”, examples of people who did not go to the lab doctor soon enough and their injury got worse with time
 - 2002: “Think about it”, examples of people who should have stopped to think about getting help or using a lifting tool before lifting an unusual object
 - Philosophy is that people respond to real examples, not generalities

PPD Integrated ES&H, part 2



- Annual Safety Picnic – 12 merit awards in 2003 for safety suggestions
 - Buy easy on/off high current connectors for UPS
 - Battery recycling at DZero
 - Laptop cord trip hazard in cafeteria, employee insisted on removal at once
 - Buy special gas cylinder slings – BOA-Grip
 - Remove drawers from workstations to save knee injuries
 - Put chain link fence around LN2 dewar after sighting children in the area
 - Install yield signs on new bike path to warn bicyclers
 - Process Improvement: change bizarre shift schedule for collider techs
 - Install speed bumps on curve near parking
 - Install stop sign by new experiment due to increased traffic
 - ★ • Recycle plastic waste from our new plastic extruder
 - “Pollution Prevention & Environmental Stewardship Accomplishment” award from the Office of Science

PPD Integrated ES&H, part 3: Results



- Recordable and DART cases down

	OSHA Recordable Cases	Lost Workday Cases
2000	15	8
2001	14	7
2002	9	3
2003	3	2

- First division to hit
One Million Hours hours
worked with no DART
 - Got to 1,500,459 hours
 - At 437,000⁺ since then



PPD Summary



- We believe PPD is hitting pretty well on all cylinders relative to our mission and lab's priorities,
but,
- We are happy to see if you agree.
- We are happy to hear your advice.