

Work Authorization Document

NSTX Upgrade Project

Control Account #:	1200	Title:	Structures & Supports
WBS	1.1.2	Title:	Vacuum Vessel & Support Structures

Period of Performance: 23 February 2009 through 09 December 2013

Authorized Budget:	\$3,554	Control Account Manager: Smith
Revision #:	0	Revision Date: July-11

Authorized Work Description:

The vacuum vessel & support structure (VVSS) consists of the vacuum chamber, not including the PFCs, all ports and vacuum boundary closures and the torus support structure which provides the overall supporting mechanism for the torus components to the test cell floor. This WBS element includes the engineering design, analysis, procurement activities and component fabrication.

The NSTX Upgrade Project will require that the existing VVSS be modified to accommodate the new center stack structure, including the umbrella structure and the new center stack support structure. This WBS element includes the analytical and CAD design of the support structures associated with the Magnet upgrade activities. The scope includes; the Vacuum Vessel & Structural Support, the Outer TF Structures, the Outer PF Coil Structures, the Umbrella Structural Reinforcement, the CS Support Pedestal and miscellaneous Vacuum Vessel Structural Supports. It also includes the procurement and fabrication of these structures, but does not include installation costs. Installations costs are included in WBS 1.8.

Attachments:

- 1- A detailed Control Account schedule showing all work packages and planning packages.
- 2- Budgeted Cost by month.
- 3- Original Work Authorization Form (WAF)
- 4- WBS Dictionary sheet that defines the scope of work for this WBS element.

Control Account History

ECP#	Implement Date	Prior Budget	New Budget	Signature

Approvals	Name	Signature	Date
NSTX-U Project Manager	R. Strykowski		
Control Account Manager	Smith		
Functional Manager	L. Dudek		

Activity ID	Activity Description	Work Days	BASLINE START	Forecast Start	BASLINE FINISH	Forecast Finish	Schedule Slip (Days)	Total Float	Budgeted Cost	PPCT	Earned value cost (BCWP)	Planned value cost (BCWS)	FY11	FY12	FY13	FY14	FY15	FY16
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NSTX Upgrade Project

Subtotal		1,201	23FEB09A	23FEB09A	09DEC13	09DEC13	0	1,687	3,554,749.99		2,102,422.15	2,150,087.39						
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Job: 1200 - Vacuum Vsl & Struct Support-SMITH

Subtotal		406	23FEB09A	23FEB09A	30SEP10A	30SEP10A	0		1,509,360.00	100	1,509,360.00	1,509,360.00						
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FY091210	FY09 Actual Cost	22*	23FEB09A	23FEB09A	30SEP09A	30SEP09A	0		571,717.00	100	571,717.00	571,717.00						
FY101200	FY10 Actual Cost	100	01DEC09A	01DEC09A	30APR10A	30APR10A	0		370,213.00	100	370,213.00	370,213.00						
FY101200A	FY10 Actual Cost	110	03MAY10A	03MAY10A	30SEP10A	30SEP10A	0		360,410.00	100	360,410.00	360,410.00						
FY101210	FY10 Actual Cost	150	01OCT09A	01OCT09A	28MAY10A	28MAY10A	0		207,020.00	100	207,020.00	207,020.00						

Job: 1201 - Outer TF Structures-SMITH

Subtotal		770	03MAY10A	03MAY10A	31MAY13	31MAY13	0	1,818	704,742.45		111,417.86	125,774.16						
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1201-0009	Dsgn Eng/CAD Models: Iteration, Optimizatn, Updt	30	03MAY10A	03MAY10A	14JUN10A	14JUN10A	0		0.00	100	0.00	0.00						
1201-0010	Complete Preliminary CAD Models	10	09JUN10A	09JUN10A	22JUN10A	22JUN10A	0		0.00	100	0.00	0.00						
1201-0011	Mockups:outer link, real estate issues(# of it 4	66	03MAY10A	03MAY10A	04AUG10A	04AUG10A	0		0.00	100	0.00	0.00						
1201-0013	ME Analysis/CAD Model Iterations-Strss/EM/Therml	32	03MAY10A	03MAY10A	16JUN10A	16JUN10A	0		0.00	100	0.00	0.00						
1201-0014	Analysis of Preliminary Design Approved	1	16JUN10A	16JUN10A	16JUN10A	16JUN10A	0		0.00	100	0.00	0.00						
1201-0016	PDR	1	24JUN10A	24JUN10A	24JUN10A	24JUN10A	0		0.00	100	0.00	0.00						
1201-0018	Dsgn Eng & CAD Models: Iterations, Optim & Updat	61*	24JUN10A	24JUN10A	16AUG10A	16AUG10A	0		0.00	100	0.00	0.00						
1201-0021	DOE CD-2 (Lehman) Review	1	11AUG10A	11AUG10A	11AUG10A	11AUG10A	0		0.00	100	0.00	0.00						
1201-0024	PDR CAD model Compld-Outr supp ring/clamp/sprng	1	16AUG10A	16AUG10A	16AUG10A	16AUG10A	0		0.00	100	0.00	0.00						
1201-0028	Det Dsgn Eng, CAD/Analysis Iterations(34mod)	209*	17SEP10A	17AUG10A	16FEB11	17JUN11	-86	123	29,756.12	95	28,395.94	29,890.46						
1201-0029	Update Design Drawings	1	24JUN10A	24JUN10A	16AUG10A	16AUG10A	0		0.00	100	0.00	0.00						
1201-0030	Design Drawings (13dw)	82*	17FEB11	23FEB11A	21APR11	17JUN11	-40	123	14,572.74	75	10,929.56	14,572.74						
1201-0031	Final Design Analysis	182*	01OCT10	24SEP10A	21FEB11	17JUN11	-83	123	77,607.53	82	63,831.03	77,842.72						
1201-0031B	N/A Analysis: Ring, Bracket, Spring Link	57*	16AUG10A	16AUG10A	16AUG10A	16AUG10A	0		0.00	100	0.00	0.00						
1201-0031C	N/A Analysis:Keep Clevis Bracket Load Stress Upd	63*	16AUG10A	16AUG10A	16AUG10A	16AUG10A	0		0.00	100	0.00	0.00						

Data Date: 30APR11 1105
 Run Date: 20MAY11 10:46

**NSTX UPGRADES
 RESOURCE LOADED SCHEDULE
 CD-2 Schedule
 April 2011**

Sheet 1 of 11

Early Bar

Progress Bar

Critical Activity

EM//EM =31 ; EA/SB =202 ;

EM//EM =10 ; EA/SB =104 ;

EA//EM =404

Activity ID	Activity Description	Work Days	BASELINE START	Forecast Start	BASELINE FINISH	Forecast Finish	Schedule Slip (Days)	Total Float	Budgeted Cost	PPCT	Earned value cost (BCWP)	Planned value cost (BCWS)	FY11 FY12 FY13 FY14 FY15 FY16																
1201-0031D	N/A OTF Analysis: Fatigue Assessment	63*	16AUG10A	16AUG10A	16AUG10A	16AUG10A	0		0.00	100	0.00	0.00																	
1201-0031E	N/A Analysis: Write. Check, File Calculations	63*	16AUG10A	16AUG10A	16AUG10A	16AUG10A	0		0.00	100	0.00	0.00																	
1201-0031F	N/A Analysis: DCOS Input	63*	16AUG10A	16AUG10A	16AUG10A	16AUG10A	0		0.00	100	0.00	0.00																	
1201-0031G	N/A Analysis: Insul Bond Shear/Copper Stress/CC	63*		16AUG10A		16AUG10A	0		0.00	100	0.00	0.00																	
1201-0032	Validation of Design Complete	84*	22APR11	21FEB11A	05MAY11	17JUN11	-30	123	5,780.40	50	2,890.20	3,468.24																	
1201-0033	Update CAD Models per Validation	84*	06MAY11	21FEB11A	19MAY11	17JUN11	-20	123	4,246.94	50	2,123.47	0.00																	
1201-0034	Revise Fabrication & Assembly Drawings per Valid	44*	20MAY11	18APR11A	03JUN11	17JUN11	-10	123	6,495.32	50	3,247.66	0.00																	
1201-0035	Review, Check Drawings	4	06JUN11	14JUN11	10JUN11	17JUN11	-5	123	7,361.12		0.00	0.00																	
1201-0036	Drawings ready for FDR	1	13JUN11	17JUN11	13JUN11	17JUN11	-4	123	0.00		0.00	0.00																	
1201-0038	FDR	3	14JUN11	22JUN11*	14JUN11*	24JUN11	-8	121	0.00		0.00	0.00																	
1201-0042	Prep Req & Procurement Package	10	01JUN12*	01JUN12*	14JUN12	14JUN12	0	62	5,551.68		0.00	0.00																	
1201-0043	Submit Req to Procurement	1	14JUN12	14JUN12	14JUN12	14JUN12	0	62	0.00		0.00	0.00																	
1201-0044	Procurement Processing	22	14JUN12	14JUN12	16JUL12	16JUL12	0	62	0.00		0.00	0.00																	
1201-0045	Submit for Vendor Quotes	1	17JUL12	17JUL12	17JUL12	17JUL12	0	62	0.00		0.00	0.00																	
1201-0046	Eval Quotes	43	17JUL12	17JUL12	14SEP12	14SEP12	0	62	1,387.92		0.00	0.00																	
1201-0047	Tech Eval of Vendors	43	17JUL12	17JUL12	14SEP12	14SEP12	0	62	2,775.84		0.00	0.00																	
1201-0048	Award / Order Approved	1	17SEP12	17SEP12	17SEP12	17SEP12	0	62	0.00		0.00	0.00																	
1201-0048A	Fabricate Components - Outer TF Structure	100	18SEP12	18SEP12	15FEB13	15FEB13	0	62	509,784.56		0.00	0.00																	
1201-0049	Vendor Oversight	100	18SEP12	18SEP12	15FEB13	15FEB13	0	62	7,072.46		0.00	0.00																	
1201-0050	Receipt of Hardware	4	18FEB13	18FEB13	21FEB13	21FEB13	0	62	0.00		0.00	0.00																	
1201-0051	QA Inspection	10	22FEB13	22FEB13	07MAR13	07MAR13	0	72	6,926.10		0.00	0.00																	
1201-0052	Resolve Procurement Issues	5	18FEB13	18FEB13	22FEB13	22FEB13	0	62	354.28		0.00	0.00																	
1201-0053	Documentation: Assembly Procedures	15	18FEB13	18FEB13	08MAR13	08MAR13	0	71	4,810.80		0.00	0.00																	
1201-0054	Assembly of Components	20	25FEB13	25FEB13	22MAR13	22MAR13	0	62	9,594.96		0.00	0.00																	
1201-0055	Outer TF Structure Parts ready for installation	1	22MAR13	22MAR13	22MAR13	22MAR13	0	62	0.00		0.00	0.00																	
1201-0056	Handling / Warehouse / Storage	50	22MAR13	22MAR13	31MAY13	31MAY13	0	1,818	10,663.68		0.00	0.00																	
Job: 1202 - Outer PF2 Coil Structures-SMITH																													
Subtotal		643	03MAY10A	03MAY10A	21NOV12	21NOV12	0	53	40,448.68		15,840.64	13,736.04																	
1202-0008	Input F/Analysis Group:Prelim Analysis of PF2	1	01JUL10A	01JUL10A	01JUL10A	01JUL10A	0		0.00	100	0.00	0.00																	
1202-0009	Dsgn Eng/CAD Models: Iteration, Optimizatr, Updt	30	03MAY10A	03MAY10A	14JUN10A	14JUN10A	0		0.00	100	0.00	0.00																	

Activity ID	Activity Description	Work Days	BASELINE START	Forecast Start	BASELINE FINISH	Forecast Finish	Schedule Slip (Days)	Total Float	Budgeted Cost	PPCT	Earned value cost (BCWP)	Planned value cost (BCWS)	FY11 FY12 FY13 FY14 FY15 FY16										
													FY11	FY12	FY13	FY14	FY15	FY16					
1202-0010	Complete Preliminary CAD Models	10	09JUN10A	09JUN10A	22JUN10A	22JUN10A	0		0.00	100	0.00	0.00											
1202-0013	ME Analysis/CAD Model Iterations-Strss/EM/Therml	32	03MAY10A	03MAY10A	16JUN10A	16JUN10A	0		0.00	100	0.00	0.00											
1202-0014	Analysis of Preliminary Design Approved	1	16JUN10A	16JUN10A	16JUN10A	16JUN10A	0		0.00	100	0.00	0.00											
1202-0016	PDR	1	23JUN10A	23JUN10A	23JUN10A	23JUN10A	0		0.00	100	0.00	0.00											
1202-0021	DOE CD-2 (Lehman) Review	1	11AUG10A	11AUG10A	11AUG10A	11AUG10A	0		0.00	100	0.00	0.00											
1202-0028	Update CAD & Design Drawings(10mod/4dwgs)	113*	16AUG10A	16AUG10A	01FEB11	31JAN11A	1		8,485.33	100	8,487.17	8,487.17						EM//EM =06 ; EA//SB =62 ;					
1202-0030	N/A Dsgn Drawing Ready for Checking & Validation	1	16AUG10A	16AUG10A	16AUG10A	16AUG10A	0		0.00	100	0.00	0.00											
1202-0031	Validate Analysis: Stress, EM, Thermal	130	24JUN10A	24JUN10A	31AUG10A	31AUG10A	0		0.00	100	0.00	0.00											
1202-0032	Analysis & Validation of Design Complete	176*	02FEB11	04OCT10A	26APR11	17JUN11	-37	123	4,874.14	95	4,630.43	4,874.14						EA//SB =02 ; EA//EM =24 ;					
1202-0033	Update CAD Models per Validation	84*	27APR11	21FEB11A	10MAY11	17JUN11	-27	123	1,249.10	90	1,124.19	374.73						EA//SB =10 ;					
1202-0034	Revise Fabrication & Assembly Dwgs per Validatn	84*	11MAY11	21FEB11A	24MAY11	17JUN11	-17	123	1,998.56	80	1,598.85	0.00						EA//SB =16 ;					
1202-0035	Review, Check Drawings	10	25MAY11	06JUN11	08JUN11	17JUN11	-7	123	2,897.80		0.00	0.00						EM//EM =12 ; EA//SB =08 ;					
1202-0036	Drawings ready for FDR	1	09JUN11	17JUN11	09JUN11	17JUN11	-6	123	0.00		0.00	0.00											
1202-0038	FDR	3	10JUN11	22JUN11*	10JUN11*	24JUN11	-10	121	0.00		0.00	0.00											
1202-0042	Prep Req & Procurement Package	5	01MAR12*	01MAR12*	07MAR12	07MAR12	0	53	2,081.88		0.00	0.00						EM//EM =12 ;					
1202-0043	Submit Req to Procurement	1	07MAR12	07MAR12	07MAR12	07MAR12	0	53	0.00		0.00	0.00											
1202-0044	Procurement Processing	22	07MAR12	07MAR12	05APR12	05APR12	0	53	0.00		0.00	0.00											
1202-0045	Submit for Vendor Quotes	1	06APR12	06APR12	06APR12	06APR12	0	53	0.00		0.00	0.00											
1202-0046	Eval Quotes	43	06APR12	06APR12	06JUN12	06JUN12	0	53	173.49		0.00	0.00						EM//EM =1 ;					
1202-0048	Award / Order Approved	1	07JUN12	07JUN12	07JUN12	07JUN12	0	53	0.00		0.00	0.00											
1202-0049	Vendor Oversight	100	08JUN12	08JUN12	29OCT12	29OCT12	0	53	174.26		0.00	0.00						EM//EM =1 ;					
1202-0050	Receipt of Hardware	1	30OCT12	30OCT12	30OCT12	30OCT12	0	53	17,826.60		0.00	0.00						41=13,505 ;					
1202-0051	QA Inspection	10	30OCT12	30OCT12	12NOV12	12NOV12	0	54	399.30		0.00	0.00						EM//EM =1 ; EM//ST =2					
1202-0052	Resolve Procurement Issues	5	13NOV12	13NOV12	19NOV12	19NOV12	0	54	177.14		0.00	0.00						EM//EM =1					
1202-0055	Parts ready for installation	1	21NOV12	21NOV12	21NOV12	21NOV12	0	53	0.00		0.00	0.00											
1202-0056	Handling / Warehouse / Storage	16	31OCT12	31OCT12	21NOV12	21NOV12	0	53	111.08		0.00	0.00						em//st=1					
Job: 1203 - PF3 Support.-SMITH																							
Subtotal		542	03MAY10A	03MAY10A	29JUN12	29JUN12	0	172	21,503.88		9,111.43	8,330.88											
1203-0013	ME Analysis/CAD Model Iterations-Strss/EM/Therml	32	03MAY10A	03MAY10A	16JUN10A	16JUN10A	0		0.00	100	0.00	0.00											
1203-0014	Analysis of Preliminary Design Approved	1	16JUN10A	16JUN10A	16JUN10A	16JUN10A	0		0.00	100	0.00	0.00											

Activity ID	Activity Description	Work Days	BASELINE START	Forecast Start	BASELINE FINISH	Forecast Finish	Schedule Slip (Days)	Total Float	Budgeted Cost	PPCT	Earned value cost (BCWP)	Planned value cost (BCWS)	FY11 FY12 FY13 FY14 FY15 FY16					
1203-0016	PDR	1	23JUN10A	23JUN10A	23JUN10A	23JUN10A	0		0.00	100	0.00	0.00						
1203-0021	DOE CD-2 (Lehman) Review	1	11AUG10A	11AUG10A	11AUG10A	11AUG10A	0		0.00	100	0.00	0.00						
1203-0029	Update CAD & Design Drawings (2mod/2dwgs)	115*	17AUG10A	17AUG10A	04FEB11	31JAN11A	4		3,453.77	100	3,456.74	3,456.74	EM//EM =05 ; EA//SB =22 ;					
1203-0030	N/A Dsg Drawings Ready for Checking & Validation	1	16AUG10A	16AUG10A	16AUG10A	16AUG10A	0		0.00	100	0.00	0.00						
1203-0032	Analysis & Validation of Design Complete	176*	07FEB11	04OCT10A	29APR11	17JUN11	-34	123	4,874.14	95	4,630.43	4,874.14	EA//SB =02 ; EA//EM =24 ;					
1203-0033	Update CAD Models per Validation	84*	02MAY11	21FEB11A	13MAY11	17JUN11	-24	123	249.82	90	224.84	0.00	EA//SB =02 ;					
1203-0034	Revise Fabrication & Assembly Dwngs per Validatn	84*	16MAY11	21FEB11A	27MAY11	17JUN11	-14	123	999.28	80	799.42	0.00	EA//SB =08 ;					
1203-0035	Review, Check Drawings	10	31MAY11	06JUN11	13JUN11	17JUN11	-4	123	1,448.90		0.00	0.00	EM//EM =06 ; EA//SB =04 ;					
1203-0036	Drawings ready for FDR	1	14JUN11	17JUN11	14JUN11	17JUN11	-3	123	0.00		0.00	0.00						
1203-0038	FDR	3	15JUN11*	22JUN11*	15JUN11	24JUN11	-7	121	0.00		0.00	0.00						
1203-0042	Prep Req & Procurement Package:inconel Bolts	5	03OCT11*	03OCT11*	07OCT11	07OCT11	0	172	2,081.88		0.00	0.00	EM//EM =12 ;					
1203-0043	Submit Req to Procurement	1	07OCT11	07OCT11	07OCT11	07OCT11	0	172	0.00		0.00	0.00						
1203-0044	Procurement Processing	22	07OCT11	07OCT11	07NOV11	07NOV11	0	172	0.00		0.00	0.00						
1203-0045	Submit for Vendor Quotes	1	08NOV11	08NOV11	08NOV11	08NOV11	0	172	0.00		0.00	0.00						
1203-0046	Eval Quotes	43	08NOV11	08NOV11	17JAN12	17JAN12	0	172	173.49		0.00	0.00	em/em=1					
1203-0048	Award / Order Approved	1	18JAN12	18JAN12	18JAN12	18JAN12	0	172	0.00		0.00	0.00						
1203-0049	Vendor Oversight	100	19JAN12	19JAN12	07JUN12	07JUN12	0	172	173.49		0.00	0.00	em/em=1					
1203-0050	Receipt of Hardware	5	08JUN12	08JUN12	14JUN12	14JUN12	0	172	6,811.20		0.00	0.00	41=5,280 ;					
1203-0051	QA Inspection	10	15JUN12	15JUN12	28JUN12	28JUN12	0	172	1,129.12		0.00	0.00	EM//EM =04 ; EM//ST =04					
1203-0055	Parts ready for installation	1	29JUN12	29JUN12	29JUN12	29JUN12	0	172	0.00		0.00	0.00						
1203-0056	Handling / Warehouse / Storage	1	29JUN12	29JUN12	29JUN12	29JUN12	0	172	108.79		0.00	0.00	em/st=1					

Job: 1204 - PF4/5 Leads & Radial Supports-SMITH

Subtotal		662	18MAY10A	18MAY10A	15JAN13	15JAN13	0	53	10,804.10		8,796.74	8,817.82						
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1204-0009	Dsgn Eng/CAD Models: Iteration, Optimizatn, Updt	10	18MAY10A	18MAY10A	01JUN10A	01JUN10A	0		0.00	100	0.00	0.00						
1204-0013	ME Analysis/CAD Model Iterations-Strss/EM/Therm	24	19MAY10A	19MAY10A	22JUN10A	22JUN10A	0		0.00	100	0.00	0.00						
1204-0014	Analysis of Preliminary Design Approved	1	22JUN10A	22JUN10A	22JUN10A	22JUN10A	0		0.00	100	0.00	0.00						
1204-0016	PDR	1	23JUN10A	23JUN10A	23JUN10A	23JUN10A	0		0.00	100	0.00	0.00						
1204-0021	DOE CD-2 (Lehman) Review	1	10AUG10A	10AUG10A	10AUG10A	10AUG10A	0		0.00	100	0.00	0.00						
1204-0028	Update CAD & Design Drawings(2mod/2dwg)	174*	17AUG10A	17AUG10A	04FEB11	28APR11A	-59		3,639.99	100	3,610.59	3,610.59	EM//EM =06 ; EA//SB =22 ;					
1204-0030	N/A Dsg Drawings Ready for Checking & Validation	1	16AUG10A	16AUG10A	16AUG10A	16AUG10A	0		0.00	100	0.00	0.00						

Activity ID	Activity Description	Work Days	BASELINE START	Forecast Start	BASELINE FINISH	Forecast Finish	Schedule Slip (Days)	Total Float	Budgeted Cost	PPCT	Earned value cost (BCWP)	Planned value cost (BCWS)	FY11	FY12	FY13	FY14	FY15	FY16
1204-0032	Analysis & Validation of Design Complete	176*	07FEB11	04OCT10A	01APR11	17JUN11	-54	123	4,624.32	90	4,161.89	4,624.32						
1204-0033	Update CAD Models per Validation	84*	04APR11	21FEB11A	22APR11	17JUN11	-39	123	249.82	90	224.84	249.82						
1204-0034	Revise Fabrication & Assembly Drawings per Valid	84*	25APR11	21FEB11A	13MAY11	17JUN11	-24	123	999.28	80	799.42	333.09						
1204-0035	Review, Check Drawings	15	16MAY11	27MAY11	06JUN11	17JUN11	-9	123	1,290.69		0.00	0.00						
1204-0036	Drawings ready for FDR	1	07JUN11	17JUN11	07JUN11	17JUN11	-8	123	0.00		0.00	0.00						
1204-0038	FDR	3	08JUN11*	22JUN11*	08JUN11	24JUN11	-12	121	0.00		0.00	0.00						
1204-0039	NOTE: Only visco mtl (shim) rqr. incl in 1208	0	16JAN13	16JAN13	15JAN13	15JAN13	0	53	0.00		0.00	0.00						

Job: 1205 - Umbrella-SMITH																		
Subtotal		854	03MAY10A	03MAY10A	01OCT13	01OCT13	0	110	629,986.50		140,407.28	164,892.24						

Lower Umbrella																		
1205-0008	Input F/Analysis Group:Interface Detail to CS	1	01JUN10A	01JUN10A	01JUN10A	01JUN10A	0		0.00	100	0.00	0.00						
1205-0009	Dsgn Eng/CAD Models: Iteration, Optimizatn, Updt	30	03MAY10A	03MAY10A	14JUN10A	14JUN10A	0		0.00	100	0.00	0.00						
1205-0010	Complete Preliminary CAD Models	10	09JUN10A	09JUN10A	22JUN10A	22JUN10A	0		0.00	100	0.00	0.00						
1205-0011	Mockups:CS Struct Real Estate Issues	66	03MAY10A	03MAY10A	04AUG10A	04AUG10A	0		0.00	100	0.00	0.00						
1205-0013	ME Analysis/CAD Model Iterations-Strss/EM/ThermI	32	03MAY10A	03MAY10A	16JUN10A	16JUN10A	0		0.00	100	0.00	0.00						
1205-0014	Analysis of Preliminary Design Approved	1	16JUN10A	16JUN10A	16JUN10A	16JUN10A	0		0.00	100	0.00	0.00						
1205-0016	PDR	1	24JUN10A	24JUN10A	24JUN10A	24JUN10A	0		0.00	100	0.00	0.00						
1205-0018	Dsgn Eng & CAD Models: Iterations, Optim & Updat	38	24JUN10A	24JUN10A	17AUG10A	17AUG10A	0		0.00	100	0.00	0.00						
1205-0021	DOE CD-2 (Lehman) Review	1	11AUG10A	11AUG10A	11AUG10A	11AUG10A	0		0.00	100	0.00	0.00						
1205-0024	PDR CAD model Compld-Outr supp ring/clamp/sprng	1	18AUG10A	18AUG10A	18AUG10A	18AUG10A	0		0.00	100	0.00	0.00						
1205-0028	Det Dsgn Eng, CAD/Analysis Iterations(15mod)	209*	03SEP10A	17AUG10A	18FEB11	17JUN11	-84	123	24,149.96	95	22,909.27	24,115.02						
1205-0029	Final design Analysis	210*	03SEP10A	16AUG10A	18FEB11	17JUN11	-84	123	46,542.96	75	34,859.71	46,479.62						
1205-0030	Design Drawings (11dwgs)	82*	21FEB11	23FEB11A	12APR11	17JUN11	-47	123	12,257.76	80	9,806.20	12,257.76						
1205-0032	Validation of Design Complete	64*	13APR11	21MAR11A	26APR11	17JUN11	-37	123	2,890.20	57	1,647.41	2,890.20						
1205-0033	Update CAD Models per Validation	84*	27APR11	21FEB11A	10MAY11	17JUN11	-27	123	1,873.65	50	936.83	562.10						
1205-0034	Revise Fabrication & Assembly Drawings per Valid	84*	11MAY11	21FEB11A	24MAY11	17JUN11	-17	123	5,496.04	50	2,748.02	0.00						
1205-0035	Review, Check Drawings	4	25MAY11	14JUN11	01JUN11	17JUN11	-12	123	7,494.32		0.00	0.00						
1205-0036	Drawings ready for FDR	1	02JUN11	17JUN11	02JUN11	17JUN11	-11	123	0.00		0.00	0.00						
1205-0038	FDR	3	03JUN11*	22JUN11*	03JUN11	24JUN11	-15	121	0.00		0.00	0.00						
1205-0042	Prep Req & Procurement Package	10	01AUG12*	01AUG12*	14AUG12	14AUG12	0	57	6,939.60		0.00	0.00						
1205-0043	Submit Req to Procurement	1	14AUG12	14AUG12	14AUG12	14AUG12	0	57	0.00		0.00	0.00						

Activity ID	Activity Description	Work Days	BASELINE START	Forecast Start	BASELINE FINISH	Forecast Finish	Schedule Slip (Days)	Total Float	Budgeted Cost	PPCT	Earned value cost (BCWP)	Planned value cost (BCWS)	FY11 FY12 FY13 FY14 FY15 FY16								
1205-0044	Procurement Processing	22	14AUG12	14AUG12	13SEP12	13SEP12	0	57	0.00		0.00	0.00									
1205-0045	Submit for Vendor Quotes	1	14SEP12	14SEP12	14SEP12	14SEP12	0	57	0.00		0.00	0.00									
1205-0046	Eval Quotes	43	14SEP12	14SEP12	13NOV12	13NOV12	0	57	1,409.65		0.00	0.00						EM//EM =08 ;			
1205-0047	Tech Eval of Vendors	43	14SEP12	14SEP12	13NOV12	13NOV12	0	57	1,409.65		0.00	0.00						EM//EM =08 ;			
1205-0048	Award / Order Approved	1	14NOV12	14NOV12	14NOV12	14NOV12	0	57	0.00		0.00	0.00									
1205-0049	Fab & Deliver incl Vendor Oversight	102	15NOV12	15NOV12	18APR13	18APR13	0	57	188,224.04		0.00	0.00						EM//EM =10 ; 41=141,252			
1205-0050	Receipt of Hardware	4	19APR13	19APR13	24APR13	24APR13	0	57	0.00		0.00	0.00									
1205-0051	QA Inspection	10	25APR13	25APR13	08MAY13	08MAY13	0	57	7,457.52		0.00	0.00						EM//EM =12 ; EM//ST			
1205-0052	Resolve Procurement Issues	5	09MAY13	09MAY13	15MAY13	15MAY13	0	57	354.28		0.00	0.00						EM//EM =02 ;			
1205-0053	Documentation: Assembly Procedures	10	16MAY13	16MAY13	30MAY13	30MAY13	0	57	3,393.68		0.00	0.00						EM//EM =16 ; EA//SB			
1205-0054	Assembly of Components	15	31MAY13	31MAY13	20JUN13	20JUN13	0	57	4,263.12		0.00	0.00						EM//EM =04 ; EM//ST			
1205-0055	Parts ready for installation	1	21JUN13	21JUN13	21JUN13	21JUN13	0	57	0.00		0.00	0.00									
1205-0056	Handling / Warehouse / Storage	3	24JUN13	24JUN13	26JUN13	26JUN13	0	172	888.64		0.00	0.00						EM//ST =08 ;			
Upper Umbrella																					
1205-0066	Input F/Analysis Group:Interface Detail to CS	1	01JUN10A	01JUN10A	01JUN10A	01JUN10A	0		0.00	100	0.00	0.00									
1205-0067	Dsgn Eng/CAD Models: Iteration, Optimizatn, Updat	30	03MAY10A	03MAY10A	14JUN10A	14JUN10A	0		0.00	100	0.00	0.00									
1205-0068	Complete Preliminary CAD Models	10	09JUN10A	09JUN10A	22JUN10A	22JUN10A	0		0.00	100	0.00	0.00									
1205-0069	Mockups:CS Struct Real Estate Issues	66	03MAY10A	03MAY10A	04AUG10A	04AUG10A	0		0.00	100	0.00	0.00									
1205-0071	ME Analysis/CAD Model Iterations-Strrs/EM/Therml	32	03MAY10A	03MAY10A	16JUN10A	16JUN10A	0		0.00	100	0.00	0.00									
1205-0072	Analysis of Preliminary Design Approved	1	16JUN10A	16JUN10A	16JUN10A	16JUN10A	0		0.00	100	0.00	0.00									
1205-0074	PDR	1	24JUN10A	24JUN10A	24JUN10A	24JUN10A	0		0.00	100	0.00	0.00									
1205-0076	Dsgn Eng & CAD Models: Iterations, Optim & Updat	38	24JUN10A	24JUN10A	17AUG10A	17AUG10A	0		0.00	100	0.00	0.00									
1205-0079	DOE CD-2 (Lehman) Review	1	11AUG10A	11AUG10A	11AUG10A	11AUG10A	0		0.00	100	0.00	0.00									
1205-0081	PDR CAD model Compld-Outr supp ring/clamp/sprng	1	18AUG10A	18AUG10A	18AUG10A	18AUG10A	0		0.00	100	0.00	0.00									
1205-0086	Final Dsgn Eng Iterations, DetailCAD (15mod)	209*	03SEP10A	17AUG10A	04FEB11	17JUN11	-94	123	18,540.72	95	17,564.87	18,489.33						EM//EM =20 ; EA//SB =125 ;			
1205-0087	Final Design Analysis	209*	03SEP10A	17AUG10A	04FEB11	17JUN11	-94	123	46,563.39	75	34,796.51	46,395.35						EA//EM =180 ; EM//EM =80 ;			
1205-0088	Design Drawings (11dwgs)	82*	07FEB11	23FEB11A	22APR11	17JUN11	-39	123	12,257.76	80	9,806.20	12,257.76						EM//EM =8 ; EA//SB =88 ;			
1205-0090	Validation of Design Complete	64*	25APR11	21MAR11A	06MAY11	17JUN11	-29	123	2,890.20	57	1,647.41	1,445.10						EA//EM =15 ; EA//SB =0 ;			
1205-0091	Update CAD Models per Validation	84*	09MAY11	21FEB11A	20MAY11	17JUN11	-19	123	1,873.65	50	936.83	0.00						EA//SB =15 ;			
1205-0092	Revise Fabrication & Assembly Drawings per Valid	84*	23MAY11	21FEB11A	06JUN11	17JUN11	-9	123	5,496.04	50	2,748.02	0.00						EA//SB =44 ;			

Activity ID	Activity Description	Work Days	BASELINE START	Forecast Start	BASELINE FINISH	Forecast Finish	Schedule Slip (Days)	Total Float	Budgeted Cost	PPCT	Earned value cost (BCWP)	Planned value cost (BCWS)	Fiscal Year							
													FY11	FY12	FY13	FY14	FY15	FY16		
1205-0093	Review, Check Drawings	4	07JUN11	14JUN11	13JUN11	17JUN11	-4	123	7,494.32		0.00	0.00								
1205-0094	Drawings ready for FDR	1	14JUN11	17JUN11	14JUN11	17JUN11	-3	123	0.00		0.00	0.00								
1205-0096	FDR	3	15JUN11*	22JUN11*	15JUN11	24JUN11	-7	121	0.00		0.00	0.00								
1205-0100	Prep Req & Procurement Package	10	01NOV12*	01NOV12*	14NOV12	14NOV12	0	67	7,085.60		0.00	0.00								
1205-0101	Submit Req to Procurement	1	14NOV12	14NOV12	14NOV12	14NOV12	0	67	0.00		0.00	0.00								
1205-0102	Procurement Processing	22	14NOV12	14NOV12	17DEC12	17DEC12	0	67	0.00		0.00	0.00								
1205-0103	Submit for Vendor Quotes	1	18DEC12	18DEC12	18DEC12	18DEC12	0	67	0.00		0.00	0.00								
1205-0104	Eval Quotes	43	18DEC12	18DEC12	25FEB13	25FEB13	0	67	1,417.12		0.00	0.00								
1205-0105	Tech Eval of Vendors	43	18DEC12	18DEC12	25FEB13	25FEB13	0	67	1,417.12		0.00	0.00								
1205-0106	Award / Order Approved	1	26FEB13	26FEB13	26FEB13	26FEB13	0	67	0.00		0.00	0.00								
1205-0107	Vendor Oversight	102	27FEB13	27FEB13	23JUL13	23JUL13	0	67	7,085.60		0.00	0.00								
1205-0108	Receipt of Hardware	5	24JUL13	24JUL13	30JUL13	30JUL13	0	67	186,452.64		0.00	0.00								
1205-0109	QA Inspection	10	31JUL13	31JUL13	13AUG13	13AUG13	0	67	7,457.52		0.00	0.00								
1205-0110	Resolve Procurement Issues	5	14AUG13	14AUG13	20AUG13	20AUG13	0	67	354.28		0.00	0.00								
1205-0111	Documentation: Assembly Procedures	10	21AUG13	21AUG13	04SEP13	04SEP13	0	67	3,393.68		0.00	0.00								
1205-0112	Assembly of Components	15	05SEP13	05SEP13	25SEP13	25SEP13	0	67	4,263.12		0.00	0.00								
1205-0113	Parts ready for installation	1	26SEP13	26SEP13	26SEP13	26SEP13	0	67	0.00		0.00	0.00								
1205-0114	Handling / Warehouse / Storage	3	27SEP13	27SEP13	01OCT13	01OCT13	0	110	898.67		0.00	0.00								

Job: 1206 - Pedestal -SMITH

Subtotal		890	18MAY10A	18MAY10A	09DEC13	09DEC13	0	53	149,120.49		37,417.00	40,809.88								
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1206-0008	Input F/Analysis Group:Interface Detail to CS	1	01JUN10A	01JUN10A	01JUN10A	01JUN10A	0		0.00	100	0.00	0.00								
1206-0009	Dsgn Eng/CAD Models: Iteration, Optimizatr, Updt	10	18MAY10A	18MAY10A	01JUN10A	01JUN10A	0		0.00	100	0.00	0.00								
1206-0010	Complete Preliminary CAD Models	10	01JUN10A	01JUN10A	14JUN10A	14JUN10A	0		0.00	100	0.00	0.00								
1206-0013	ME Analysis/CAD Model Iterations-Strss/EM/Therm!	24	19MAY10A	19MAY10A	22JUN10A	22JUN10A	0		0.00	100	0.00	0.00								
1206-0014	Analysis of Preliminary Design Approved	1	22JUN10A	22JUN10A	22JUN10A	22JUN10A	0		0.00	100	0.00	0.00								
1206-0016	PDR	1	23JUN10A	23JUN10A	23JUN10A	23JUN10A	0		0.00	100	0.00	0.00								
1206-0018	Dsgn Eng & CAD Models: Iterations, Optim & Updat	38	24JUN10A	24JUN10A	17AUG10A	17AUG10A	0		0.00	100	0.00	0.00								
1206-0021	DOE CD-2 (Lehman) Review	1	10AUG10A	10AUG10A	10AUG10A	10AUG10A	0		0.00	100	0.00	0.00								
1206-0023	PDR CAD model Compld-Outr supring/clamp/sprng	1	18AUG10A	18AUG10A	18AUG10A	18AUG10A	0		0.00	100	0.00	0.00								
1206-0028	Final Dsgn Eng Iteration, Detl CAD Model (19mod)	209*	17AUG10A	17AUG10A	04MAR11	17JUN11	-74	123	15,553.07	90	13,898.09	15,442.32								

Activity ID	Activity Description	Work Days	BASELINE START	Forecast Start	BASELINE FINISH	Forecast Finish	Schedule Slip (Days)	Total Float	Budgeted Cost	PPCT	Earned value cost (BCWP)	Planned value cost (BCWS)	Gantt Chart						
													FY11	FY12	FY13	FY14	FY15	FY16	
1206-0029	Final Design Analysis	209*	17AUG10A	17AUG10A	04MAR11	17JUN11	-74	123	13,636.23	85	11,503.78	13,533.86	EM//EM =40 ; EA/sb =60 ;						
1206-0030	Design Drawings (8dwg)	84*	07MAR11	21FEB11A	22APR11	17JUN11	-39	123	8,943.50	80	7,154.80	8,943.50	EM//EM =06 ; EA/SB =64 ;						
1206-0032	Validation of Design Complete	40*	25APR11	22APR11A	06MAY11	17JUN11	-29	123	5,780.40	40	2,312.16	2,890.20	EA//EM =30						
1206-0033	Update CAD Models per Validation	84*	09MAY11	21FEB11A	20MAY11	17JUN11	-19	123	2,373.29	40	949.32	0.00	EA//SB =19 ;						
1206-0034	Revise Fabrication & Assembly Drawings per Valid	84*	23MAY11	21FEB11A	06JUN11	17JUN11	-9	123	3,997.12	40	1,598.85	0.00	EA//SB =32 ;						
1206-0035	Review, Check, Drawings	5	07JUN11	13JUN11	13JUN11	17JUN11	-4	123	5,320.97		0.00	0.00	EM//EM =21 ; EA/SB =16 ;						
1206-0036	Drawings ready for FDR	1	14JUN11	17JUN11	14JUN11	17JUN11	-3	123	0.00		0.00	0.00							
1206-0038	FDR	3	15JUN11*	22JUN11*	15JUN11	24JUN11	-7	121	0.00		0.00	0.00							
1206-0042	Prep Req & Procurement Package	10	02JAN13*	02JAN13*	15JAN13	15JAN13	0	53	5,668.48		0.00	0.00	EM//EM =32 ;						
1206-0043	Submit Req to Procurement	1	15JAN13	15JAN13	15JAN13	15JAN13	0	53	0.00		0.00	0.00							
1206-0044	Procurement Processing	22	15JAN13	15JAN13	13FEB13	13FEB13	0	53	0.00		0.00	0.00							
1206-0045	Submit for Vendor Quotes	1	14FEB13	14FEB13	14FEB13	14FEB13	0	53	0.00		0.00	0.00							
1206-0046	Eval Quotes	43	14FEB13	14FEB13	15APR13	15APR13	0	53	1,417.12		0.00	0.00	em//em=8						
1206-0047	Tech Eval of Vendors	43	14FEB13	14FEB13	15APR13	15APR13	0	53	1,417.12		0.00	0.00	em//em=8						
1206-0048	Award / Order Approved	1	16APR13	16APR13	16APR13	16APR13	0	53	0.00		0.00	0.00							
1206-0049	Vendor Oversight	102	17APR13	17APR13	11SEP13	11SEP13	0	53	1,417.12		0.00	0.00	EM//EM =08 ;						
1206-0050	Receipt of Hardware	5	12SEP13	12SEP13	18SEP13	18SEP13	0	53	62,990.40		0.00	0.00	41=47,720						
1206-0051	QA Inspection	10	19SEP13	19SEP13	02OCT13	02OCT13	0	53	2,502.67		0.00	0.00	EM//EM =04 ; EM//S						
1206-0052	Resolve Procurement Issues	5	03OCT13	03OCT13	09OCT13	09OCT13	0	53	366.28		0.00	0.00	em//em=2						
1206-0053	Documentation: Assembly Procedures	15	10OCT13	10OCT13	30OCT13	30OCT13	0	53	6,438.88		0.00	0.00	EM//EM =32; ea//sb=						
1206-0054	Assembly of Components	20	31OCT13	31OCT13	27NOV13	27NOV13	0	53	9,919.76		0.00	0.00	em//st=80;em//em=4						
1206-0055	Parts ready for installation	1	02DEC13	02DEC13	02DEC13	02DEC13	0	53	0.00		0.00	0.00							
1206-0057	Handling / Warehouse / Storage	5	03DEC13	03DEC13	09DEC13	09DEC13	0	53	1,378.08		0.00	0.00	EM//ST =12 ;						
Job: 1207 - Vessel Legs -SMITH																			
Subtotal		838	19MAY10A	19MAY10A	25SEP13	25SEP13	0	109	17,240.77		6,063.56	5,672.36							
1207-0013	ME Analysis/CAD Model Iterations-Strss/EM/Therm	24	19MAY10A	19MAY10A	22JUN10A	22JUN10A	0		0.00	100	0.00	0.00							
1207-0014	Analysis of Preliminary Design Approved	1	22JUN10A	22JUN10A	22JUN10A	22JUN10A	0		0.00	100	0.00	0.00							
1207-0016	PDR	1	23JUN10A	23JUN10A	23JUN10A	23JUN10A	0		0.00	100	0.00	0.00							
1207-0021	DOE CD-2 (Lehman) Review	1	10AUG10A	10AUG10A	10AUG10A	10AUG10A	0		0.00	100	0.00	0.00							
1207-0028	Updt CAD & Dsgn Dwgs, (3 CAD/2dwg)	132*	17AUG10A	17AUG10A	04FEB11	31JAN11A	4		4,127.34	100	4,130.92	4,130.92	EM//EM =07 ; EA/SB =25 ;						

Activity ID	Activity Description	Work Days	BASELINE START	Forecast Start	BASELINE FINISH	Forecast Finish	Schedule Slip (Days)	Total Float	Budgeted Cost	PPCT	Earned value cost (BCWP)	Planned value cost (BCWS)	FY11	FY12	FY13	FY14	FY15	FY16
1207-0030	N/A Dsgn Drawing Ready for Checking & Validation	1	16AUG10A	16AUG10A	16AUG10A	16AUG10A	0		0.00	100	0.00	0.00						
1207-0032	Analysis & Validation of Design Complete	176*	07FEB11	04OCT10A	29APR11	17JUN11	-34	123	1,541.44	80	1,233.15	1,541.44						
1207-0033	Update CAD Models per Validation	84*	02MAY11	21FEB11A	13MAY11	17JUN11	-24	123	374.73	80	299.78	0.00						
1207-0034	Revise Fabrication & Assembly Drawings per Valid	84*	16MAY11	21FEB11A	27MAY11	17JUN11	-14	123	999.28	40	399.71	0.00						
1207-0035	Review, Check Drawings	10	31MAY11	06JUN11	13JUN11	17JUN11	-4	123	1,448.90		0.00	0.00						
1207-0036	Drawings ready for FDR	1	14JUN11	17JUN11	14JUN11	17JUN11	-3	123	0.00		0.00	0.00						
1207-0038	FDR	3	15JUN11*	22JUN11*	15JUN11	24JUN11	-7	121	0.00		0.00	0.00						
1207-0042	Prep Req & Procurement Package	3	01FEB13*	01FEB13*	05FEB13	05FEB13	0	109	3,188.52		0.00	0.00						
1207-0043	Submit Req to Procurement	1	05FEB13	05FEB13	05FEB13	05FEB13	0	109	0.00		0.00	0.00						
1207-0044	Procurement Processing	22	05FEB13	05FEB13	06MAR13	06MAR13	0	109	0.00		0.00	0.00						
1207-0045	Submit for Vendor Quotes	1	07MAR13	07MAR13	07MAR13	07MAR13	0	109	0.00		0.00	0.00						
1207-0046	Eval Quotes	43	07MAR13	07MAR13	06MAY13	06MAY13	0	109	177.14		0.00	0.00						
1207-0048	Award / Order Approved	1	07MAY13	07MAY13	07MAY13	07MAY13	0	109	0.00		0.00	0.00						
1207-0050	Receipt of Hardware	60	08MAY13	08MAY13	02AUG13	02AUG13	0	109	5,095.20		0.00	0.00						
1207-0051	QA Inspection	15	05AUG13	05AUG13	23AUG13	23AUG13	0	109	177.14		0.00	0.00						
1207-0052	Resolve Procurement Issues	20	26AUG13	26AUG13	23SEP13	23SEP13	0	109	0.00		0.00	0.00						
1207-0055	Parts ready for installation	1	24SEP13	24SEP13	24SEP13	24SEP13	0	109	0.00		0.00	0.00						
1207-0056	Handling warehouse storage	1	25SEP13	25SEP13	25SEP13	25SEP13	0	109	111.08		0.00	0.00						

Job: 1208 - PF4&5 Verticle Support-SMITH

Subtotal		770	03MAY10A	03MAY10A	31MAY13	31MAY13	0	121	257,178.50		80,375.38	87,683.42						
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1208-0009	Dsgn Eng/CAD Models: Iteration, Optimizatn, Updt	20	03MAY10A	03MAY10A	28MAY10A	28MAY10A	0		0.00	100	0.00	0.00						
1208-0010	Complete Preliminary CAD Models	5	02JUN10A	02JUN10A	08JUN10A	08JUN10A	0		0.00	100	0.00	0.00						
1208-0011	Mockups:PF4/5 Vert Supp Struct Real Estate Issue	66	03MAY10A	03MAY10A	04AUG10A	04AUG10A	0		0.00	100	0.00	0.00						
1208-0013	ME Analysis/CAD Model Iterations-Strss/EM/Therml	24	19MAY10A	19MAY10A	22JUN10A	22JUN10A	0		0.00	100	0.00	0.00						
1208-0014	Analysis of Preliminary Design Approved	1	22JUN10A	22JUN10A	22JUN10A	22JUN10A	0		0.00	100	0.00	0.00						
1208-0016	PDR	1	23JUN10A	23JUN10A	23JUN10A	23JUN10A	0		0.00	100	0.00	0.00						
1208-0018	Dsgn Eng & CAD Models: Iterations, Optim & Updat	38	24JUN10A	24JUN10A	17AUG10A	17AUG10A	0		0.00	100	0.00	0.00						
1208-0021	DOE CD-2 (Lehman) Review	1	18AUG10A	18AUG10A	18AUG10A	18AUG10A	0		0.00	100	0.00	0.00						
1208-0028	Det Dsgn Eng, CAD (42 CAD)	210*	16AUG10A	16AUG10A	03FEB11	17JUN11	-95	123	21,461.31	95	20,161.18	21,222.29						

Activity ID	Activity Description	Work Days	BASELINE START	Forecast Start	BASELINE FINISH	Forecast Finish	Schedule Slip (Days)	Total Float	Budgeted Cost	PPCT	Earned value cost (BCWP)	Planned value cost (BCWS)	FY11 FY12 FY13 FY14 FY15 FY16					
1208-0029	Final Design Analysis	210*	16AUG10A	16AUG10A	03FEB11	17JUN11	-95	123	37,870.03	90	33,587.89	37,319.88	EA/EM =200 ; EA/SB =0 ;					
1208-0030	Design Drawings (23 dwg)	84*	04FEB11	21FEB11A	21APR11	17JUN11	-40	123	25,673.01	80	20,538.41	25,673.01	EM/EM =17 ; EA/SB =184 ;					
1208-0032	Validation of Design Complete	64*	22APR11	21MAR11A	05MAY11	17JUN11	-30	123	5,780.40	50	2,890.20	3,468.24	EA/EM=30					
1208-0033	Update CAD Models per Validation	84*	06MAY11	21FEB11A	19MAY11	17JUN11	-20	123	5,246.22	50	2,623.11	0.00	EA/SB =42 ;					
1208-0034	Revise Fabrication & Assembly Drawings per Valid	84*	20MAY11	21FEB11A	03JUN11	17JUN11	-10	123	11,491.72	5	574.59	0.00	EA/SB =92 ;					
1208-0035	Review, Check Drawings	5	06JUN11	13JUN11	10JUN11	17JUN11	-5	123	13,023.52		0.00	0.00	EM/EM =46 ; EA/SB =46 ;					
1208-0036	Drawings ready for FDR	1	13JUN11	17JUN11	13JUN11	17JUN11	-4	123	0.00		0.00	0.00						
1208-0038	FDR	3	14JUN11*	22JUN11*	14JUN11	24JUN11	-8	121	0.00		0.00	0.00						
1208-0042	Prep Req & Procurement Package	10	02JUL12*	02JUL12*	16JUL12	16JUL12	0	62	5,551.68		0.00	0.00	EM/EM =32 ;					
1208-0043	Submit Req to Procurement	1	16JUL12	16JUL12	16JUL12	16JUL12	0	62	0.00		0.00	0.00						
1208-0044	Procurement Processing	22	16JUL12	16JUL12	14AUG12	14AUG12	0	62	0.00		0.00	0.00						
1208-0045	Submit for Vendor Quotes	1	15AUG12	15AUG12	15AUG12	15AUG12	0	62	0.00		0.00	0.00						
1208-0046	Eval Quotes	43	15AUG12	15AUG12	15OCT12	15OCT12	0	62	1,395.39		0.00	0.00	EM/EM =08 ;					
1208-0047	Tech Eval of Vendors	43	15AUG12	15AUG12	15OCT12	15OCT12	0	62	2,790.78		0.00	0.00	EM/EM =16 ;					
1208-0048	Award / Order Approved	1	16OCT12	16OCT12	16OCT12	16OCT12	0	62	0.00		0.00	0.00						
1208-0049	Fab & Deliver incl Vendor Oversight	102	17OCT12	17OCT12	20MAR13	20MAR13	0	62	107,986.40		0.00	0.00	EM/EM =40 ; 41=76,440					
1208-0050	Receipt of Hardware	5	21MAR13	21MAR13	27MAR13	27MAR13	0	62	0.00		0.00	0.00						
1208-0051	QA Inspection	10	28MAR13	28MAR13	10APR13	10APR13	0	62	2,041.52		0.00	0.00	EM/EM =4 ; EM/ST =					
1208-0052	Resolve Procurement Issues	5	11APR13	11APR13	17APR13	17APR13	0	62	354.28		0.00	0.00	EM/EM =02 ;					
1208-0053	Documentation: Assembly Procedures	10	18APR13	18APR13	01MAY13	01MAY13	0	62	4,251.36		0.00	0.00	EM/EM =24 ;					
1208-0054	Assembly of Components	15	02MAY13	02MAY13	22MAY13	22MAY13	0	62	9,594.96		0.00	0.00	EM/EM =4 ; EM/ST =					
1208-0055	Parts ready for installation	1	23MAY13	23MAY13	23MAY13	23MAY13	0	62	0.00		0.00	0.00						
1208-0057	Handling / Warehouse / Storage	5	24MAY13	24MAY13	31MAY13	31MAY13	0	121	2,665.92		0.00	0.00	EM/ST =24 ;					
Job: 1220 - Misc Structural Design-SMITH																		
Subtotal		288	03MAY10A	03MAY10A	24JUN11	24JUN11	0	330	214,364.62		183,632.26	185,010.59						
1220-0016	Final Design Oversight (LOE)	180*	01OCT10	01OCT10A	22JUN11	22JUN11	0	332	82,902.04	LOE	65,824.22	65,861.07	EM/EM=524					
1220-0017	Design/Analysis support from EMEM (Willard)	79*	01NOV10*	04OCT10A	23DEC10	31JAN11A	-21		50,627.20	100	50,627.20	50,627.20	EM/EM=320					
1220-0017A	Analysis VV Dome/NB Port & PF2/3 Rib	145*	05OCT10A	05OCT10A	01FEB11	05MAY11	-67	156	6,328.40	80	5,062.72	6,328.40	EM/EM=40					
1220-0017B	VV & Support Structure - Peer Review	0			30MAR11*	18MAY11*	-35	147	0.00		0.00	0.00						

Activity ID	Activity Description	Work Days	BASELINE START	Forecast Start	BASELINE FINISH	Forecast Finish	Schedule Slip (Days)	Total Float	Budgeted Cost	PPCT	Earned value cost (BCWP)	Planned value cost (BCWS)	FY11 FY12 FY13 FY14 FY15 FY16					
1220-0020	Prep for FDR	5	09JUN11*	09JUN11*	15JUN11	15JUN11	0	128	6,328.40		0.00	0.00						
1220-0031	Misc/admin	180*	05OCT10A	05OCT10A	24JUN11	24JUN11	0	330	27,928.42	LOE	21,867.96	21,943.76						
1220-1 PDR	Prelim Design Oversight	38	03MAY10A	03MAY10A	24JUN10A	24JUN10A	0		0.00	100	0.00	0.00						
1220-2 FDR	Final Design Oversight (LOE)	190*	25JUN10A	25JUN10A	30SEP10A	30SEP10A	0		40,250.16	100	40,250.16	40,250.16						

1200 Structures & Supports (Smith)	31JAN2012	29FEB2012	31MAR2012	30APR2012	31MAY2012	30JUN2012	31JUL2012	31AUG2012	30SEP2012	31OCT2012	30NOV2012	31DEC2012
BCWS	0	0	2	0	0	14	7	10	45	141	155	156
CUM BCWS	2,293	2,293	2,295	2,295	2,295	2,309	2,315	2,326	2,371	2,512	2,666	2,823
BCWP	0	0	0	0	0	0	0	0	0	0	0	0
CUM BCWP	2,102	2,102	2,102	2,102	2,102	2,102	2,102	2,102	2,102	2,102	2,102	2,102
ACWP	0	0	0	0	0	0	0	0	0	0	0	0
CUM ACWP	2,092	2,092	2,092	2,092	2,092	2,092	2,092	2,092	2,092	2,092	2,092	2,092
CV	10	10	10	10	10	10	10	10	10	10	10	10
SV	-191.	-191.	-193.	-193.	-193.	-207.	-214.	-224.	-269.	-410.	-564.	-721.
CPI	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
SPI	0.92	0.92	0.92	0.92	0.92	0.91	0.91	0.9	0.89	0.84	0.79	0.74

1200 Structures & Supports (Smith)	31JAN2013	28FEB2013	31MAR2013	30APR2013	31MAY2013	30JUN2013	31JUL2013	31AUG2013	30SEP2013	31OCT2013	30NOV2013	31DEC2013
BCWS	178	119	67	40	29	8	191	10	71	8	9	1
CUM BCWS	3,000	3,119	3,186	3,226	3,255	3,263	3,454	3,464	3,535	3,543	3,552	3,554
BCWP	0	0	0	0	0	0	0	0	0	0	0	0
CUM BCWP	2,102	2,102	2,102	2,102	2,102	2,102	2,102	2,102	2,102	2,102	2,102	2,102
ACWP	0	0	0	0	0	0	0	0	0	0	0	0
CUM ACWP	2,092	2,092	2,092	2,092	2,092	2,092	2,092	2,092	2,092	2,092	2,092	2,092
CV	10	10	10	10	10	10	10	10	10	10	10	10
SV	-898.	-1018.	-1085.	-1124.	-1153.	-1162.	-1352.	-1362.	-1433.	-1441.	-1451.	-1452.
CPI	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.	1.
SPI	0.7	0.67	0.66	0.65	0.65	0.64	0.61	0.61	0.59	0.59	0.59	0.59

Annex I – WBS Dictionary

This Work Breakdown Structure (WBS) organizes and defines the scope of the NSTX Upgrade using the WBS as established by the original NSTX project and modified to accommodate the NSTX Upgrade.

<u>WBS</u>			
<u>L1</u>	<u>L2</u>	<u>L3</u>	<u>Description</u>
1			NSTX UPGRADE PROJECT
	1.1		Torus Systems
		1.1.0	Project Integrated Model
		1.1.1	Plasma Facing Components
		1.1.2	Vacuum Vessel and Support Structure
		1.1.3	Magnet Systems
	1.2		Plasma Heating and Current Drive Systems
		1.2.1	High Harmonic Fast Wave (HHFW)
		1.2.2	Coaxial Helicity Injection (CHI) Current Drive
		1.2.3	Electron Cyclotron Heating (ECH)
		1.2.4	Neutral Beam Injection (NBI)
	1.3		Auxiliary Systems
		1.3.1	Vacuum Pumping System
		1.3.2	Coolant Systems
		1.3.3	Bakeout Heating System
		1.3.4	Gas Delivery System
		1.3.5	Glow Discharge Cleaning System
	1.4		Plasma Diagnostics
		1.4.1	Plasma Diagnostics
	1.5		Power Systems
		1.5.1	AC Power Systems
		1.5.2	AC/DC Converters
		1.5.3	DC Systems
		1.5.4	Control and Protection System
		1.5.5	General Power Systems and Integration
	1.6		Central Instrumentation and Controls (I&C)
		1.6.1	Control System
		1.6.2	Data Acquisition System
	1.7		Project Support & Integration
		1.7.1	Project Management and Integration
		1.7.2	Project Physics
		1.7.3	Integrated Systems Tests
	1.8		Site Preparation and Assembly
		1.8.1	Site Preparation
		1.8.2	Torus Assembly and Construction

Annex I – WBS Dictionary

protection, divertor area strike plates, and local I&C. This element consists of the engineering design, analysis, procurement activities and component fabrication.

The NSTX Upgrade Project will require new PFCs on the new Center Stack Casing (CSC) and the new Inboard divertor (IBD). This WBS element includes the design and analysis for both the CS and IBD PFCs, design modifications to the PFC tiles to accommodate surface diagnostics, including design of the tile mounting schemes and routing plans for diagnostic wires, generation of required documentation such as checked calculations, specifications and procedures, the procurement and installation of all PFC tiles and hardware on the CSC and IBD.

{Center Stack Upgrade (CSU) PFCs (Job 1001)}

In addition the NSTX Upgrade will require analysis of the passive plates for disruption and thermal loads. CDR level calculations were performed that addressed one of five disruptions. The remaining identified disruptions are to be completed during Preliminary Design. During Final design, analysis updates are expected as a result of preliminary design evolution. Modest hardware upgrades are anticipated as part of this task. Additions of accelerometers or other diagnostics to benchmark calculations with actual performance in NSTX are also anticipated. This analysis effort is included in this WBS element.

{Passive Plate Analysis and Upgrade Activity (Job 1002)}

With the exception of the modifications identified above, no additional modifications to the PFCs are anticipated.

WBS Element: 1.1.2

WBS Level: 3

WBS Title: Vacuum Vessel and Support Structure

Definition: The vacuum vessel & support structure (VVSS) consists of the vacuum chamber, not including the PFCs, all ports and vacuum boundary closures and the torus support structure which provides the overall supporting mechanism for the torus components to the test cell floor. This WBS element includes the engineering design, analysis, procurement activities and component fabrication.

The NSTX Upgrade Project will require that the existing VVSS be modified to accommodate the new center stack structure, including the umbrella structure and the new center stack support structure. This WBS element includes the analytical and CAD design of the support structures associated with the Magnet upgrade activities. The scope includes; the Vacuum Vessel & Structural Support, the Outer TF Structures, the Outer PF Coil Structures, the Umbrella Structural Reinforcement, the CS Support Pedestal and miscellaneous Vacuum Vessel Structural Supports. It also includes the procurement and fabrication of these structures, but

Annex I – WBS Dictionary

does not include installation costs. Installations costs are included in WBS 1.8. **{Vacuum Vessel & Support Structure (Job 1200)}**

WBS Element: 1.1.3

WBS Level: 3

WBS Title: Magnet Systems

Definition: The magnet system consists of the outer Poloidal Field (PF) coils (PF#2-5), the outer Toroidal Field (TF) coil legs, and the Center Stack Assembly (CSA). The CSA contains the inner TF coil legs, the TF coil joint (flex bus assembly), the OH solenoid, the shaping coils, and the center stack casing. This WBS element includes the design, analysis, prototypes (as required), procurement activities and fabrication of the magnet systems up to and including the magnet system coil buswork, but does not include installation costs. Installations costs are included in WBS 1.8

The NSTX Upgrade Project will require engineering, analysis, design procurement and fabrication of a new CSA, replacement of two outer TF coil legs, and a fabrication of a new TF coil joint

This WBS element provides CAD design support for the overall assembly drawings associated with the CSA upgrade. It also includes some time for space allocation studies associated with the magnet upgrades. CAD design support for individual components is included in the specific component jobs.

{Center Stack Upgrade Project Design Support (Job 1300)}

WBS Element: 1.1.3.1

WBS Level: 4

WBS Title: Outer Poloidal Field Coils (PF #3-5)

Definition: The outer Poloidal Field coils (PF 3-5) consist of 5 poloidal field coils PF 3 upper and lower, PF 4 upper and lower and PF 5. There are no changes to the outer PF coils as part of the NSTX Upgrade Project scope.

WBS Element: 1.1.3.2

WBS Level: 4

WBS Title: Outer Toroidal Field Coils

Definition: The outer Toroidal Field coils subsystem consists of the coil sections that make up the 12 TF outer legs. This WBS element includes the design, analysis, prototypes (as required), procurement activities and fabrication. For the NSTX Upgrade Project two (2) new Outer TF coils will be fabricated to replace existing ones. This WBS element includes the fabrication of (2) new Outer TF coils to replace the existing leaking OTF#7 and OTF#11 in NSTX. The scope includes the procurement of conductor, insulation material, aluminum castings and supports necessary to fabricate a new OTF coils. Coil fabrication will be performed in-house. This scope does not include costs associated with installation. Installations costs are included in WBS 1.8

{Outer Toroidal Field Coil Repairs (Job 1301)}

Work Approval Form (WAF)

Cost Center: 9417
Job Number: 1200
Job Title: Vacuum Vessel & Support Structure
Job Manager: M. Smith
Rev 2 7/15/2010

Description:

Includes the analytical and CAD design of the support structures associated with the Magnet upgrade activities.

Scope includes

1200-Vacuum Vessel & Structural Support

1201-Outer TF Structure

1202-PF2 Support Structure

1203-PF3 Support Structure

1204-PF4-5 Leads, Radial Support

1205-Umbrella Reinforcement

1206-Pedestal

1207-Vacuum Vessel Leg's

1208 - PF4 PF5 Verticle Support

1220-Misc

Includes the procurement and fabrication of these structures.

Does not include installation costs.

Schedule:

See Tab B or attached

Approvals:

Job Manager

Project Manager

Engineering Department Head

M. Smith 7/21/10

[Signature] 8/3/10

[Signature] 8/3/10

Cost Center: 9417
 Job Number: 1200
 Job Title: Vacuum Vessel & Support Structure
 Job Manager: M. Smith

USER INPUT TASKS AND DESCRIPTIONS		SCHEDULE		Estimate (user input)																		Contingency %	Category				
		USER INPUT		FY10\$K									HOURS														
task	TASK DESCRIPTION	Responsible	DURATION in WORK DAYS	Logical Pre-requisites (one task: numbers in each column, any order)		M&S (4:1)	CREDIT CARD (4:3)	OTHER (9:9)	TRAVEL (9:5)	OVERTIME (9:1)	EA* EM (analysis engr)	EA* SB (Designer)	EC* EM (computing Engr)	EC* SB (Computing Tech)	EE* EM (Elec Engr)	EE* TB (Elec Tech)	EM** EM (FOAM Engr)	EM** TB (FOAM Tech)	FC* AM (P&C Officer)	LP** TB (HP Tech)	RM** RM (Researcher)	Other:	Other:	Other:			
The TF Outer Support consists of the: Outer support ring, TF clamp reinforcement, and vessel spring link.																											
5	1201 Outer TF Structure																										
6	<i>Preliminary Design Activities</i>		77																								
9	Design Eng & CAD Models: Iterations, Optimization & Updates		30									80					40								37%	2, 4, 9, 11	
10	Complete Preliminary CAD Models		10									40													60%	2, 4, 9, 11	
11	Mockups: outer link, real estate issues (# of items approx 4)		66			\$8						8					4	80							60%	2, 4, 9	
12	ME Analysis & CAD Model Iterations (Titus)																6								10%	2, 4, 9	
13	Stress, EM, Thermal	Titus	32							101															20%	2, 4, 9, 10	
14	Analysis of Preliminary Design Approved	Titus	-	13																					25%		
16	PDR		-																						20%		
18	Design Eng & CAD Models: Iterations, Optimization & Updates		38	16								60					30								37%	2, 4, 9, 11	
21	DOE CD-2 (Lehman) Review		-																						0%		
23	Preliminary Design CAD model Completed																										
24	Outer support ring, clamps, spring		-	18																					10%		
26	<i>Final Design Activities</i>																										
28	Detailed Design Eng, CAD & Analysis Iterations(34 models, 13 dwg)		64									102					31								41%	2, 4, 9, 11	
29	Update Design Drawings		64									104					10								47%	2, 4, 9, 11	
30	Design Drawings Ready for Checking & Validation		-																						25%		
31	Validate Analysis: Stress, EM, Thermal	Titus	130							380	40														20%	10	
32	Validation of Design Complete	Titus	-	31																					25%		
33	Update CAD Models per Validation		10	32								34													60%	2, 4, 9, 11	
34	Revise Fabrication & Assembly Drawings per Validation		10	33								52													60%	2, 4, 9, 11	
35	Review, Check Drawings		5	34								26					26								30%	2, 4, 9, 11	
36	Drawings Ready for FDR		-	35																					10%		
37																											
38	FDR		-																						12%		
40	<i>Procurement & Fabrication</i>																										
42	Prep Req & Procurement Package		10														32								30%	2, 4, 9	
43	Submit Req to Procurement		-	42																					20%		
44	Procurement Processing	Procurement	22	43																							
45	Submit for Vendor Quotes		-	44																						10%	
46	Eval Quotes	Procurement	43	45													8								10%	2, 4, 9	
47	Tech Eval of Vendors		43	45													16								10%	2, 4, 9	
48	Award / Order Approved		-	46																					10%		
49	Vendor Oversight		100	48	47												40								10%	2, 4, 9	
50	Receipt of Hardware		4	49																					10%		
51	QA Inspection		10	50													9	48							44%	2, 4, 9	
52	Resolve Procurement Issues		5	51													2								10%	2, 4, 9	
53	Documentation: Assembly Procedures		15	50								4					24								10%	2, 4, 9	
54	Assembly of Components		20	53													4	80							48%	2, 4, 9	
55	Parts ready for installation		-	54																					25%		
56	Handling / Warehouse / Storage		50	50														96							60%	2, 4, 9	
TOTALS						\$8	\$0	\$0	\$0	\$0	\$0	\$481	\$560	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0

1. National Sta

Cost Center: 9417
 Job Number: 1200
 Job Title: Vacuum Vessel & Support Structure
 Job Manager: M. Smith

USER INPUT TASKS AND DESCRIPTIONS				SCHEDULE		FY10\$K		Estimate (user input)										Contingency %	Category								
TASK	TASK DESCRIPTION	Responsible	DURATION in WORK DAYS	Logical Pre-requisites (one task numbers in each column, any order)	User Input Start Date (optional)	START DATE	FINISH DATE	HOURS																			
1	P3 cross ref (optional)																										
2				PF2 Support consists of: 1. Increase number of clamps from 6 to 11 using existing design.																							
6	1202 PF2 Support Structure																										
7	<i>Preliminary Design Activities</i>																										
8	Input from Analyst Group: Preliminary Analysis of PF2	Titus	-			7/30/10	7/30/2010											28%	2, 4, 9								
9	Design Eng & CAD Models: Iterations, Optimization & Updates		30			7/30/10	9/10/2010							24				50%	2, 4, 9, 11								
10	Complete Preliminary CAD Models		12	8		7/30/10	8/16/2010							16				50%	2, 4, 9, 11								
12	ME Analysis & CAD Model Iterations (Titus)																										
13	Stress, EM, Thermal	Titus	32			7/30/10	9/13/2010							20				20%	2, 4, 9, 10								
14	Analysis of Preliminary Design Approved	Titus	-	13		9/13/10	9/13/2010											28%	2, 4, 9, 10								
16	PDR		-			7/30/10	7/30/2010											20%									
18	Design Eng & CAD Models: Iterations, Optimization & Updates		38	16		7/30/10	9/21/2010							16		8		37%	2, 4, 9, 11								
21	DOE CD-2 (Lehman) Review		-		8/11/10	8/11/10	8/11/2010																				
23			-			7/30/10	7/30/2010																				
26	<i>Final Design Activities</i>																										
27	Detailed Design Eng, CAD & Analysis Iterations (3 models, 1 dwg)		64		8/17/10	8/17/10	11/14/2010							9		5		37%	2, 4, 9, 11								
29	Update Design Drawings		64		8/17/10	8/17/10	11/14/2010							8		1		47%	2, 4, 9, 11								
30	Design Drawings Ready for Checking & Validation		-		11/15/10	11/15/2010												10%									
31	Validate Analysis: Stress, EM, Thermal	Titus	190		1/20/00									80		2		20%	2, 4, 10								
32	Validation of Design Complete	Titus	-	31		7/30/10	7/30/2010											28%									
33	Update CAD Models per Validation		10	32		7/30/10	8/13/2010											50%	2, 4, 9, 11								
34	Revise Fabrication & Assembly Drawings per Validation		10	33		8/13/10	8/27/2010											50%	2, 4, 9, 11								
35	Review, Check Drawings		5	34		8/27/10	9/8/2010											28%	2, 4, 9, 11								
36	Drawings Ready for PDR		-	35		9/3/10	9/3/2010											8%									
37			-																								
38	FDR		-		3/31/11	3/31/11	3/31/2011											12%									
40	<i>Procurement & Fabrication</i>																										
42	Prep Req & Procurement Package		5		5/1/11	5/1/11	5/8/2011											10%	2, 4, 9								
43	Submit Req to Procurement		-	42		5/8/11	5/8/2011											10%									
44	Procurement Processing	Procurement	22	43		5/8/11	6/7/2011											10%									
45	Submit for Vendor Quotes		-	44		6/7/11	6/7/2011											10%									
46	Eval Quotes	Procurement	43	45		6/7/11	8/7/2011											10%	2, 4, 9								
47			-	46		8/7/11	8/7/2011											10%	2, 4, 9								
48	Award / Order Approved		-	48		8/7/11	12/25/2011											10%	2, 4, 9								
49	Vendor Oversight		100	49		12/25/11	12/28/2011											8%									
50	Receipt of Hardware		1	50		12/28/11	1/6/2012											37%	2, 4, 9								
51	QA Inspection		10	50		1/6/12	1/6/2012											26%									
52	Resolve Procurement Issues		5	51		1/6/12	1/6/2012																				
53			-																								
54			-																								
55	Parts ready for installation		-	52		1/16/12	1/16/2012											6%									
56	Handling / Warehouse / Storage		16	50		12/28/11	1/17/2012											8%	2, 4, 9								
57			-																								
58			-																								
59			-																								
60			-																								
61			-																								
62			-																								
63			-																								
TOTALS								60	60	60	60	60	100	84													
TOTAL Preliminary Cost Estimate (\$K)								\$0	\$0	\$0	\$0	\$0	\$18	\$10	\$0	\$0	\$0	\$0	\$0	\$5	\$0	\$0	\$0	\$0	\$0	\$0	\$0

Notes:

Cost Center: 9417
Job Number: 1200
Job Title: Vacuum Vessel & Support Structure
Job Manager: M. Smith

Task	USER INPUT TASKS AND DESCRIPTIONS	Responsible	SCHEDULE				START DATE	FINISH DATE
			USER INPUT		Calculated			
			DURATION in WORK DAYS	Logical Pre-requisites (one task numbers in each column, any order)	User Input Start Date (optional)	START DATE		
1	P3 cross ref (optional)							
2								
3								
4								
5	1203 PF3 Support Structure							
6	Preliminary Design Activities							
11								
12	ME Analysis & CAD Model Iterations (Titus)							
13	Stress, EM, Thermal	Titus	32		5/1/10	6/1/10 6/14/2010		
14	Analysis of Preliminary Design Approved	Titus	-	13		7/30/10 7/30/2010	20%	
15							28%	
16	PDR		-		6/23/10	6/23/10 6/23/2010	20%	
21	DOE CD-2 (Lehman) Review		-		8/11/10	8/11/10 8/11/2010	0%	
25								
26	Final Design Activities							
27								
28	Detailed Design Eng. CAD (2 models, 2 dwg)		64		8/17/10	8/17/10 11/14/2010	37%	
29	Update Design Drawings		64		8/17/10	8/17/10 11/14/2010	47%	
30	Design Drawings Ready for Checking & Validation		-		11/15/10	11/15/10 11/15/2010	10%	
31	Validate Analysis: Stress, EM, Thermal	Titus	130		1/0/00	6/30/1900	20%	
32	Validation of Design Complete	Titus	-	31		7/30/10 7/30/2010	28%	
33	Update CAD Models per Validation		10	32		7/30/10 8/13/2010	50%	
34	Revise Fabrication & Assembly Drawings per Validation		10	33		8/13/10 8/27/2010	50%	
35	Review, Check Drawings		5	34		8/27/10 9/3/2010	26%	
36	Drawings Ready for FDR		-	35		9/3/10 9/3/2010	8%	
37								
38	FDR		-		3/31/11	3/31/11 3/31/2011	12%	
39								
40	Procurement & Fabrication							
41								
42	Prep Req & Procurement Package		5		5/1/11	5/1/11 5/8/2011	10%	
43	Submit Req to Procurement		-	42		5/8/11 5/8/2011	10%	
44	Procurement Processing	Procurement	20	43		5/8/11 6/5/2011	10%	
45	Submit for Vendor Quotes		-	44		6/5/11 6/5/2011	10%	
46	Eval Quotes	Procurement	40	45		6/5/11 7/31/2011	10%	
47								
48	Award / Order Approved		-	46		7/31/11 7/31/2011		
49	Vendor Oversight		100	48		7/31/11 12/18/2011	10%	
50	Receipt of Hardware		5	49		12/18/11 12/25/2011	8%	
51	QA Inspection		10	50		12/25/11 1/9/2012		
52								
53								
54								
55	Parts ready for installation		-	51		1/8/12 1/8/2012	5%	
56	Handling / Warehouse / Storage		1	55		1/8/12 1/8/2012	5%	
57								
58								
59								
60								
61								
62								
63								
	TOTALS							
	TOTAL Preliminary Cost Estimate (\$K)							

Actual - A	Estimate (user input)											Contingency %	Category							
	FY10\$K		HOURS																	
	M&S (41)	CREDIT CARD (43)	OTHER (39)	TRAVEL (38)	OVERTIME (31)	EA**EM (analysis engr)	EA**SB (Designer)	EC**EM (computing Engr)	EC**SB (Computing Tech)	EE**EM (Eledr Engr)	EE**TB (Eledr Tech)	EM**EM (FO&M Engr)	EM**TB (FO&M Tech)	EC**AM (P&C Officer)	EP**TB (HP Tech)	FR**RM (Researcher)	Other	Other	Other	

Cost Center: 9417
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task	USER INPUT TASKS AND DESCRIPTIONS	Responsible	SCHEDULE			Calculated	
			DURATION in WORK DAYS	Logical Pre-requisites (one task numbers in each column, any order)	User Input Start Date (optional)	START DATE	FINISH DATE
numb	P3 cross ref (optional)						
1							
2							
3							
4							
5							
6							
7							
8							
9	Design Eng & CAD Models: Iterations, Optimization & Updates		10		5/18/10	5/19/10	6/1/2010
10							
11							
12	ME Analysis & CAD Model Iterations (Titus)						
13	Stress, EM, Thermal	Titus	32		5/1/10	5/1/10	6/14/2010
14	Analysis of Preliminary Design Approved	Titus	-	13		7/30/10	7/30/2010
15							
16	PDR				6/23/10	6/23/10	6/23/2010
17							
18							
19							
20							
21	DOE CD-2 (Lehman) Review				8/11/10	8/11/10	8/11/2010
22							
23							
24							
25							
26							
27	Final Design Activities						
28	Detailed Design Eng, CAD & Analysis Iterations (6 models, 3 dwg)		64		8/17/10	8/17/10	11/14/2010
29	Update Design Drawings		64		8/17/10	8/17/10	11/14/2010
30	Design Drawings Ready for Checking & Validation		-		11/15/10	11/15/10	11/15/2010
31	Validate Analysis: Stress, EM, Thermal	Titus	120		1/0/00	1/0/00	6/16/1900
32	Validation of Design Complete	Titus	-	31		7/30/10	7/30/2010
33	Update CAD Models per Validation		10	32		7/30/10	8/13/2010
34	Revise Fabrication & Assembly Drawings per Validation		10	33		8/13/10	8/27/2010
35	Review, Check Drawings		5	34		8/27/10	9/3/2010
36	Drawings Ready for FDR		-	35		9/3/10	9/3/2010
37							
38	FDR				3/31/11	3/31/11	3/31/2011
39							
40							
41	NOTE:						
42	Only visco material (shim) required which is already accounted for in 1208.						
43							
44							
45							
46	NOTE:						
47	Ron, This sub-task (1204) will require field work for Mike Viola.						
48							
49							
50							
51							
52							
53							
54							
55							
56							
57							
58							
59							
60							
61							
62							
63							
	TOTALS						

Actual A	Estimate (user input)													Contingency %	Category					
	FY10\$K					HOURS														
	M/S (41)	CREDIT CARD (45)	OTHER (89)	TRAVEL (95)	OVERTIME (31)	EA-EM (analysis engr)	EA-SB (Designer)	EC-EM (computing Engr)	EC-SB (Computing Tech)	EE-EM (Eler Engr)	EE-TB (Eler Tech)	EE-EM (FOBM Engr)	EE-TB (FOBM Tech)	EC-AM (PAC Officer)	LP-TB (HP Tech)	Y-EM (Researcher)	Other	Other	Other	

Notes:

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Job Manager:	M. Smith

USER INPUT TASKS AND DESCRIPTIONS		SCHEDULE				Estimate user input																		Contingency %		Category								
		USER INPUT			Calculated	FY10\$K																												
task	TASK DESCRIPTION	Responsible	DURATION in WORK DAYS	Logical Pre-requisites (one task numbers in each column, any order)	User Input Start Date (optional)	START DATE	FINISH DATE	MB5 (41)	CREDIT CARD (43)	OTHER (38)	TRAVEL (35)	OVERTIME (31)	EA* EM (analysis eng)	EA* SB (Designer)	EC* EM (comparing Eng)	EC* SB (Comparing Tech)	EE* EM (Elec Eng)	EE* TB (Elec Tech)	EM* EM (FOAM Eng)	EM* TB (FOAM Tech)	EC* AM (PIC Officer)	LP* TB (HP Tech)	P** RM (Researcher)	Other	Other	Other	Other	Other	Other	Other				
F3 cross ref (optional)																																		
1																																		
2																																		
3																																		
4																																		
5	1206 Pedestal Support Structure																																	
6	<u>Preliminary Design Activities</u>																																	
7	Input from Analyst Group: Interface Details to Center Stack.	Titus	-			6/1/10	6/1/10 6/1/2010																											
8	Design Eng & CAD Models: Iterations, Optimization & Updates		30			5/1/10	5/1/10 6/12/2010						80							60												25%		
9	Complete Preliminary CAD Models		10	8		7/30/10	8/13/2010						20																			35%		
10	Mockups: Real estate issues		66			5/1/10	5/1/10 8/1/2010																									50%		
11	ME Analysis & CAD Model Iterations (Titus)																																	
12	Stress, EM, Thermal	Titus	32			5/1/10	5/1/10 6/14/2010																											
13	Analysis of Preliminary Design Approved	Titus	-	13		7/30/10	7/30/2010																										25%	
14	PDR		-			6/23/10	6/23/2010																										20%	
15	Design Eng & CAD Models: Iterations, Optimization & Updates		38	16		7/30/10	9/21/2010						24							12												37%		
16	DOE CD-2 (Lehman) Review		-			8/11/10	8/11/2010																										0%	
17	Preliminary Design CAD Model Completed		-	18		9/21/10	9/21/2010																										10%	
18	<u>Final Design Activities</u>																																	
19	Detailed Design Eng, CAD & Analysis Iterations (19 models, 8 dwg)		64			8/17/10	8/17/10 11/14/2010																										39%	
20	Update Design Drawings		64			8/17/10	8/17/10 11/14/2010																										47%	
21	Design Drawings Ready for Checking & Validation		-			11/15/10	11/15/2010																											
22	Validate Analysis: Stress, EM, Thermal	Titus	120			1/0/00	6/16/1900						4	4																		20%		
23	Validation of Design Complete	Titus	-	31		7/30/10	7/30/2010																										25%	
24	Update CAD Models per Validation		10	32		7/30/10	8/13/2010																										50%	
25	Revise Fabrication & Assembly Drawings per Validation		10	33		8/13/10	8/27/2010																										50%	
26	Review, Check Drawings		5	34		8/27/10	9/3/2010																										27%	
27	Drawings Ready for FDR		-	35		9/3/10	9/3/2010																										10%	
28	PDR		-			3/31/11	3/31/2011																										12%	
29	<u>Procurement & Fabrication</u>																																	
30	Prep Req & Procurement Package		10			5/1/11	5/15/2011																										20%	
31	Submit Req to Procurement		-	42		5/15/11	5/15/2011																										10%	
32	Procurement Processing	Procurement	22	43		5/15/11	6/14/2011																										10%	
33	Submit for Vendor Quotes		-	44		6/14/11	6/14/2011																										10%	
34	Eval Quotes	Procurement	43	45		6/14/11	8/14/2011													8													10%	
35	Tech Eval of Vendors		43	45		6/14/11	8/14/2011													8													10%	
36	Award / Order Approved		-	46	47	8/14/11	8/14/2011																										10%	
37	Vendor Oversight		102	48		8/14/11	1/3/2012																										10%	
38	Receipt of Hardware		5	49		1/3/12	1/10/2012																										10%	
39	QA Inspection		10	50		1/10/12	1/24/2012																										42%	
40	Resolve Procurement Issues		5	51		1/24/12	1/31/2012																										10%	
41	Documentation: Assembly Procedures		15	52		1/31/12	2/21/2012																										14%	
42	Assembly of Components		20	53		2/21/12	3/20/2012																										48%	
43	Parts ready for Installation		-	54		3/20/12	3/20/2012																										25%	
44	Handling / Warehouse / Storage		5	55		3/20/12	3/27/2012																										50%	
TOTALS								\$0	\$0	\$0	\$0	\$0	\$4	\$38	\$0	\$0	\$0	\$0	\$0	\$220	\$108	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0			
TOTAL Preliminary Co		Installation of the clamps requires drilling holes for anchors which is field work for Mike Viola. This will also require alignment, possibly using an alignment fixture.					\$381																											

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USER INPUT TASKS AND DESCRIPTIONS			SCHEDULE				Estimate (user input)															Contingency %	Category						
			USER INPUT			Calculated		FY10\$K					HOURS																
			task	TASK DESCRIPTION	Responsible	DURATION in WORK DAYS	Logical Pre-requisites (one task numbers in each column, any order)	User Input Start Date (optional)	START DATE	FINISH DATE	M&S (41)	CREDIT CARD (43)	OTHER (39)	TRAVEL (35)	OVERTIME (31)	EA* EM (analysis eng)	EA* SB (Designer)	EC* EM (comparing Eng)	EC* SB (Comparing Tech)	EE* EM (Elec Eng)	EE* TB (Elec Tech)			EM* EM (FOAM Eng)	EM* TB (FOAM Tech)	EC* AM (R&C Officer)	EP* TB (RP Tech)	ET* RM (Researcher)	Other:
P3 cross ref (optional) PF4-PF5 Verticle Support consists of: columns, column clamps, visco-elastic material shims, and shims at existing support plates.																													
1208 PF4 PF5 Verticle Support																													
<u>Preliminary Design Activities</u>																													
	Design Eng & CAD Models: Iterations, Optimization & Updates		20		5/1/10	5/1/10	5/29/2010								40					24								38%	2, 4, 9, 11
	Complete Preliminary CAD Models		5	9	5/1/10	7/30/10	8/8/2010								20					8								30%	2, 4, 9, 11
	Mockups: Real estate issues & sizing		66		5/1/10	5/1/10	8/1/2010		\$10						4					2	32							48%	2, 4, 9, 11
	ME Analysis & CAD Model Iterations (Titus)				5/1/10	5/1/10	6/14/2010									49												20%	2, 4, 9, 10
	Stress, EM, Thermal	Titus	32			8/6/10	8/8/2010																					28%	
	Analysis of Preliminary Design Approved	Titus	-	10	13																							20%	
	PDR		-		6/23/10	6/23/10	6/23/2010																					20%	
	Design Eng & CAD Models: Iterations, Optimization & Updates		38	16		7/30/10	9/21/2010								24					4								44%	2, 4, 9, 11
<u>DOE CD-2 (Lehman) Review</u>					8/1/1/10	8/1/1/10	8/11/2010																					0%	
	Preliminary Design CAD model Completed		-	18		9/21/10	9/21/2010																					10%	
<u>Final Design Activities</u>																													
	Detailed Design Eng, CAD & Analysis Iterations (42 cad, 23 dwg)		64		8/17/10	8/17/10	11/14/2010								126					38								41%	2, 4, 9, 11
	Update Design Drawings		64		8/17/10	8/17/10	11/14/2010								184					17								47%	2, 4, 9, 11
	Design Drawings Ready for Checking & Validation		-		11/15/10	11/15/10	11/15/2010																						
	Validate Analysis: Stress, EM, Thermal	Titus	130		1/0/00	6/30/1900	7/30/10	7/30/2010							200	34												20%	2, 4, 9, 10
	Validation of Design Complete	Titus	-	31		7/30/10	7/30/2010																					25%	
	Update CAD Models per Validation		10	32		7/30/10	8/13/2010								42													50%	2, 4, 9, 11
	Revise Fabrication & Assembly Drawings per Validation		10	33		8/13/10	8/27/2010								92													80%	2, 4, 9, 11
	Review, Check Drawings		5	34		8/27/10	9/3/2010								46					46								30%	2, 4, 9, 11
	Drawings Ready for FDR		-	35		9/3/10	9/3/2010																					10%	
	PDR		-		3/31/11	3/31/11	3/31/2011																					12%	
<u>Procurement & Fabrication</u>																													
	Prop Req & Procurement Package		10		5/1/11	5/1/11	5/15/2011													32								50%	2, 4, 9
	Submit Req to Procurement		-	42		5/15/11	5/15/2011																					10%	
	Procurement Processing	Procurement	22	43		5/15/11	6/14/2011																					10%	
	Submit for Vendor Quotes		-	44		6/14/11	6/14/2011																					10%	
	Eval Quotes	Procurement	43	45		6/14/11	8/14/2011													8								25%	2, 4, 10
	Tech Eval of Vendors		43	45		6/14/11	8/14/2011													16								25%	2, 4, 10
	Award / Order Approved		-	47		8/14/11	8/14/2011																					10%	
	Vendor Oversight		101	48		8/14/11	1/2/2012													40								25%	2, 4, 10
	Receipt of Hardware		1	49		1/2/12	1/3/2012																					10%	
	QA Inspection		10	50		1/3/12	1/17/2012													4	12							40%	2, 4, 10
	Resolve Procurement Issues		6	51		1/17/12	1/24/2012													2								20%	2, 4, 10
	Documentation: Assembly Procedures		10	52		1/24/12	2/7/2012													24								33%	2, 4, 10
	Assembly of Components		15	53		2/7/12	2/28/2012													4	80							48%	2, 4, 10
	Parts ready for installation		-	54		2/28/12	2/28/2012																					25%	
	Handling / Warehouse / Storage		5	55		2/28/12	3/6/2012														24							50%	2, 4, 10
TOTALS									\$10	\$0	\$0	\$0	\$0	\$0	249	612				269	148								
TOTAL Preliminary Cost Estimate (\$K)									\$12	\$0	\$0	\$0	\$0	\$0	\$44	\$73				\$41	\$13								

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 Job Manager: M. Smith

Estimate (user input)

USER INPUT TASKS AND DESCRIPTIONS			SCHEDULE		Estimate (user input)														Contingency %	Category									
			USER INPUT		Calculated		FY10\$K							HOURS															
task	TASK DESCRIPTION	Responsible	DURATION in WORK DAYS	Logical Pre-requisites (one task numbers in each column, any order)	User Input Start Date (optional)	START DATE	FINISH DATE	actual= A	M&S (41)	CREDIT CARD (43)	OTHER (39)	TRAVEL (35)	OVERTIME (31)	EA* EM (analysis engr)	EA* SB (Designer)	EC** EM (computing Engr)	EC** SB (Computing Tech)	EE* EM (Eltar Engr)	EE*TB (Eltar Tech)	EM** EM (FORM Engr)	EM**TB (FOAM Tech)	FC** AM (PAC Office)	LP** TB (HP Tech)	RM** RM (Researcher)	Other	Other	Other		
1																													
2	1220 Misc																												
3	Preliminary Design Activities		77			5/1/10	5/1/10 8/16/2010																						
5	Revise FMEA		5			5/24/10	5/24/10 5/31/2010													8								25%	2, 4
6	Revise SRD		5	5			7/30/10 8/6/2010													24								33%	2, 4
7	Project Oversight		77			5/1/10	5/1/10 8/16/2010													231								25%	2, 4, 9
8	Update Cost & Schedule		2			6/14/10	6/14/10 6/16/2010													24								33%	2, 4
9	Prep for PDR		5			6/1/10	6/1/10 6/8/2010													40								20%	2, 4
10	PDR		-			6/23/10	6/23/10 6/23/2010																					20%	2, 4
11	Disposition of PDR CHITS		30	10			7/30/10 9/10/2010													40								50%	2, 4
12	DOE CD-2 (Lehman) Review																												
13	Prep for Review		5			8/4/10	8/4/10 8/11/2010													40								20%	2, 4
14	Review		-	13			8/11/10 8/11/2010																					0%	
15	Final Design Activities		162			8/17/10	8/17/10 3/31/2011																						
16	Project Oversight		162			8/17/10	8/17/10 3/31/2011													324								50%	2, 4, 9
17	Preliminary Design Accepted: Design Requirements Frozen		-			8/31/10	8/31/10 8/31/2010																					10%	
18	Update Cost & Schedule		2			3/22/11	3/22/11 3/24/2011													24								33%	2, 4
19	Prep for FDR		5	18			3/24/11 3/31/2011													40								20%	2, 4
20	FDR		-	19			3/31/11 3/31/2011																					12%	
22	Laboratory Misc / Admin: meetings, training, safety, etc.		217			6/1/10	6/1/10 3/31/2011													22								10%	2, 4, 9
22	Item 22: Non project related activity, but personnel not available for project effort, for example: safety training.																												
TOTALS									\$0	\$0	\$0	\$0	\$0	22						224									
TOTAL Preliminary Cost Estimate (\$K)									\$0	\$0	\$0	\$0	\$0	\$3	\$0	\$0	\$0	\$0	\$0	\$139	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0

	assy	sub assy	description	contents	part	DWG		cad	dwg
1201									
tf	1	1	TF coils/clamps/links	TF coils		1			
		1	spring assembly	Spring	3	2			
				clamp around TF	2	2			
		1	link weldment	links	6	3			
				rods end	1				
				bolts	7				
				sp washer	1				
		1	tf rings	insulators	3	3			
				links plates	1	1			
	1		main						
	2	1	bumper		1	1			
total	4	5			25	13		34	13
1202									
PF2	1	1		pf2 mod	1	1			
total	1	1			1	1		3	1
1203									
total	1				1	2		2	2
1204									
PF4/5 leads									
radial support	1		radial clamp		5	3			
total	1	0			5	3		6	3
1205									
Umbrella(U & L)		2	ring/gusset weldment		4	3			
lids				existing sliding	3	3			
feet		2	umbrella assy			2			
rings			upper lids		2	2			
			interface		2	2			
			lower spokes		2	2			
	1		umbrella to vessel						
total	1	4			13	14		18	14
1206									
Pedestal		1	upper pestal weldment		4	1			
		1	lower pedetal		5	1			
			plate		1	1			
			shims						
	1		pedestal assy			1			
			interface		3	3			
		1	plate/grout		2	1			
total	1	3			15	8		19	8
1207									
Leg clamp	1		assy						
			clamps		1	1			
			drill anchor holes		1	1			
total	1				2	2		3	2
1208									
pf4/5	1		pf4/5 to vessel			1			
	1	2	clamp support	clamps	8	3			
			shims to old suport	shims	4	2			
		2	shim assy		6	8			
		2		clamps weldment	6	2			
		1		column weldment	3	1			
				clamp plate	1	1			
		1	radial clamps		3	4			
	1		pf4/5 assy			1			
total	3	8			31	23		42	23

Key:
 Preliminary Design = PD, Final Design = FD, Final Design Review = FDR,
 Computer Aided Design = CAD, Engineer = Eng,
 man-hours = mh, man-day = md = 8 mh, Project Day = pd = 1 md
 Project Week = pw = 5pd, man-month = mm,
 man-year = my = 1776 mh (includes vac, sick, etc)

Basis Notes for Estimates: CAD Models & Drawings

Detail CAD Designer mh @ 3mh/FD model, Eng @ (0.3 to 0.5)*(total Designer mh)
 Update FD drawings: Designer @ 6 mh/drawing, Eng @ (0.75mh)/drawing

Basis Notes for Estimates: tab 1201

Valid QA: approx 24 sets of assembled outer links (heavy parts)
 from Receipt of parts to parts ready approx 16 weeks.
 Check Tech: estimate 2 mh per part.
 Eng: 2 mh for discussion prior, .25 mh per part, 1 mn admin

Handling & Storage: 24 sets of assembled outer links (heavy parts)
 estimate 2 men, 2mh/rw for each part occurring over approx 17 weeks.

Basis Notes for Estimates: tab 1204

Since design is pending analysis, actual design and components is not known.
 Estimate for assembly (Task 54) based on 2 men for 2 weeks.

Basis Notes for Estimates: tab 1205

Basis Notes for Estimates: tab 1220

For PD efforts:
 Eng project management @ 3 mh/pd for various activities.

For FD efforts:

Basis Notes for Estimates: tab 1206

QA: Pedestal components, approx 3 main heavy parts.
 Tech: estimate 2 mh per part, but min 8 hr.
 Eng: 2 mh for discussion prior, .25 mh per part, 1 mn admin

Handling & Storage: Pedestal components, approx 3 main heavy parts.
 estimate 2 men, 2mh/very move each part.
 From start of QA effort to parts ready for installation approx 16 weeks total.
 Estimate 3 moves.

Basis Notes for Estimates: tab 1208

QA: approx 6 sets of assembled parts.
 from Receipt of parts to parts ready approx 16 weeks.
 Tech: estimate 2 mh per part.
 Eng: 2 mh for discussion prior, .25 mh per part, 1 mn admin

Handling & Storage: approx 6 sets of assembled parts (heavy parts).
 estimate 2 men, 2 mh/rw for each part occurring over approx 17 weeks.

Basis Notes for Contingency

NOTE: Main milestones (i.e. PDR) "schedule" contingency accounts for (cumulative) all associated sub tasks.

Also, contingency % for milestones reflects schedule concerns, when manpower is included in a task, % reflects man power concerns.

Milestone Durations

PD Duration 5/1/10 to 8/16/10	77 md
5/1/10 to 6/23	39 md
PDR 6/23/10 to 8/15/10	38 md
FD Duration 8/17/10 to 3/31/11	162 md
Drawings for Validation 8/17 to 11/15	64 md
11/16/10 to 2/15/11	65 md
Received Materials/Parts 4/27/11 - 1/1/12	178 md
Received to Ready Install 1/1/12 - 5/1/12	approx 4 mm
Parts Ready Install 4/27/11 to 5/1/12	263 md

Milestone / Schedule slippage (non cumulative)

PDR:	3 mw
FDR:	4 mw
Parts Ready Install:	4 mw

Designer Models @ 50%
 Designer Drawings @ 50%
 Analyst: 8 hrs per week = 20%
 Engineer 4 hrs per week = 10%
 Tech @ 50%

Normalized when efforts are combined.

Procurement Activities

Eng @ 10-50% task dependent.

Basis Notes for Estimates: Procurement Activities

Eval quotes: 1d/quote
 Tech Eval: 1 day vendor

Vendor oversight -
 TF 1 week
 PF4/5 1 week
 Umbr U/L 0.5 wk,
 remaining items 1 wk