

Work Authorization Document

NSTX Upgrade Project

Control Account #:	2490	Title:	NTC Equipt Relocations
WBS	1.2.4	Title:	NB Injection

Period of Performance: 23 February 2009 through 16 June 2014

Authorized Budget:	\$3,618	Control Account Manager: Perry
Revision #:	0	Revision Date: July-11

Authorized Work Description:

This WBS element covers moving of racks and diagnostics to clear space in the NSTX Test Cell (NTC) for the second Neutral Beamline. Racks to be removed and re-installed in a new location are #419, 431-435, 440-445, 447-449, 488. Racks 456 and 489 will be removed and excess. This scope also includes the fabrication and installation of five sections of platform at elevation 118' on the west side of the NTC to accommodate the racks being re-installed in the NTC. Racks #441-445 will be relocated to the Gallery east of the NTC. Diagnostics to be removed are those from the midplanes of Bay J and Bay K as well as those on the present pump duct. The diagnostics from Bay J will be re-installed ~5" outboard of their present position. IR windows and the Transmission Grating Spectrometer will be relocated to the new NB duct. Ion gages, filaments and the RGA will be relocated to the new pump duct under the NB2 duct. SPRED and LOWEUS will be relocated to Bay L. The Thomson Scattering Beam Dump Window will be relocated to between Bays K and L.

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	Perry		
Functional Manager	L. Dudek		

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
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NSTX Upgrade Project

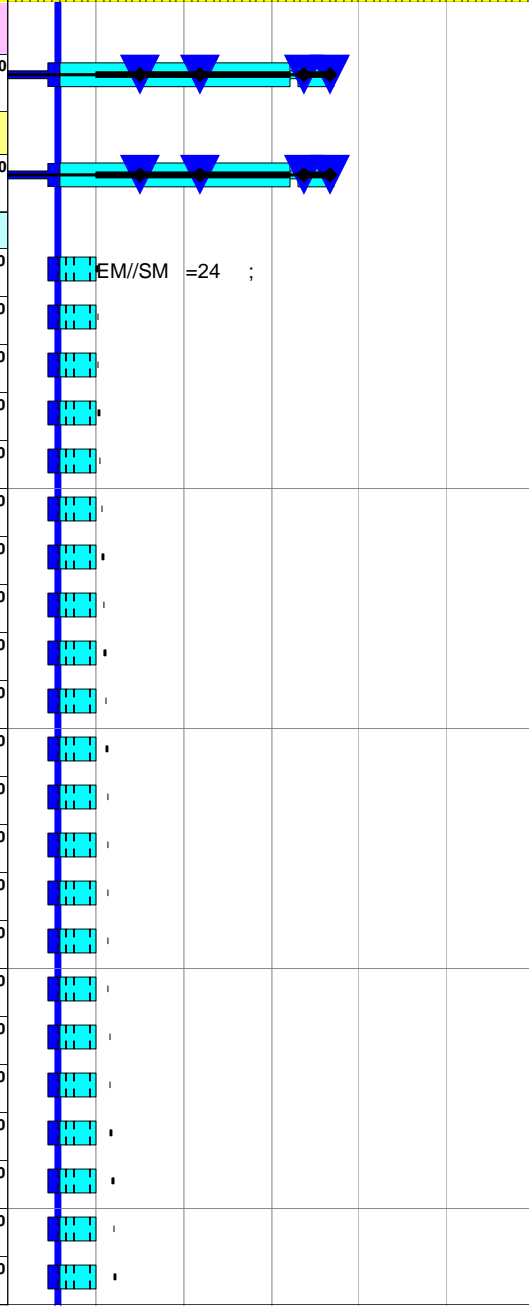
Subtotal		1,327	23FEB09A	23FEB09A	16JUN14	16JUN14	0	74	3,606,279.99		344,666.16	278,206.00						
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Job: 2490 - NTC Eqipt Relocations-PERRY

Subtotal		1,327	23FEB09A	23FEB09A	16JUN14	16JUN14	0	74	3,606,279.99		344,666.16	278,206.00						
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Removal Procedures

24910010	Prep procd rack 419 removal - UCLA Reflectometer	142*	03OCT11*	14MAR11A	05OCT11	30SEP11	3	283	3,777.12	50	2,070.96	0.00						
24910160	Prep procedure rack 440 removal-SPRED & VIPS	142*	06OCT11	14MAR11A	10OCT11	30SEP11	6	283	3,777.12	50	2,070.96	0.00						
24910210	Prep procedure rack 441-445 removal-VV ion gages	142*	11OCT11	14MAR11A	13OCT11	30SEP11	9	283	3,777.12	50	2,070.96	0.00						
24910260	Prep procedure rack 447-448 removal-Fiber Optics	142*	14OCT11	14MAR11A	18OCT11	30SEP11	12	283	3,777.12	50	2,070.96	0.00						
24910310	Prep procedure rack 449 removal - Glow Discharge	142*	19OCT11	14MAR11A	21OCT11	30SEP11	15	283	3,777.12	50	2,070.96	0.00						
24910360	Prep procd rack 456 removal-Xray Crystal Spectr	142*	24OCT11	14MAR11A	26OCT11	30SEP11	18	283	3,777.12	50	2,070.96	0.00						
24910380	Prp procd rack 488 remv-Dep monitr/fast xray/NPA	142*	27OCT11	14MAR11A	31OCT11	30SEP11	21	283	3,777.12	50	2,070.96	0.00						
24910430	Prep procedure rack 489 removal - NPA	142*	01NOV11	14MAR11A	03NOV11	30SEP11	24	283	3,777.12	50	2,070.96	0.00						
24910450	Prep procedure rack removal - PSI Camera	142*	04NOV11	14MAR11A	08NOV11	30SEP11	27	283	3,777.12	50	2,070.96	0.00						
24910500	Prp procd rack removal -Ultra Fast X-ray Camera	142*	09NOV11	14MAR11A	11NOV11	30SEP11	30	283	3,777.12	50	2,070.96	0.00						
24910550	Prep procd rack removal-Transmsn Grating Spectro	142*	14NOV11	14MAR11A	16NOV11	30SEP11	33	283	3,777.12	50	2,070.96	0.00						
24910700	Prp procd equipt removal Bay J-Two gas injectors	142*	17NOV11	14MAR11A	17NOV11	30SEP11	34	283	1,265.68	50	693.96	0.00						
24910750	Prep procd equipment removal Bay J - Reflectometer	142*	18NOV11	14MAR11A	18NOV11	30SEP11	35	283	1,265.68	50	693.96	0.00						
24910800	Prep procdur equipment removal Bay J - Bolometer	142*	21NOV11	14MAR11A	21NOV11	30SEP11	36	283	1,265.68	50	693.96	0.00						
24910850	Prep procdur equipment removal Bay J - RF Prove	142*	22NOV11	14MAR11A	22NOV11	30SEP11	37	283	1,265.68	50	693.96	0.00						
24910900	Prep procedure equipment removal Bay J - S-Flip	142*	23NOV11	14MAR11A	23NOV11	30SEP11	38	283	1,265.68	50	693.96	0.00						
24910950	Prep procedure equipment removal Bay J - SSNPA	142*	28NOV11	14MAR11A	28NOV11	30SEP11	39	283	1,265.68	50	693.96	0.00						
24911000	Prp procd equipt removal Bay J-Re-entrant Window	142*	29NOV11	14MAR11A	29NOV11	30SEP11	40	283	1,265.68	50	693.96	0.00						
24911050	Prp procd equipt removal Bay K-High K Scattering	142*	30NOV11	14MAR11A	06DEC11	30SEP11	45	283	6,328.40	50	3,469.80	0.00						
24911070	Prep procdur equipment removal Bay K - FireTips	142*	07DEC11	14MAR11A	13DEC11	30SEP11	50	283	6,328.40	50	3,469.80	0.00						
24911090	Prep procdur equipment removal Bay K - PSI Camera	142*	14DEC11	14MAR11A	16DEC11	30SEP11	53	283	3,797.04	50	2,081.88	0.00						
24911110	Prp procedure equipment removal Bay K - NPA	142*	19DEC11	14MAR11A	23DEC11	30SEP11	58	283	6,328.40	50	3,469.80	0.00						



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NSTX UPGRADES
 RESOURCE LOADED SCHEDULE
 CD-2 Schedule
 April 2011

Sheet 1 of 7

- Early Bar
- Progress Bar
- Critical Activity

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		
24911130	Prp procd equipt remov Bay K-Ultra Fast Xray Cam	142*	03JAN12	14MAR11A	03JAN12	30SEP11	59	283	1,265.68	50	693.96	0.00								
24911150	Prp procd equipt removal Bay K-IR Window f/Camra	142*	04JAN12	14MAR11A	04JAN12	30SEP11	60	283	1,265.68	50	693.96	0.00								
24911200	Prp procd equip removal Bay K-Trans Grating Spec	142*	05JAN12	14MAR11A	05JAN12	30SEP11	61	283	1,265.68	50	693.96	0.00								
24911250	Prep procd EQ remval Bay L pmp duct-VV Ion Gages	142*	06JAN12	14MAR11A	09JAN12	30SEP11	63	283	2,531.36	50	1,387.92	0.00								
24911300	Prp procd EQ rem BayL pmp duct-X-ray Crystal Spe	142*	10JAN12	14MAR11A	10JAN12	30SEP11	64	283	1,265.68	50	693.96	0.00								
24911320	Prep procedu equip removal Bay L pump duct-SPRED	142*	11JAN12	14MAR11A	11JAN12	30SEP11	65	283	1,265.68	50	693.96	0.00								
24911390	Prep procedure equip removal Bay L pump duct-RGA	142*	12JAN12	14MAR11A	13JAN12	30SEP11	67	283	2,531.36	50	1,387.92	0.00								
24911460	Prep procedu equip removal Bay L pump duct-LOWEUS	142*	16JAN12	14MAR11A	16JAN12	30SEP11	68	283	1,265.68	50	693.96	0.00								
24911630	Prp procd EQ remov Bay L pmp duct-MPTS Beam Dump	142*	17JAN12	14MAR11A	17JAN12	30SEP11	69	283	1,265.68	50	693.96	0.00								
24911642	Prp procd EQ remov Bay L pmp duct-Pump Duct	142*	18JAN12	14MAR11A	23JAN12	30SEP11	73	283	1,265.68	50	693.96	0.00								
24911750	Prep procedur Power/Ground/Light @ Platform W NTC	142*	24JAN12	14MAR11A	30JAN12	30SEP11	78	283	6,255.44	50	3,429.92	0.00								
24911820	Prp procd EQ Remov Misc. - Gas Delivery System	142*	31JAN12	14MAR11A	31JAN12	30SEP11	79	283	1,265.68	50	693.96	0.00								
24911840	Prp procd EQ Remov Misc. - NW Sect 109' Platform	142*	01FEB12	14MAR11A	02FEB12	30SEP11	81	283	2,531.36	50	1,387.92	0.00								
24911860	Prp procd EQ Remov Misc. - Convenience Outlets	142*	03FEB12	14MAR11A	09FEB12	30SEP11	86	283	6,328.40	50	3,469.80	0.00								
24911880	Prp procd EQ Remov Misc. - Cat 3 & Cat 4 Bus	142*	10FEB12	14MAR11A	16FEB12	30SEP11	91	283	6,328.40	50	3,469.80	0.00								
24911900	Prp procd EQ Remv Misc-Lights/E-stops/Fire Alarm	142*	17FEB12	14MAR11A	24FEB12	30SEP11	97	283	7,594.08	50	4,163.76	0.00								
24911920	Prp procd EQ Rem Misc-Glow Disch Splice Box/Disc	142*	27FEB12	14MAR11A	28FEB12	30SEP11	99	283	2,531.36	50	1,387.92	0.00								
Removals																				
24910019	BEGIN DIAG REMOVALS	0			02APR12*	02APR12*	0	160	0.00		0.00	0.00								
24910020	Remove rack 419 - UCLA Reflectometer	4	03APR12	03APR12	06APR12	06APR12	0	160	8,472.20		0.00	0.00								
24910170	Remove rack 440 - SPRED and VIPS	8	09APR12	09APR12	18APR12	18APR12	0	160	14,639.60		0.00	0.00								
24910220	Remove rack 441-445 - VV ion gages, RGA	15	19APR12	19APR12	09MAY12	09MAY12	0	160	31,761.16		0.00	0.00								
24910270	Remove rack 447-448 - Fiber Optics	5	10MAY12	10MAY12	16MAY12	16MAY12	0	160	11,593.48		0.00	0.00								
24910320	Remove rack 449 - Glow Discharge	10	17MAY12	17MAY12	31MAY12	31MAY12	0	160	21,677.32		0.00	0.00								
24910370	Remove rack 456 --Xray Crystal Spectr	7	01JUN12	01JUN12	11JUN12	11JUN12	0	160	15,074.76		0.00	0.00								
24910390	Remove rack 488 - Depositn monitor/fast xray/NPA	7	12JUN12	12JUN12	20JUN12	20JUN12	0	160	15,074.76		0.00	0.00								
24910440	Remove rack 489 - NPA	10	21JUN12	21JUN12	05JUL12	05JUL12	0	160	21,677.32		0.00	0.00								
24910460	Remove rack - PSI Camera	2	06JUL12	06JUL12	09JUL12	09JUL12	0	160	4,990.92		0.00	0.00								
24910510	Remove rack - Ultra Fast X-ray Camera	2	10JUL12	10JUL12	11JUL12	11JUL12	0	160	4,990.92		0.00	0.00								
24910560	Remove rack - Transmission Grating Spectrometer	3	12JUL12	12JUL12	16JUL12	16JUL12	0	160	6,731.56		0.00	0.00								
24910690	Moving equipment In & Out of NTC	6	17JUL12	17JUL12	24JUL12	24JUL12	0	160	13,205.12		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)	Fiscal Year																
													FY11	FY12	FY13	FY14	FY15	FY16											
24910710	Remove Bay J - Two gas injectors	1	25JUL12	25JUL12	25JUL12	25JUL12	0	160	1,869.64		0.00	0.00																	
24910760	Remove Bay J - Reflectomer	1	26JUL12	26JUL12	26JUL12	26JUL12	0	160	1,869.64		0.00	0.00																	
24910810	Remove Bay J - Bolometer	1	27JUL12	27JUL12	27JUL12	27JUL12	0	160	1,869.64		0.00	0.00																	
24910860	Remove Bay J - RF Prove	1	30JUL12	30JUL12	30JUL12	30JUL12	0	160	1,869.64		0.00	0.00																	
24910910	Remove Bay J - S-Flip	1	31JUL12	31JUL12	31JUL12	31JUL12	0	160	1,869.64		0.00	0.00																	
24910960	Remove Bay J - SSNPA	1	01AUG12	01AUG12	01AUG12	01AUG12	0	160	999.32		0.00	0.00																	
24911010	Remove Bay J - Re-entrant Window	1	02AUG12	02AUG12	02AUG12	02AUG12	0	160	999.32		0.00	0.00																	
24911060	Remove Bay K - High K Scattering	10	03AUG12	03AUG12	16AUG12	16AUG12	0	160	34,941.80		0.00	0.00																	
24911080	Remove Bay K - FireTips	5	17AUG12	17AUG12	23AUG12	23AUG12	0	160	17,535.40		0.00	0.00																	
24911100	Remove Bay K - PSI Camera	4	24AUG12	24AUG12	29AUG12	29AUG12	0	160	14,054.12		0.00	0.00																	
24911120	Remove Bay K - NPA	10	30AUG12	30AUG12	13SEP12	13SEP12	0	160	34,941.80		0.00	0.00																	
24911140	Remove Bay K - Ultra Fast X-ray Camera	1	14SEP12	14SEP12	14SEP12	14SEP12	0	160	999.32		0.00	0.00																	
24911160	Remove Bay K - IR Window for Camera	1	17SEP12	17SEP12	17SEP12	17SEP12	0	160	999.32		0.00	0.00																	
24911210	Remove Bay K - Transmission Grating Spectrometer	1	18SEP12	18SEP12	18SEP12	18SEP12	0	160	999.32		0.00	0.00																	
24911260	Remove Bay Bay L pump duct-VV Ion Gages/Filament	2	19SEP12*	19SEP12*	20SEP12	20SEP12	0	160	3,610.28		0.00	0.00																	
24911310	Remove Bay Bay L pump duct--X-ray Crystal Spectr	1	21SEP12	21SEP12	21SEP12	21SEP12	0	160	2,739.96		0.00	0.00																	
24911330	Remove Bay L pump duct-SPRED	1	24SEP12	24SEP12	24SEP12	24SEP12	0	160	1,869.64		0.00	0.00																	
24911400	Remove Bay L pump duct-RGA	3	25SEP12	25SEP12	27SEP12	27SEP12	0	160	5,350.92		0.00	0.00																	
24911470	Remove Bay L pump duct - LOWEUS	3	28SEP12	28SEP12	02OCT12	02OCT12	0	160	1,896.07		0.00	0.00																	
24911640	Remove Bay L pump duct-MPTS Beam Dump Window	1	03OCT12	03OCT12	03OCT12	03OCT12	0	160	1,020.64		0.00	0.00																	
24911646	Remove Bay L pump duct-Pump Duct	1	04OCT12	04OCT12	04OCT12	04OCT12	0	160	17,307.52		0.00	0.00																	
24911830	Remove Misc. EQ. - Gas Delivery System	4	05OCT12	05OCT12	10OCT12	10OCT12	0	160	18,363.52		0.00	0.00																	
24911850	Remove Misc. EQ - NW Sect 109' Platform	6	11OCT12	11OCT12	18OCT12	18OCT12	0	160	33,485.28		0.00	0.00																	
24911870	Remove Misc. EQ - Convenience Outlets	10	19OCT12	19OCT12	01NOV12	01NOV12	0	160	23,330.72		0.00	0.00																	
24911890	Remove Misc. EQ - Cat 3 & Cat 4 Bus	5	02NOV12	02NOV12	08NOV12	08NOV12	0	160	14,351.68		0.00	0.00																	
24911910	Remove Misc. EQ-Lights/E-stops/Fire Alarm	13	09NOV12	09NOV12	29NOV12	29NOV12	0	160	32,715.20		0.00	0.00																	
24911930	Remove Misc. EQ-Glow Disch Splice Box/Disc	2	30NOV12	30NOV12	03DEC12	03DEC12	0	160	6,287.20		0.00	0.00																	
24919999	REMOVALS COMPLETE	0			03DEC12	03DEC12	0	160	0.00		0.00	0.00																	
Design, Procurement & Fabr of Re-installations																													
24910030	Dsgn rack 419 re-installation - UCLA Reflectomer	17	29SEP11*	29SEP11*	21OCT11	21OCT11	0	73	23,741.77		0.00	0.00																	
24910040	Prep procd rack 419 reinstalltn-UCLA Reflectomet	3	24OCT11	24OCT11	26OCT11	26OCT11	0	73	4,668.16		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
24910080	Dsgn rack 431-435 reinstallatn-VV T/C/magnetics	45	27OCT11	27OCT11	09JAN12	09JAN12	0	73	70,496.64		0.00	0.00						
24910090	Prep procd rack 431-435 reinstln-VV T/C/magnetic	5	10JAN12	10JAN12	16JAN12	16JAN12	0	73	6,859.84		0.00	0.00						
24910180	Design rack 440 re-installation - SPRED	13	17JAN12	17JAN12	02FEB12	02FEB12	0	73	19,587.20		0.00	0.00						
24910190	Prep procd rack 440 reinstallatn-SPRED	3	03FEB12	03FEB12	07FEB12	07FEB12	0	73	4,668.16		0.00	0.00						
24910230	Dsgn rack 441-445 re-installatn-VV ion gages/RGA	46	08FEB12	08FEB12	11APR12	11APR12	0	73	65,142.48		0.00	0.00						
24910240	Prep procd rack 441-445 reinstln-VV ion gage/RGA	5	12APR12	12APR12	18APR12	18APR12	0	73	6,859.84		0.00	0.00						
24910280	Design rack 447-448 re-installation-Fiber Optics	17	19APR12	19APR12	11MAY12	11MAY12	0	73	23,970.56		0.00	0.00						
24910290	Prep procd rack 447-448 re-instaltn-Fiber Optics	3	14MAY12	14MAY12	16MAY12	16MAY12	0	73	4,668.16		0.00	0.00						
24910330	Design rack 449 re-installation - Glow Discharge	45	17MAY12	17MAY12	20JUL12	20JUL12	0	73	67,916.64		0.00	0.00						
24910340	Prep procedure rack 449 reinstall-Glow Discharge	5	23JUL12	23JUL12	27JUL12	27JUL12	0	73	6,859.84		0.00	0.00						
24910400	Dsgn rack 488 instal-Dep monitr/fast xray	20	30JUL12	30JUL12	24AUG12	24AUG12	0	73	28,638.72		0.00	0.00						
24910410	Prp procd rck 488 reinst-Dep montr/fast xray	5	27AUG12	27AUG12	31AUG12	31AUG12	0	73	6,859.84		0.00	0.00						
24910470	Design rack re-installation - PSI Camera	20	04SEP12	04SEP12	01OCT12	01OCT12	0	73	28,669.56		0.00	0.00						
24910480	Prep procedure rack re-installation - PSI Camera	5	02OCT12	02OCT12	08OCT12	08OCT12	0	73	7,007.04		0.00	0.00						
24910520	Dsgn rack reinstallation-Ultra Fast X-ray Camera	20	09OCT12	09OCT12	05NOV12	05NOV12	0	73	29,255.52		0.00	0.00						
24910530	Prp procd rack reinstall-Ultra Fast X-ray Camera	5	06NOV12	06NOV12	12NOV12	12NOV12	0	73	7,007.04		0.00	0.00						
24910570	Dsgn rack reinstall- Transmissn Grating Spectrom	13	13NOV12	13NOV12	03DEC12	03DEC12	0	73	15,958.08		0.00	0.00						
24910580	Prp procd rack reinstall-Transm Grating Spectrom	3	04DEC12	04DEC12	06DEC12	06DEC12	0	73	7,409.28		0.00	0.00						
24910600	Design rack re-installation -IR Camera at Bay L	12	07DEC12	07DEC12	02JAN13	02JAN13	0	73	18,891.84		0.00	0.00						
24910610	Prep procd rack re-installatn-IR Camera at Bay L	3	03JAN13	03JAN13	07JAN13	07JAN13	0	73	4,769.28		0.00	0.00						
24910630	Design rack re-installation - IR Camera at Bay K	24	01OCT12*	01OCT12*	01NOV12	01NOV12	0	33	41,651.04		0.00	0.00						
24910640	Prep procedure rack reinstall-IR Camera at Bay K	3	02NOV12	02NOV12	06NOV12	06NOV12	0	33	4,769.28		0.00	0.00						
24910660	Dsgn rack reinstall-Reconf AC & Diagnostic Trays	45	07NOV12	07NOV12	21JAN13	21JAN13	0	33	79,945.44		0.00	0.00						
24910670	Prp procd rack reinstall-Reconf AC & Diagnt Tray	5	22JAN13	22JAN13	28JAN13	28JAN13	0	33	7,007.04		0.00	0.00						
24910730	Prep procd Equip reinstln Bay J-Two gas injectr	10	29JAN13	29JAN13	11FEB13	11FEB13	0	33	14,171.20		0.00	0.00						
24910780	Prep procd Equip reinstln Bay J-Reflectomer	5	12FEB13	12FEB13	18FEB13	18FEB13	0	33	7,085.60		0.00	0.00						
24910830	Prep procd Equip reinstln Bay J-Bolometer	5	19FEB13	19FEB13	25FEB13	25FEB13	0	33	7,085.60		0.00	0.00						
24910880	Prep procd Equip reinstln Bay J-RF Prove	5	26FEB13	26FEB13	04MAR13	04MAR13	0	33	7,085.60		0.00	0.00						
24910930	Prep procd Equip reinstln Bay J-S-Flip	5	05MAR13	05MAR13	11MAR13	11MAR13	0	33	7,085.60		0.00	0.00						
24910980	Prep procd Equip reinstln Bay J-SSNPA	5	12MAR13	12MAR13	18MAR13	18MAR13	0	33	7,085.60		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					
24911030	Prep procd Equip reinst Bay J-Re-entrant Window	5	19MAR13	19MAR13	25MAR13	25MAR13	0	33	7,085.60		0.00	0.00						
24911180	Prep procd Equip reinst NB2 Duct-IR Window f/Cam	5	26MAR13	26MAR13	01APR13	01APR13	0	33	7,085.60		0.00	0.00						
24911230	Prep procd EQ reinst NB2 Duct-Trans Grating Spect	5	02APR13	02APR13	08APR13	08APR13	0	33	7,085.60		0.00	0.00						
24911280	Prep procd EQ instal New pmp duct-VV Ion Gages	5	09APR13	09APR13	15APR13	15APR13	0	33	7,085.60		0.00	0.00						
24911340	Design Equip re-installatn Bay L - SPRED	10	16APR13	16APR13	29APR13	29APR13	0	33	18,274.40		0.00	0.00						
24911350	Prep procedure Equip re-installatn Bay L -SPRED	3	30APR13	30APR13	02MAY13	02MAY13	0	33	4,773.76		0.00	0.00						
24911360	Procure Equipment re-installatn Bay L - SPRED	1	03MAY13	03MAY13	03MAY13	03MAY13	0	185	4,057.12		0.00	0.00						
24911370	Fabrication Equipment re-installatn Bay L-SPRED	5	06MAY13	06MAY13	10MAY13	10MAY13	0	185	8,886.40		0.00	0.00						
24911410	Prelim Design New Pump Duct - RGA	10	03MAY13	03MAY13	16MAY13	16MAY13	0	33	25,360.00		0.00	0.00						
24911420	Final Design New Pump Duct - RGA	10	17MAY13	17MAY13	31MAY13	31MAY13	0	33	25,360.00		0.00	0.00						
24911430	Prep procd Equip installtn New Pump Duct -RGA	5	03JUN13	03JUN13	07JUN13	07JUN13	0	33	7,011.52		0.00	0.00						
24911440	Procure Equipment re-installatn New Pump Duct-RGA	1	10JUN13	10JUN13	10JUN13	10JUN13	0	165	11,977.12		0.00	0.00						
24911480	Design Bay L - LOWEUS	10	10JUN13	10JUN13	21JUN13	21JUN13	0	33	18,274.40		0.00	0.00						
24911490	Prep procedure Equip re-installatn Bay L-LOWEUS	3	24JUN13	24JUN13	26JUN13	26JUN13	0	33	4,773.76		0.00	0.00						
24911500	Procure Equipment re-installatn Bay L-LOWEUS	1	27JUN13	27JUN13	27JUN13	27JUN13	0	142	1,417.12		0.00	0.00						
24911510	Fabrication Equipment re-installatn Bay L-LOWEUS	10	28JUN13	28JUN13	15JUL13	15JUL13	0	142	8,886.40		0.00	0.00						
24911530	Design Bay L - IR Camera	6	27JUN13	27JUN13	08JUL13	08JUL13	0	33	15,189.12		0.00	0.00						
24911540	Prep procd Equip re-installatn Bay L- IR Camera	3	09JUL13	09JUL13	11JUL13	11JUL13	0	33	4,237.92		0.00	0.00						
24911550	Procure Equip re-installatn Bay L- IR Camera	1	12JUL13	12JUL13	12JUL13	12JUL13	0	143	2,640.00		0.00	0.00						
24911580	Design Bay L - Glow Discharge	10	12JUL13	12JUL13	25JUL13	25JUL13	0	33	18,274.40		0.00	0.00						
24911590	Prep procd EQ re-installatn Bay L-Glow Discharge	3	26JUL13	26JUL13	30JUL13	30JUL13	0	33	4,773.76		0.00	0.00						
24911600	Procure EQ re-installatn Bay L-Glow Discharge	1	31JUL13	31JUL13	31JUL13	31JUL13	0	33	4,057.12		0.00	0.00						
24911610	Fabrication EQ re-installatn Bay L-Glow Discharge	10	01AUG13	01AUG13	14AUG13	14AUG13	0	33	8,886.40		0.00	0.00						
24911700	Design 5 sections of Platform EI 118' W Side NTC	10	15AUG13	15AUG13	28AUG13	28AUG13	0	33	18,646.72		0.00	0.00						
24911710	Prep procd 5 sections of Platform EI 118' W Side	3	29AUG13	29AUG13	03SEP13	03SEP13	0	33	4,251.36		0.00	0.00						
24911720	Fab 5 sections of Platform EI 118' W Side NTC	20	04SEP13	04SEP13	01OCT13	01OCT13	0	87	53,275.36		0.00	0.00						
24911740	Fin Dsgn Power/Ground/Light @ Platform WSide NTC	20	04SEP13	04SEP13	01OCT13	01OCT13	0	33	31,946.16		0.00	0.00						
24911760	Procurements Power/Ground/Light @ Platform W NTC	1	02OCT13	02OCT13	02OCT13	02OCT13	0	86	5,400.00		0.00	0.00						
24911780	Design 42 Ckt Panel NTC/30 Ckt Panel Gallery	25	02OCT13	02OCT13	05NOV13	05NOV13	0	33	34,749.76		0.00	0.00						
24911790	Prep procd 42 Ckt Panel NTC/30 Ckt Panel Gallery	3	06NOV13	06NOV13	08NOV13	08NOV13	0	33	4,927.84		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
24911800	Procuremnt 42 Ckt Panel NTC/30 Ckt Panel Gallery	1	11NOV13	11NOV13	11NOV13	11NOV13	0	58	81,000.00		0.00	0.00						
24911940	PreI Dsgn New Pmp Duct-Tank Farm/TMB Sys/Gas Sol	10	11NOV13	11NOV13	22NOV13	22NOV13	0	33	26,219.20		0.00	0.00						
24911950	Fin Dsgn New Pmp Duct-Tank Farm/TMB Sys/Gas Sol	10	25NOV13	25NOV13	10DEC13	10DEC13	0	33	26,219.20		0.00	0.00						
24911960	Prep proc EQ Reinst New Pmp Duct-Tank Farm/TMB S	5	11DEC13	11DEC13	17DEC13	17DEC13	0	33	14,651.20		0.00	0.00						
24911970	Proc EQ Reinst New Pmp Duct-Tank Farm/TMB Sys/Ga	1	18DEC13	18DEC13	18DEC13	18DEC13	0	33	18,900.00		0.00	0.00						
Re-Installation																		
24910049	BEGIN RE-INSTALLATION OF DIAGNOSTICS	0			12FEB14	12FEB14	0	1	0.00		0.00	0.00						
24910050	re-install rack 419 - UCLA Reflectometer	6	13FEB14	13FEB14	20FEB14	20FEB14	0	1	11,294.64		0.00	0.00						
24910100	re-install rack 431-435 - VV T/C & magnetics	30	21FEB14	21FEB14	03APR14	03APR14	0	1	68,132.72		0.00	0.00						
24910200	re-install rack 440 - SPRED	8	04APR14	04APR14	15APR14	15APR14	0	1	15,805.80		0.00	0.00						
24910250	re-install rack 441-445 - VV ion gages, RGA	20	19MAR14	19MAR14	15APR14	15APR14	0	1	42,692.40		0.00	0.00						
24910300	re-install rack 447-448 - Fiber Optics	10	28APR14	16APR14	09MAY14	29APR14	8	22	14,455.80		0.00	0.00						
24910350	re-install rack 449 - Glow Discharge	15	23JAN14	23JAN14	12FEB14	12FEB14	0	35	31,611.60		0.00	0.00						
24910420	re-install rack 488-Dep monitor/fast xray	10	13FEB14	13FEB14	26FEB14	26FEB14	0	35	21,993.12		0.00	0.00						
24910490	re-install rack - PSI Camera	10	27FEB14	27FEB14	12MAR14	12MAR14	0	35	21,074.40		0.00	0.00						
24910540	re-install rack - Ultra Fast X-ray Camera	10	13MAR14	13MAR14	26MAR14	26MAR14	0	35	21,074.40		0.00	0.00						
24910590	re-install rack-Transmission Grating Spectrometr	7	27MAR14	27MAR14	04APR14	04APR14	0	35	14,752.08		0.00	0.00						
24910620	re-install rack - IR Camera at Bay L	4	07APR14	07APR14	10APR14	10APR14	0	35	8,699.76		0.00	0.00						
24910650	re-install rack - IR Camera at Bay K	15	12MAY14	30APR14	02JUN14	20MAY14	8	22	31,611.60		0.00	0.00						
24910680	re-install rack-Reconfigure AC & Diagnostic tray	30	13FEB14	13FEB14	26MAR14	26MAR14	0	20	82,417.52		0.00	0.00						
24910740	re-install Equipment Bay J - Two gas injectors	10	27MAR14	27MAR14	09APR14	09APR14	0	20	21,074.40		0.00	0.00						
24910790	re-install Equipment Bay J - Reflectomer	20	10APR14	10APR14	07MAY14	07MAY14	0	20	49,436.00		0.00	0.00						
24910840	re-install Equipment Bay J - Bolometer	20	10APR14	10APR14	07MAY14	07MAY14	0	20	49,436.00		0.00	0.00						
24910890	re-install Equipment Bay J - RF Prove	20	10APR14	10APR14	07MAY14	07MAY14	0	20	49,436.00		0.00	0.00						
24910940	re-install Equipment Bay J - S-Flip	15	17APR14	17APR14	07MAY14	07MAY14	0	20	49,436.00		0.00	0.00						
24910990	re-install Equipment Bay J - SSNPA	20	13FEB14	13FEB14	12MAR14	12MAR14	0	36	49,436.00		0.00	0.00						
24911040	re-install Equipment Bay J - Re-entrant Window	1	13MAR14	13MAR14	13MAR14	13MAR14	0	36	1,053.72		0.00	0.00						
24911190	re-install Equipment NB2 Duct-IR Window f/Camera	3	14MAR14	14MAR14	18MAR14	18MAR14	0	36	3,161.16		0.00	0.00						
24911240	reinstall Equip NB2 Duct-Transm Grating Spectro	20	19MAR14	19MAR14	15APR14	15APR14	0	36	49,436.00		0.00	0.00						
24911290	reinstall EQ New pump duct-VV Ion Gages/Filament	20	08MAY14	08MAY14	05JUN14	05JUN14	0	20	49,436.00		0.00	0.00						
24911380	re-install Bay L - SPRED	20	13FEB14	13FEB14	12MAR14	12MAR14	0	25	42,148.80		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	
24911450	Re-install New Pump Duct - RGA	20	13MAR14	13MAR14	09APR14	09APR14	0	25	42,148.80		0.00	0.00							
24911520	re-install Bay L - LOWEUS	20	13MAR14	13MAR14	09APR14	09APR14	0	25	42,148.80		0.00	0.00							
24911570	re-install Bay L - IR Camera	15	20MAR14	20MAR14	09APR14	09APR14	0	25	16,480.80		0.00	0.00							
24911620	re-install Bay L - Glow Discharge	20	10APR14	10APR14	07MAY14	07MAY14	0	25	42,148.80		0.00	0.00							
24911730	instl 5 sections of Platform EI 118' W Side NTC	5	08MAY14	08MAY14	14MAY14	14MAY14	0	25	21,912.80		0.00	0.00							
24911770	Install Power/Ground/Light @ Platform W Side NTC	10	15MAY14	15MAY14	29MAY14	29MAY14	0	25	21,074.40		0.00	0.00							
24911810	Install 42 Ckt Panel NTC/30 Ckt Panel Gallery	20	01MAY14	01MAY14	29MAY14	29MAY14	0	25	49,436.00		0.00	0.00							
24911980	Reinstall New Pmp Duct-Tank Farm/TMB Sys/Gas So	50	20MAR14	20MAR14	29MAY14	29MAY14	0	25	110,818.72		0.00	0.00							
24911999	DIAGNOSTICS RE-INSTALLED	0			29MAY14	29MAY14	0	25	0.00		0.00	0.00							
24910001	Test Cell Oversight during diag removals	169	03APR12	03APR12	30NOV12	30NOV12	0	161	158,321.15		0.00	0.00							
24910002	Test Cell Oversight during diag re-installation	87	13FEB14	13FEB14	16JUN14	16JUN14	0	74	266,711.52		0.00	0.00							
FY092490	FY09 Actual Cost	22*	23FEB09A	23FEB09A	30SEP09A	30SEP09A	0		143,025.00	100	143,025.00	143,025.00							
FY102490	FY10 Actual Cost	143	01OCT09A	01OCT09A	30APR10A	30APR10A	0		115,145.00	100	115,145.00	115,145.00							
FY102490A	FY10 Actual Cost	45	01JUN10A	01JUN10A	30JUL10A	30JUL10A	0		20,036.00	100	20,036.00	20,036.00							

2490 NTC Equipment Relocations (Perry)	31JAN2011	28FEB2011	31MAR2011	30APR2011	31MAY2011	30JUN2011	31JUL2011	31AUG2011	30SEP2011	31OCT2011	30NOV2011	31DEC2011
BCWS	0	0	0	0	0	0	0	0	3	59	57	53
CUM BCWS	278	278	278	278	278	278	278	278	281	340	397	449
BCWP	0	0	66	0	0	0	0	0	0	0	0	0
CUM BCWP	278	278	345	345	345	345	345	345	345	345	345	345
ACWP	0	0	0	0	0	0	0	0	0	0	0	0
CUM ACWP	278	278	278	278	278	278	278	278	278	278	278	278
CV	0	0	66	66	66	66	66	66	66	66	66	66
SV	.	.	66.	66.	66.	66.	66.	66.	64.	5.	-52.	-105.
CPI	1.	1.	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24
SPI	1	1	1.24	1.24	1.24	1.24	1.24	1.24	1.23	1.01	0.87	0.77

2490 NTC Equipment Relocations (Perry)	31JAN2012	29FEB2012	31MAR2012	30APR2012	31MAY2012	30JUN2012	31JUL2012	31AUG2012	30SEP2012	31OCT2012	30NOV2012	31DEC2012
BCWS	56	58	31	88	102	93	98	128	91	187	132	60
CUM BCWS	506	564	595	683	785	878	976	1,105	1,196	1,383	1,515	1,575
BCWP	0	0	0	0	0	0	0	0	0	0	0	0
CUM BCWP	345	345	345	345	345	345	345	345	345	345	345	345
ACWP	0	0	0	0	0	0	0	0	0	0	0	0
CUM ACWP	278	278	278	278	278	278	278	278	278	278	278	278
CV	66	66	66	66	66	66	66	66	66	66	66	66
SV	-161.	-219.	-250.	-338.	-440.	-533.	-632.	-760.	-851.	-1038.	-1171.	-1230.
CPI	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24
SPI	0.68	0.61	0.58	0.5	0.44	0.39	0.35	0.31	0.29	0.25	0.23	0.22

2490 NTC Equipment Relocations (Perry)	31JAN2013	28FEB2013	31MAR2013	30APR2013	31MAY2013	30JUN2013	31JUL2013	31AUG2013	30SEP2013	31OCT2013	30NOV2013	31DEC2013
BCWS	40	28	30	35	67	48	54	30	83	40	127	49
CUM BCWS	1,615	1,643	1,673	1,709	1,775	1,823	1,877	1,907	1,990	2,030	2,157	2,206
BCWP	0	0	0	0	0	0	0	0	0	0	0	0
CUM BCWP	345	345	345	345	345	345	345	345	345	345	345	345
ACWP	0	0	0	0	0	0	0	0	0	0	0	0
CUM ACWP	278	278	278	278	278	278	278	278	278	278	278	278
CV	66	66	66	66	66	66	66	66	66	66	66	66
SV	-1270.	-1299.	-1328.	-1364.	-1431.	-1479.	-1532.	-1562.	-1645.	-1685.	-1813.	-1861.
CPI	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24	1.24
SPI	0.21	0.21	0.21	0.2	0.19	0.19	0.18	0.18	0.17	0.17	0.16	0.16

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

{NBI Controls & Instrumentation (Job 2475)}

WBS Element: 1.2.4.8 **WBS Level:** 4

WBS Title: NSTX Beamline 2 Duct & vacuum Vessel Modifications

Definition: This WBS element includes the design, and fabrication of all components connecting the Neutral Beam Box to NSTX, and the connecting ductwork and modifications to NSTX Vacuum Vessel to accommodate the second beamline.

{NSTX NB2 Duct & VV Mods (Job 2480)}

WBS Element: 1.2.4.9 **WBS Level:** 4

WBS Title: NSTX Test Cell Equipment Removals/Relocations

Definition: This WBS element covers moving of racks and diagnostics to clear space in the NSTX Test Cell (NTC) for the second Neutral Beamline. Racks to be removed and re-installed in a new location are #419, 431-435, 440-445, 447-449, 488. Racks 456 and 489 will be removed and excess. This scope also includes the fabrication and installation of five sections of platform at elevation 118' on the west side of the NTC to accommodate the racks being re-installed in the NTC. Racks #441-445 will be relocated to the Gallery east of the NTC. Diagnostics to be removed are those from the midplanes of Bay J and Bay K as well as those on the present pump duct. The diagnostics from Bay J will be re-installed ~5" outboard of their present position. IR windows and the Transmission Grating Spectrometer will be relocated to the new NB duct. Ion gages, filaments and the RGA will be relocated to the new pump duct under the NB2 duct. SPRED and LOWEUS will be relocated to Bay L. The Thomson Scattering Beam Dump Window will be relocated to between Bays K and L.

{NTC Equipment Removals/Relocations (Job 2490)}

WBS Element: 1.3 **WBS Level:** 2

WBS Title: Auxiliary Systems

Definition: The auxiliary systems include all the mechanical non-torus support systems for NSTX. This WBS element includes the Vacuum Pumping System, the Coolant Systems, the Bakeout Heating System, Gas Delivery System and the Glow Discharge Cleaning System. The scope of the work contains engineering design, R&D, mockups, procurement activities, component fabrication, and System Testing. Installation of the WBS 3 systems is included in the individual WBS 3, level 3 elements.

WBS Element: 1.3.1 **WBS Level:** 3

WBS Title: Vacuum Pumping System

Definition: The Vacuum Pumping System provides the source and distribution of all vacuum pumping to NSTX. This includes the roughing pumps as well as the turbo pumps and any backing pumps to:

- Provide the initial high vacuum environment with minimum impurities for plasma formation;

Work Approval Form (WAF)

Cost Center: 9418
Job Number: 2490
Job Title: NTC Equipment Removals / Relocations
Job Manager: Eric D. Perry

Description:

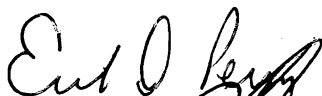
This scope covers the move of racks and diagnostics to clear space in the NSTX Test Cell for the second Neutral Beamline. Racks to be removed and re-installed in a new location are #419, 431-435, 440-445, 447-449, 488. Racks 456 and 489 will be removed and excessed. This scope also includes the fabrication and installation of five sections of platform at elevation 118' on the west side of the NTC to accommodate the racks being re-installed in the Test Cell. Racks #441-445 will be relocated to the Gallery east of the NTC. Diagnostics to be removed are those from the midplanes of Bay J and Bay K as well as those on the present pump duct. The diagnostics from Bay J will be re-installed ~5" outboard of their present position. IR windows and the Transmission Grating Spectrometer will be relocated to the new NB duct. Ion gages, filaments and the RGA will be relocated to the new pump duct under the NB2 duct. SPRED and LOWEUS will be relocated to Bay L. The Thomson Scattering Beam Dump Window will be relocated to between Bays K and L.

The scope of this job includes the vacuum vessel interfaces for any diagnostics that are relocated as well as the actual relocation of these diagnostics as they presently exist. Modifications to the diagnostics are outside the scope of the NSTX Upgrade Project.


Schedule:

Refer to Primavera Data-Base


Approvals:

 7/20/10

Job Manager

 8/3/10

Project Manager

 8/3/10

Engineering Department Head



Cost Center 9418
Job Number: 2490
Job Title: NTC Equipment Removals / Relocations
Job Manager: Eric D. Perry

Removals at	Eric D. Perry	Start	Duration days	Crew Size persons	EMEM MD	EMSM MD	EMDM MD	EMTB MD	M&S \$K	Cont.
Removal of Racks										
419	UCLA Reflectometer					3				15%
	Remove rack		4	2		1		8	0.1	15%
440	SPREAD and VIPS					3				15%
	Remove rack		8	2		2		16	0.1	15%
441 - 445	VV ion gages, RGA					3				15%
	Prepare procedure		15	2		4		30	0.1	15%
	Remove rack					3				15%
447 - 448	Fiber Optics					2				15%
	Remove rack		5	2		3		10	0.1	15%
449	Glow Discharge					3				15%
	Prepare procedure		10	2		3		20	0.1	15%
	Remove rack					3				15%
456	XCS					2				15%
	Prepare procedure		7	2		3		14	0.1	15%
	Remove rack					2				15%
488	Deposition monitor, fast x-ray, NPA					3				15%
	Prepare procedure		7	2		2		14	0.1	15%
	Remove rack					3				15%
489	NPA					3				15%
	Prepare procedure		10	2		3		20	0.1	15%
	Remove rack					3				15%
	Prepare procedure		2	2		1		4	0.1	15%
	Remove rack					3				15%
	Ultra Fast X-ray Camera					3				15%
	Prepare procedure		2	2		1		4	0.1	15%
	Remove rack					3				15%
	Transmission Grating Spectrometer					3				15%
	Prepare procedure		3	2		1		6	0.1	15%
	Remove rack									15%
Removal of Equipment										
From Bay J										
	Two Gas Injectors									15%
	Prepare procedure		1	2	1			2	0.1	15%
	Remove									15%
	Reflectometer									15%
	Prepare procedure		1	2	1			2	0.1	15%
	Remove									15%
	Bolometer									15%
	Prepare procedure		1	2	1			2	0.1	15%
	Remove									15%
	RF Probe									15%
	Prepare procedure		1	2	1			2	0.1	15%
	Remove									15%
	S-Flip									15%
	Prepare procedure		1	2	1			2	0.1	15%
	Remove									15%
	SSNPA									15%
	Prepare procedure		1	2	1			2	0.1	15%
	Remove									15%
	Re-entrant Window									15%
	Prepare procedure		1	1	1			1	0.1	15%
	Remove									15%
	Prepare procedure									15%

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Job Manager:		Eric D. Perry										

	Start	Duration days	Crew Size persons	E MEM MD	EMSM MD	EMDM MD	EMTB MD	M&S \$K	Cont.
Removals at Eric D. Perry									
		1	1				1	0.1	15%
From Bay K									
High K Scattering		10	4	5			40	0.1	15%
Fire Tips		5	4	5			20	0.1	15%
PSI Camera		4	4	3			16	0.1	15%
NPA		10	4	5			40	0.1	15%
Ultra Fast X-ray Camera		1	1	1			1	0.1	15%
IR Windows for Camera		1	1	1			1	0.1	15%
Transmission Grating Spectrometer		1	1	1			1	0.1	15%
From Bay L pump duct									
Vac Vessel Ion Gages, Filaments,									
		2	2	2			4	0.1	15%
X-ray Crystal Spectrometer		1	3	1			3	0.1	15%
SPRED		1	2	2			2	0.1	15%
RGA		3	2	2			6	0.1	15%
LOWEUS		1	2	1			2	0.1	15%
MPTS Beam Dump Window		1	1	1			1	0.1	15%
Remove Pump Duct (incl turbos)		4	4	1			16	0.2	15%
Miscellaneous Removals									
Gas Delivery Systems		4	4	1			16	1	15%
Remove NW section of 109' platform		6	4	2			24	6	15%
Convenience outlets		10	2	5			20	1	15%
Cat 2 and Cat 4 bus				5					15%

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Removals at	Eric D. Perry	Start	Duration days	Crew Size persons	EMEM MD	EMSM MD	EMDM MD	EMTB MD	M&S \$K	Cont.
	Relocate		5	2		2		10	2	15%
	Prepare procedure				6					15%
	Relocate		13	2		4		26	3	15%
	Prepare procedure				2					15%
	Relocate		2	2		1		4	1	15%
Re-installation of Racks										
	Design					6	45		16	15%
	Prepare Procedure					1	5			15%
	Install					8		60	1	15%
419	Design					2	17		2	15%
	Prepare procedure					1	3			15%
	Install					6	45	12	0.2	15%
431 - 435	Design					1	5		10	15%
	Prepare procedure					8		60	1	15%
	Install					2	13		2	15%
440	Design					1	3			15%
	Prepare procedure									15%
	Install							15	1.5	15%
441 - 445	Design					6	46		5	15%
	Prepare procedure					1	5			15%
	Install							45	1	15%
447 - 448	Design					2	17		2	15%
	Prepare procedure					1	3			15%
	Install					6	45	15	0.5	15%
449	Design					1	5		8	15%
	Prepare procedure									15%
	Install							30	3	15%
488	Design					3	20		2	15%
	Prepare procedure					1	5			15%
	Install							21	2	15%
	Design					3	20		2	15%
	Prepare procedure					1	5			15%
	Install							20	2	15%
	Design					3	20		2	15%
	Prepare procedure					1	5			15%
	Install							20	2	15%
	Design					1	5			15%
	Prepare procedure									15%
	Install							20	2	15%
	Design					1	13			15%
	Prepare procedure					1	3			15%
	Install							14	1.4	15%

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Removals at	Eric D. Perry	Start	Duration days	Crew Size persons	E MEM MD	E M S M MD	E M D M MD	E M T B MD	M & S \$K	Cont.
IR Camera at Bay L	Design					2	12		2	15%
	Prepare procedure					1	3			15%
	Install							8	1	15%
IR Camera at Bay K	Design					3	24		8	15%
	Prepare procedure					1	3			15%
	Install							30	3	15%
Moving Equipment In and Out of NTC						2		12		15%
Re-install Equipment										
Bay J										
Two Gas Injectors	Prepare procedure		10	2	10					15%
	Install							20	2	15%
Reflectometer	Prepare procedure				5					15%
	Install		20	2		5		40	4	15%
Bolometer	Prepare procedure				5					15%
	Install		20	2		5		40	4	15%
RF Probe	Prepare procedure				5					15%
	Install		20	2		5		40	4	15%
S-Flip	Prepare procedure				5					15%
	Install		20	2		5		40	4	15%
SSNPA	Prepare procedure				5					15%
	Install		20	2		5		40	4	15%
Re-entrant Window	Prepare procedure				5					15%
	Install		1	1				1	0.1	15%
NB2 Duct										
	Prepare procedure				5					15%
	Install		3	1				3	0.3	15%
Transmission Grating Spectrometer	Prepare procedure				5					15%
	Install		20	2		5		40	4	15%
New Pump Duct										
<i>NOTE: Installation of new pump duc, turbos and lines to roughing pumps is covered in NB duct job</i>										
Vac Vessel Ion Gages, Filaments,	Prepare procedure				5					15%
	Install		20	2		5		40	4	15%
RGA	Preliminary Design				10					15%
	Final Design				10					15%
	Prepare procedure				1					15%
	Procurements				1				8	15%

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Removals at	Start	Duration days	Crew Size persons	EEM MD	EMSM MD	EMDM MD	EMTB MD	M&S \$K	Cont.
Tank farm, TMB system, Gas solenoid box & disconnects		20	2	20			40	4	15%
				20					15%
				10				14	15%
		50	2		13		100		15%
SPRED				5		10			15%
				1		3			15%
				1			10	2	15%
		20	2				40	4	15%
LOWEUS				5		10			15%
				1		3			15%
				1			10		15%
		20	2				40	4	15%
IR Camera at L					6	6			15%
					3				15%
							15	2	15%
Glow Discharge				5		10			15%
				1		3			15%
				1			10	2	15%
							40	4	15%
Between Bays K and L									
MPTS Beam Dump Window				4		6			15%
				2			10	4	15%
		1	2				2	1	15%
Fab and Install Five Sections of Platform at EL 118 on West Side of NTC									
				10		4			15%
				3			40	8	15%
				5			10	4	15%
				5					15%

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Removals and Eric D. Perry		Start	Duration days	Crew Size persons	EMEM MD	EMSM MD	EMDM MD	EMTB MD	M&S \$K	Cont.					
Platform Power (receipt), grounding and lighting															
Final Design						3	20		4	15%					
Prepare procedure						1	5			15%					
Procurements									4	15%					
Install								20	2	15%					
Install New 42 Ckt Panel in NTC and 30 Ckt Panel in Gallery															
Design						4	25			15%					
Prepare procedure						1	3			15%					
Procurements									60	15%					
Install						5		40	4	15%					
Health Physics Coverage		1 HP Tech per shift of EMTB => 376 MD put into HP job "7400 WAF"													
Test Cell Oversight/Coordination		1 EMSM per shift of EMTB => 376 MD													
TOTAL				EMSM	235	219	523	1504	267.3						
				376	1880	1752	4184	12032	267300						
FY10 Rate/hour				\$148.87	\$149.15	\$148.87	\$115.61	\$89.20	1.178						
Cost				\$447,801	\$280,402	\$260,820	\$483,712	\$1,073,254	\$314,879						
Sum									\$2,860,869						

Design Complexity		Design Maturity		Design Maturity Definition			
Low	Medium	High	High				
Low	-15%	+25%	-20%	+40%	-30%	+60%	Final design available. All design features/requirements well known. No further design development or evolution expected that will impact estimate.
Medium	-10%	+15%	-15%	+25%	-20%	+40%	Preliminary design available. Some additional design evolution likely. Further developments can be somewhat expected or anticipated and reflected in estimate.
High	-5%	+10%	-10%	+15%	-15%	+25%	No better than conceptual design basis currently available. Design details, procedures, etc. still need much development and evolution of requirements beyond estimate basis is likely and expected.
Design Complexity		Design Maturity		Design Complexity Definition			
Low	Medium	High	Low				
			Low			Work is fairly well understood -- either standard construction or repetition of activities performed in past. Little likelihood of estimate not being well understood and requirements not being well defined.	
			Medium			More complex work requirements that have potential to impact cost and schedule estimates. Limited experience performing similar tasks, so ability to estimate accurately is somewhat suspect	
			High			Extremely challenging tasks and/or requirements. Unique or first-of-a-kind assembly or work tasks. No good basis for estimating work exists so there is a high degree of estimate uncertainty. Based on standard industry and DOE estimate classifications (Per AACEI Recommended	

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Materials and Subcontracts (M&S)			Basis of Estimate	
Description:				
	CATEGORIZATION CODES: 1 - National Standards 2 - Engineering Judgement/Experience 3 - Estimates/Data from External Sources (e.g., W7X, ATF, etc.) 4 - Previous PPPL/ORNL Experience (e.g., TFTR, NSTX, PLT, etc.) 5 - Prototype Data/Test Results 6 - Catalogue Price/Vendor Quote 7 - Placed Contracts 8 - Actual experience for NCSX Work 9 - Other			
TOTALS				