

NCSX Work Approval Form (WAF)

WBS Number: 75

WBS Title: Machine Assembly Operations

Job Numbers: 7501 and 7503

Job Title: Construction Crew Support (7501)

Job Title: Machine Assembly Operations (7503)

Job Manager: Erik Perry

Description:

This WBS element consists of those activities associated with the final assembly of the stellarator core in the NCSX Test Cell

Schedule:

See Attached

Approvals:

Job Manager

Date

Responsible Line Manager

Date

Project Manager

Date

Engineering Department Head

Date

NCSX June 2007 ETC
TABLE II - Materials and Subcontracts

Materials and Subcontracts (M&S)							
Description:						Basis of Estimate	
This is an assembly operation - M&S included in Table III							

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TABLE III - Fabrication/Assembly Installation

WBS Number: 75													
WBS Title: Machine Assembly Operations													
Job Numbers: 7501 and 7503													
Job Title: Construction Crew Support (7501)													
Job Title: Machine Assembly Operations (7503)													
Job Manager: Erik Perry													
In-house Fabrication and Assembly and Installation													
Job 7501 - Construction Support Crew													
		K\$			Hours				Duration	Persons		Basis of Estimate	
Description of Task	ACT	M&S	Travel	EAEM	Metrology	EMEM	EMSM	EMTB	in Shifts	per Shift	Assumptions	Note: final designs not yet available - estimates based on conceptual information from others	
LOE Construction Support Crew during machine assy	7501-05						.75 fte	2.0 fte		2.75	crane/fork lift operator 1.0 fte, rigger 1.0 fte, tool crib .75 fte (applies to 2 nd shift also if used)	NSTX assembly	
Total Job 7501		\$0K		0	0	0	0	0					
Job 7503 - Construction Support Crew													
		K\$			Hours				Duration	Persons		Basis of Estimate	
Description of Task	ACT	M&S	Travel	EAEM	Metrology	EMEM	EMSM	EMTB	in Shifts	per Shift	Assumptions	Note: final designs not yet available - estimates based on conceptual information from others	
Assembly of Components for Others													
Fabricate assembly structure		\$80K				96	240	960	20	6	1,376	Design by WBS 1803	
Fabricate structure to go between assembly sleds & FPAs		\$80K				96	240	960			1,376	EWDA - same magnitude as assembly sleds is assumed	
Assemble 3 FPA support stands						48	120	480	15	4	648		
Assemble 3 VV spool piece support stands						32	80	320	10	4	432		
Assemble machine base structure						32	80	320	10	4	432		
Assemble 3 FPA installation carts						32	80	320	10	4	432		
Fabricate 3 laser support poles		\$24K						480	30	2	504		
Fabricate 3 concrete blocks for testing of assembly structure with metrology		\$18K				20		192	12	2	230	Req'd for concrete block on assembly structure test T. Brown requirement	
Exercise assembly structure with concrete block and metrology before start of assembly						80	320	640	40		1,040	T. Brown requirement	
Install test cell metrology site monuments and check them					640	64	160		20	4	864	T. Brown requirement - re-doing what is done for station 5 work	
Test test cell floor deflections with concrete block placed at FPA support positions					120	48	120	480		15	4	768	T. Brown requirement
Exercise assembly structure with FPA-1 before start of assembly		\$0K			320	80	320	640	40		1,360	Review requested 8 weeks of trial runs/metrology	
Machine Assembly													
Install Permanent Base Plates/Columns	7503-020			60			120	480	10	6	660	TFTR and NSTX assembly	
Install temp assembly structure						72	180	720	15	6	972	TFTR and NSTX assembly	
Install Lower PF 4.5&6 into prelim position	7503-060						16	32	1	4	48	TFTR and NSTX assembly	
Install 3 Spool Pieces on fixt & test movement	7503-070			40	80		80	320	10	4	520	TFTR and NSTX assembly	
FPA-1 Installed on temp assembly sleds	7503-080										-	TFTR and NSTX assembly	
FPA-2 Installed on temp assembly sleds	7503-110										-	TFTR and NSTX assembly	
FPA-3 Installed on temp assembly sleds	7503-150										-	TFTR and NSTX assembly	
FPA-1 installation and assembly test					320	80	320	640	20		1,360	T. Brown requirement	
FPA-2 installation and assembly test					320	80	320	640	20		1,360	T. Brown requirement	
FPA-3 installation and assembly test					320	80	320	640	20		1,360	T. Brown requirement	
Test movement of FPAs & position checks.	7503-120			20	40		40	160	5	4	260	TFTR and NSTX assembly	
MC Shims		\$36K		60	32	86	216	864	18	6	1,294	shims provided by others; M&S for final sizing	
Install inboard and outboard shims											-	TFTR and NSTX assembly	
Move all FPAs together, check fitup, tack shims											-	TFTR and NSTX assembly	
Weld inboard shims on mating flanges											-	TFTR and NSTX assembly	
Install end TF coils					48		48	192	6	4	288	TFTR and NSTX assembly	
Install spacer supports and spacers							16	64	2	4	80	TFTR and NSTX assembly	
Move FPAs & spacers together & check fitup					32		48	192	6	4	272	TFTR and NSTX assembly	
Remove spacers and machine to fit								64	4	2	64	TFTR and NSTX assembly	
Re-install spacers							16	64	2	4	80	TFTR and NSTX assembly	
Position all FPA's / Spool Pieces @ MC Interface	7503-160			24	48		48	192	6	4	312	TFTR and NSTX assembly	
Install local Platforms around FPA-1	7503-090						32	128	4	4	160	TFTR and NSTX assembly	
Install local Platforms around FPA-2	7503-130						32	128	4	4	160	TFTR and NSTX assembly	

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TABLE III - Fabrication/Assembly Installation

WBS Number: 75 WBS Title: Machine Assembly Operations Job Numbers: 7501 and 7503 Job Title: Construction Crew Support (7501) Job Title: Machine Assembly Operations (7503) Job Manager: Erik Perry											
Install local Platforms around FPA-3	7503-190		0		32	128	4	4	160		TFTR and NSTX assembly
MC Interfaces: measure holes and mark bushings for eccentric drilling					24	96	3	4		Field Period Assembly will fab and install all bushings except at three MC interfaces ... at each of these 3 interfaces only 32 bushings will be fabricated during final assembly: 32 x 3 = 96 ... 1 mh to measure and mark one bushing	TFTR and NSTX assembly
MC Interfaces: drill eccentric custom holes in bushings		\$6K			24	96	3	4	120	96 bushings x 1/8 day to set up and drill each bushing with a one man crew, four crews; M&S for consumable tools at \$63 per bushing	TFTR and NSTX assembly
Measure vessel gaps to determine spool piece dimensions			288	288			18	2	126		TFTR and NSTX assembly
Spool piece installation test				320	80	320	640	20	576	T. Brown requirement	
Initial machining of spool pieces (complete one side)		\$45K			12			45	57	Spool pieces must go outside for machining	TFTR and NSTX assembly
Final machining of spool pieces		\$45K			12			45	57	Spool pieces must go outside for machining	TFTR and NSTX assembly
MC Interfaces: bolt together					29	72	288	36	6	all materials provided by others	TFTR and NSTX assembly
Retorque all super-nuts after 30 days					58	144	576	12	6	Viola requirement	
Raise permanent supports to take machine loads			180		72	180	720	15	6		1,152
Remove temporary assembly structure					24	96	2	6	120		TFTR and NSTX assembly
Install/Level FPA's and Spool Piece supports	7503-030		120	240		240	960	30	4		1,560
FPA Metrology Checks to Assure Alignment	7503-170		40	40			40	5	1		120
Mate-up and weld all VV-to-Spool interfaces	7503-200		180		240	1440	30	3		Weld time doubled to account for expected significant flange mismatch .. Can only use one welder/pedalman/safety watch at a time ... assume two shifts	TFTR and NSTX assembly
Weld on port 4's			60		180	720	30	3	960	6 ports	TFTR and NSTX assembly
Install e-beam mapping equipment				40	80	320	10	4	440	EWDA	TFTR and NSTX assembly
Install vacuum pumping system	7503-240				40	160	5	4	200		TFTR and NSTX assembly
Pumpdown & leak check VV	7503-260				120	480	15	4	600		TFTR and NSTX operations
Fit-up all TF coils	7503-210		40	200	200	800	25	4	1,240		TFTR and NSTX assembly
Install TF alignment and traction ring									-		TFTR and NSTX assembly
Pull TF coils radially inward & verify nose fir-up									-		TFTR and NSTX assembly
Lock TF coils at four support locations									-		TFTR and NSTX assembly
Install MC structure insulation boots	7503-240.1				80	320	10	4	400	EWDA	TFTR and NSTX assembly
Seal gaps in MC shims, cooling tubes, etc for insul pour					160	640	20	4	800		TFTR and NSTX assembly
Fill MC/VVSA annulus with pourable Aerogel insulation	7503-240.2				16	64	2	4	80		TFTR and NSTX assembly
Install LN2 manifolds					80	320	10	4	400	Fabrication by WBS 161; instl EWDA	TFTR and NSTX assembly
Complete Elect Pwr connections	7503-320				160	960	30	4	1,120	Provided by WBS 162; instl EWDA	TFTR and NSTX assembly
Install in-cryostat cabling for electric power to coils									-		TFTR and NSTX assembly
Connect cabling and I&C to MC and TF coils									-		TFTR and NSTX assembly
Complete mag diag & machine I&C	7503-321				160	320	10	4	480	Provided by WBS ?; instl EWDA	TFTR and NSTX assembly
Install PF Solenoid and PF 1a U/L into position	7503-290		16	32	32	128	4	4	208	All I&C in place on solenoid and PF 1a U/L mounted on support structure prior to arrival in Test Cell	TFTR and NSTX assembly
Align guide mechanism for solenoid installation									-		TFTR and NSTX assembly
Install solenoid support structure									-		TFTR and NSTX assembly
Install solenoid assembly									-		TFTR and NSTX assembly
Connect cabling, LN2 and I&C to solenoid					8	32	1	4	40		TFTR and NSTX assembly
Install PF4L					8	32	1	4	40		TFTR and NSTX assembly
Connect cabling, LN2 and I&C to PF4L					8	32	1	4	40		TFTR and NSTX assembly
Adjust spring compression in solenoid support structure					8	32	1	4	40		TFTR and NSTX assembly
Raise lower PF 5&6 coils into final position	7503-270		24		48	192	6	4	264		TFTR and NSTX assembly
Install Upper PF4, 5 & 6 coils	7503-280		24		48	192	6	4	264		TFTR and NSTX assembly
Install Cryostat Base, vapor barrier & port boots	7503-340				80	320	10	4	400		TFTR and NSTX assembly
Install elec pwr, LN2, & instr feedthrus thru cryo base					40	160	5	4	200	EWDA	TFTR and NSTX assembly
Integrated electrical testing				80	80	320	10	4	480		TFTR and NSTX operations
Install transition box, cabling and connect to power supplies					80	320	10	4	400	EWDA	TFTR and NSTX assembly

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Job Title: Machine Assembly Operations (7503)												
Job Manager: Erik Perry												
Complete LN2 connections from coils to manifolds	7503-310						80	320	10	4	400	TFTR and NSTX assembly
Connect coil and VV instrumentation							80	320	10	4	400	EWDA TFTR and NSTX assembly
Connect 150C bakeout							40	160	5	4	200	EWDA NSTX operations
<u>Prepare for and perform warm coil testing</u>											-	<u>covered in other WBS</u>
Install cryostat cooling system and instrumentation							320	1280	20	8	1,600	EWDA TFTR and NSTX assembly
Install Cryostat											-	TFTR and NSTX assembly
Install Cryostat upper section and port boots	7503-350						80	320	10	4	400	TFTR and NSTX assembly
Install Midplane Cryostat sections and port boots	7503-360						120	480	15	4	600	TFTR and NSTX assembly
Install Cryostat Circulation Duct	7503-370						40	160	5	4	200	Cryo cooling system instl in WBS 623 TFTR and NSTX assembly
PTP and Cooldown	730.8200						80	80			640	TFTR and NSTX operations
Total Job 7503												
		\$334K	-	756	3,860	1,489	7,468	26,776				

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TABLE IV - Uncertainty of Estimate and Residual Risk Assessment

WBS Number: 75														
WBS Title: Machine Assembly Operations														
Job Numbers: 7501 and 7503														
Job Title: Construction Crew Support (7501)														
Job Title: Machine Assembly Operations (7503)														
Job Manager: Erik Perry														
Uncertainty of the Estimate														
			<u>High</u>	<u>Medium</u>	<u>Low</u>	<u>Uncertainty Range (%)</u>	<u>s/Other Considerations</u>							
Job 7501														
	Design Maturity				X	-20%/+40%	Estimated without detailed drawings. Significant uncertainty that current concept will stay the same - see Residual Risks below.							
	Design Complexity			X			Follows tasks in Job 7503 - but most are LOE activities							
Job 7503														
	Design Maturity				X	-20%/+40%	Estimated without detailed drawings. Significant uncertainty that current concept will stay the same - see Residual Risks below.							
	Design Complexity			X			Experienced in assembly fusion devices, but tolerances exceed anything done before.							
	Other Comments:						Major source of uncertainty is in the machine assembly concepts which are still evolving. See Residual Risks below.							
Residual Impacts														
								Cost Impact		Schedule Impact				
Job	Risk Description					Likelihood of Occurring	Mitigation Plan		Basis of estimate		Low	High	Low	High
7501 - NONE														
7503	Additional trim coils may be required to suppress field errors from n>1 modes					U	Analysis being performed to firm up requirements		Costs could more than double the present estimate		+ \$200	+ \$400	+ 0.00	+ 0.00
	"Back office" support for FPA and final assembly becomes a chronic bottleneck, stretching out the time required to complete assembly operations					VU	Additional support budgeted for Brown, Brooks, and Ellis providing "2 deep" back office support. Should be available to mitigate peak demands once training in key skills is completed.		Estimated impact is <2 months on the critical path. Cost impact covers up to 2 months of FPA/final assembly.		+ \$0	+ \$600	+ 0.00	+ 2.00

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WBS Number: 75										
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Job Numbers: 7501 and 7503										
Job Title: Construction Crew Support (7501)										
Job Title: Machine Assembly Operations (7503)										
Job Manager: Erik Perry										
	Insulation on TF/PF coil fails during initial cooldown and testing requiring in situ repair	VU	1st of each kind will be tested at cryogenic temperature at elevated (50% higher) voltage for faults to ground. All coils will be tested at RT at elevated (50% higher) voltage for faults to ground. Ring tests are performed to reveal low resistance turn-to-turn shorts at RT.	Repair in situ is assumed recovery scenario taking 2-3 months. 1 month to warmup and cooldown the stellarator core. 3 techs/1 engr for duration of active repair)1-2 months).	+ \$50	+ \$150	+ 1.00	+ 2.00		
	Insulation on TF/PF coil fails during initial cooldown and testing requiring dismantling stellarator core	VU	1st of each kind will be tested at cryogenic temperature at elevated (50% higher) voltage for faults to ground. All coils will be tested at RT at elevated (50% higher) voltage for faults to ground. Ring tests are performed to reveal low resistance turn-to-turn shorts at RT.	<i>Crisis event not covered by contingency</i>						
	Insulation on modular coil fails during initial cooldown and testing requiring in situ repair	VU	C1 tested at full current at cryogenic tempeprature. All modular coils will be tested at RT at elevated (50% higher) voltage for faults to ground.	Repair in situ is assumed recovery scenario taking 2-3 months. 1 month to warmup and cooldown the stellarator core. 3 techs/1 engr for duration of active repair)1-2 months).	+ \$50	+ \$150	+ 1.00	+ 2.00		
	Insulation on modular coil fails during initial cooldown and testing requiring stellarator core disassembly	VU	C1 tested at full current at cryogenic tempeprature. All modular coils will be tested at RT at elevated (50% higher) voltage for faults to ground.	<i>Crisis event not covered by contingency</i>						

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TABLE IV - Uncertainty of Estimate and Residual Risk Assessment

WBS Number: 75												
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Job Numbers: 7501 and 7503												
Job Title: Construction Crew Support (7501)												
Job Title: Machine Assembly Operations (7503)												
Job Manager: Erik Perry												
	Unanticipated problems with cryostat penetrations (icing, excessive condensation). May require warming up the stellarator core to effect repair with consequent impacts to critical path activities.		U	Rapid repair materials will be on hand.	Nominally repaired with a 4-man crew in 1 week with 3 weeks for warmup/cooldown (if required)	+ \$15	+ \$30		+ 0.25	+ 1.00		
	Assembly sled for final assembly is not adequately stiff or does not provide repeatable motion		U	Functionality of sled will be determined first with concrete blocks and later with first FP. Ample time to make design modifications between arrival of the first and third FPs.	Nominal cost impact is 1 month of engineering design and up to half the fabrication cost of the sled	+ \$25	+ \$75		+ 0.00	+ 0.00		
	TC floor is not adequately rigid for present metrology plan		VU	Copper sheet and spongy surface removed from TC floor. Fiducials will be placed. Concrete blocks will be placed to see if floor is adequately stiff.	Nominal cost impact is 2 months of engineering design and \$50-150K for local reinforcement of building structures	+ \$50	+ \$200		+ 0.00	+ 0.00		
	Modular coils are shorted across toroidal break between field periods		NC	Need very low impedance, multiple shorts to get into trouble								
	Metrology equipment and general purpose tooling/ lifting equipment (e.g.cranes) not available to support the schedule		U	Maintenance contract mitigates impact of metrology equipment. Additional \$200K budgeted for a 3rd laser tracker and/or spare metrology equipment. Should result in improved efficiency.	Up to 2 week impact on FPA and critical path. FPA cost impact assumed to be \$300k/mo.	+ \$0	+ \$150		+ 0.00	+ 0.50		

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Job Title: Machine Assembly Operations (7503)													
Job Manager: Erik Perry													
Notes:													
[1]	Low cost and schedule impacts are considered the minimum (0-percentile) impacts should the event occur.												
	High cost and schedule impacts are considered the maximum (100-percentile) impacts should the event occur												
[2]	Cost impacts should be entered as man-hours (by demographic) and M&S direct cost under basis of estimate.												
	Cost impacts should NOT include standing army costs which are separately calculated from the schedule impact												
	Project control is responsible for quantifying the low and high cost impacts based on the labor hours and M&S identified												
[3]	The schedule impacts should be entered as the min and max impacts on the critical path.												
	If there is no critical path impact then the schedule entries should be zero.												
[4]	Likelihood of occurrence should be entered consistent with our risk classification methodology, i.e.												
	VL= Very Likely (P>80%), L=Likely (80%>P>40%), U=Unlikley (40%>P>10%), VU=Very Unlikely (P<10%), NC=Non-credible (P<1%)												

Activity ID	MILE-stones (level 2 & 3)	Activity Description	Duration (work days)	Baseline Start	Baseline Finish	Shifts	Total Float	% cmlpt	Proposed Budgeted						
										FY07	FY08	FY09	FY10	FY11	FY12
75 - Test Cell and Basement Assembly Operations															
Job: 7501 - Construction Support Crew-PERRY															
General Assy Support															
7501-06		Construction Support Crew for 2nd shift	217*	05MAR10	03JAN11	2	0	LOE	445,558.64						
7501-05		Construction Support Crew during machine assy	504*	26JAN09	03JAN11		0	LOE	960,961.90						
Subtotal			504*	26JAN09	03JAN11		0	LOE	1,406,520.54						

Tool Crib Control em//tb-
 Crane Operator & suppo
 Forklift Operator & suppo
 Tool Crib Control em//tb-
 Crane Operator & suppo
 Forklift Operator & suppo

Activity ID	MILE-stones (level 2 & 3)	Activity Description	Duration (work days)	Baseline Start	Baseline Finish	Shifts	Total Float	% cmplt	Proposed Budgeted							
										FY07	FY08	FY09	FY10	FY11	FY12	
Job: 7503 - Machine Assembly (station 6)-PERRY																
7501-10		Fabricate/Assemble assembly structure	30	04DEC08	23JAN09	1	13		239,444.80							
7501-10.1		Fab struct to go between assy sleds&FPA's	20	04DEC08	09JAN09	1	23		239,444.80							
7501-10.2		Assemble 3 FPA support stands	15	12NOV08*	04DEC08	1	12		63,842.40							
7501-10.3		Assemble 3 VV spool piece support stands	10	05DEC08	18DEC08	1	12		42,561.60							
7501-10.4	2	Assemble machine base structure	10	19DEC08	12JAN09	1	12		42,561.60							
7501-10.5		Assemble 3 FPA installation carts	10	13JAN09	26JAN09	1	12		42,561.60							
7501-10.6		Fab 3 laser support poles	30	20NOV08*	13JAN09	1	70		73,108.80							
7501-10.7		Fab 3 concrete blocks for testing assy struct	12	14JAN09	29JAN09	1	70		44,288.32							
7503-010		Begin Assembly Activities	0	26JAN09*		1	3		0.00							
7503-020		Install Permanent support base and columns	10	26JAN09	06FEB09	1	3		67,371.00							
7503-015		Install Temp Assembly Structure	15	09FEB09	27FEB09	1	3		95,763.60							
7503-060		Install Lower PF 4,5&6 into prelim position	1	02MAR09	02MAR09	1	3		4,814.40							
7503-070		Install 3 Spool Pieces on fixt & test movement	10	03MAR09	16MAR09	1	3		51,510.80							
7501-10.9		Install test cell metrology site monuments & chk	20	17MAR09	13APR09	1	3		85,123.20							
7501-10.10		Test TC floor deflections with concrete block	15	14APR09	04MAY09	1	3		73,737.60							
7501-10.8		Exercise assy struc with concrete blocks & metro	20	05MAY09	02JUN09	2	3		109,528.00							
7503-080A		FPA-1 Installation and assembly test	20	03JUN09	30JUN09	1	3		135,915.20							
7503-080		FPA-1 Installed on sleds	0		30JUN09	1	3		0.00							
7501-11		Exercise assy struc w/FPA-1 before start of assy	40	01JUL09	26AUG09	1	3		135,915.20							
7503-415.7		Measure vsl gaps to determ spool piece dimension	18	27AUG09	22SEP09	1	3		78,816.96							
7503-415.0		Spool piece installation test	20	23SEP09	20OCT09	1	3		139,146.96							
7503-416.1		Machine Flange A & B of Spool Piece 1	30	21OCT09	03DEC09	1	3		44,329.04							
7503-416.2		Machine Flange A & B of Spool Piece 2	30	04DEC09	26JAN10	1	3		44,329.04							
7503-416.3		Machine Flange A & B of Spool Piece 3	30	27JAN10	09MAR10	1	3		44,329.04							
7503-110A		FPA-2 Installation and assembly test	20	06OCT09	02NOV09	1	9		140,532.00							
7503-110		FPA-2 Installed on sleds	0		02NOV09	1	9		0.00							
7503-150A		FPA-3 Installation and assembly test	20	16NOV09	15DEC09	1	0		140,532.00							
7503-150	2	FPA-3 Installed on sleds	0		15DEC09	1	0		0.00							
7503-120		Test movement of FPA's incl position checks.	5	16DEC09	22DEC09	1	0		26,630.20							
7503-400		Install inboard and outboard shims	6	04JAN10	11JAN10	1	0		95,147.05							
7503-402		Move all FPA's together, chk fitup,tack shims	6	12JAN10	19JAN10	1	0		46,323.37							
7503-404		Weld inboard shims on mating flanges	6	20JAN10	27JAN10	1	0		43,595.05							
7503-406		Install TF coils at ends of each FPA	6	28JAN10	04FEB10	1	0		27,211.20							

EM//EM =96hr ; EM//TB =960hr ;
EM//SM =240hr ; 41=80\$K ;
41=80; EM//EM=96 EM//SM=240EM//TB=960
EM//EM=48 EM//SM=120 EM//TB=480
EM//EM=32 EM//SM=80 EM//TB=320
EM//EM= 32 EM//SM=80 EM//TB=320
EM//EM=32 EM//SM= 80 EM//TB=320
41=24; EM//TB=480
41=18 ;EM//EM=20 EM//TB=192
EA//EM =60hr ; EM//TB =480hr ;
EM//SM =120hr ;
EM//EM =72hr ; EM//SM =180hr ;
EM//TB =720hr ;
EM//SM =16hr ; EM//TB =32hr ;
EA//EM =40hr ; EM//TB =320hr ;
EM//SM =80hr ; EM//TB =80hr ;
Metrr=640;EM//EM=64 EM//TB=160
Metrr=120;EM//EM=48 EM//SM=120 EM//TB=480
EM//EM=80EM//SM=320 EM//TB=640
Metrr=320;EM//EM=80EM//SM=320 EM//TB=640
EM//EM =80hr ; EM//TB =640hr ;
EM//SM =320hr ; EM//TB =320hr ;
EA//EM =288hr ; metrology =288hr ;
41=45\$K ; EM//EM =12hr ;
41=30\$K ; EM//EM =8hr ;
41=30\$K ; EM//EM =8hr ;
41=30\$K ; EM//EM =8hr ;
Metrr=320;EM//EM=80EM//SM=320 EM//TB=640
Metrr=320;EM//EM=80EM//SM=320 EM//TB=640
EA//EM =20hr ; EM//TB =160hr ;
EM//SM =40hr ; EM//TB =40hr ;
41=36\$K ; EA//EM =20hr ;
EM//EM =29hr ; EM//SM =72hr ;
EM//TB =288hr ;
EA//EM =20hr ; EM//EM =29hr ;
EM//SM =72hr ; EM//TB =288hr ;
metrology=32
EA//EM =20hr ; EM//EM =29hr ;
EM//SM =72hr ; EM//TB =288hr ;
EM//TB =48hr ; EM//SM =48hr ;
EM//TB =192hr ;

Activity ID	MILE-stones (level 2 & 3)	Activity Description	Duration (work days)	Baseline Start	Baseline Finish	Shifts	Total Float	% cmplt	Proposed Budgeted						
										FY07	FY08	FY09	FY10	FY11	FY12
7503-410		Install spacer supports and spacers	2	05FEB10	08FEB10	1	0		7,706.24						
7503-412	2	Move FPA's & spacers together/chk fitup	6	09FEB10	16FEB10	1	0		25,847.04						
7503-414		Remove Spacers & Machine spacers to fit	4	17FEB10	22FEB10	1	0		5,456.64						
7503-415		Re-install spacers	2	23FEB10	24FEB10	1	0		7,706.24						
7503-160		Position all FPA's / Spool Pieces @ MC Interface	6	25FEB10	04MAR10	1	0		31,956.24						
7503-090		Install local Platforms around FPA-1	2	05MAR10	08MAR10	2	0		15,412.48						
7503-130		Install local Platforms around FPA-2	2	09MAR10	10MAR10	2	0		15,412.48						
7503-190		Install local Platforms around FPA-3	2	11MAR10	12MAR10	2	0		15,412.48						
7503-415.5		MC Interface: meas holes/mark bushings f/drilling	3	05MAR10	09MAR10	1	0		11,559.36						
7503-415.6		drill eccentric custom holes in bushings	3	10MAR10	12MAR10	1	0		20,151.36						
7503-416		Position Spool pieces and Bolt MC flanges	9	15MAR10	25MAR10	2	0		39,640.85						
7503-417		Retorque all super nuts after 30 days	6	26APR10	03MAY10	2	0		79,281.70						
7503-418		Raise permanent supports to take machine loads	8	26MAR10	06APR10	2	3		114,363.36						
7503-419		Remove temporary assy structure	1	07APR10	07APR10	2	3		11,559.36						
7503-419.1		Install/Level FPA's and spool piece supports	15	08APR10	28APR10	2	3		159,781.20						
7503-419.2		FPA Metrology checks to assure alignment	3	04MAY10	06MAY10	2	0		14,729.20						
7503-420		Mate-up and Weld spacers onto vvs	15	07MAY10	27MAY10	2	0		171,865.20						
7503-422		Weld all six port 4's in place	15	28MAY10	18JUN10	2	0		91,810.80						
7503-422.1		Install E-Beam mapping & diag equipt	5	21JUN10	25JUN10	2	0		45,376.40						
7503-240		Install Vacuum pumping system	3	21JUN10	23JUN10	2	2		19,265.60						
7503-250	2	Begin Vac Vsl Pumpdown	0	28JUN10		2	0		0.00						
										PUMP DOWN OF VACUUM VESSEL DOE LEVEL 2 MILESTONE					
7503-260		PTP Pumpdown & leak check VV	8	28JUN10	08JUL10	2	0		57,796.80						
7503-424		Install TF alignment & traction ring	4	09JUL10	14JUL10	2	0		40,467.27						
7503-426		Pull TF coil radially inward. Verify nose fit up	5	15JUL10	21JUL10	2	0		40,467.27						
7503-428		Lock TF coils at four support locations	4	22JUL10	27JUL10	2	0		40,467.27						
7503-430		Install MC structure insulation boots port 4's	5	28JUL10	03AUG10	2	0		38,531.20						
7503-431		Seal gaps MC shims, cooling tubes, for insul pour	10	04AUG10	17AUG10	2	0		77,062.40						
7503-432		Fill MC/VVSA annulus with pourable aerogel insul	1	18AUG10	18AUG10	2	0		7,706.24						
7503-433.1		Install LN2 manifolds	5	19AUG10	25AUG10	2	16		38,531.20						
7503-434		Instl in-cryostat cabling for elect pwr to coils	8	19AUG10	30AUG10	2	0		52,172.80						
7503-436		Connect cabling, and I&C to MC & TF Coils	8	31AUG10	10SEP10	2	0		52,172.80						
7503-439		Complete mag diag & machine I&C	5	13SEP10	17SEP10	2	0		49,779.20						
7503-438		Align guide mechanism for solenoid installation	1	20SEP10	20SEP10	2	0		7,562.76						
7503-444		Install solenoid support structure	1	21SEP10	21SEP10	2	0		6,913.33						
7503-440		Install solenoid assembly	1	22SEP10	22SEP10	2	0		6,913.33						

Activity ID	MILEstones (level 2 & 3)	Activity Description	Duration (work days)	Baseline Start	Baseline Finish	Shifts	Total Float	% cmlpt	Proposed Budgeted						
										FY07	FY08	FY09	FY10	FY11	FY12
7503-442		Connect cabling, LN2 and I&C to solenoid assy	1	23SEP10	23SEP10	2	0		3,853.12			EM//SM =08hr ; EM//TB =32hr ;			
7503-446		Install PF4L	1	24SEP10	24SEP10	2	0		3,853.12			EM//SM =08hr ; EM//TB =32hr ;			
7503-448		Connect cabling, LN2 and I&C to PF4L	1	27SEP10	27SEP10	2	0		3,853.12			EM//SM =08hr ; EM//TB =32hr ;			
7503-450		Adjust spring compression in solenoid sprt struc	1	28SEP10	28SEP10	2	0		3,853.12			EM//SM =08hr ; EM//TB =32hr ;			
7503-451		Raise lower PF 5&6 coils into final position	3	29SEP10	01OCT10	2	0		28,179.60			EA//EM =24hr ; EM//SM =48hr ; EM//TB =192hr ;			
7503-452		Instl Upper PF 4, 5 & 6	3	04OCT10	06OCT10	2	0		28,811.28			EA//EM =24hr ; EM//SM =48hr ; EM//TB =192hr ;			
7503-330	2	Begin Cryostat Installation	0	07OCT10		2	0		0.00			***** BEGIN CRYOSTAT INSTALLATION DOE LEVEL 2 MILESTONE *****			
7503-454		Install cryostat base, vapor barrier port boots	5	07OCT10	13OCT10	2	0		39,841.60			EM//SM =80hr ; EM//TB =320hr ;			
7503-456		Install elec pwr, LN2, & instr feedthrus	3	14OCT10	18OCT10	2	0		19,920.80			EM//SM =40hr ; EM//TB =160hr ;			
7503-458	2	Integrated Electrical testing	5	19OCT10	25OCT10	2	0		53,997.60			EM//EM =80hr ; EM//SM =80hr ; EM//TB =320hr ;			
7503-460		Instl transition box, cabling, & connect to pwr sup	5	26OCT10	01NOV10	2	34		39,841.60			EM//SM =80hr ; EM//TB =320hr ;			
7503-462		LN2 connections from coils to manifolds	5	26OCT10	01NOV10	2	8		39,841.60			EM//SM =80hr ; EM//TB =320hr ;			
7503-464		Connect coil & VV instrumentation	5	26OCT10	01NOV10	2	0		39,841.60			EM//SM =80hr ; EM//TB =320hr ;			
7503-466		Connect 150C bakeout	3	02NOV10	04NOV10	2	0		19,920.80			EM//SM =40hr ; EM//TB =160hr ;			
7503-470		Install cryostat cooling syst & instrumentation	10	12NOV10	29NOV10	2	0		159,366.40			EM//SM =320hr ; EM//TB =1,280hr ;			
7503-471		Install cryostat upper section, VB & port boots	5	30NOV10	06DEC10	2	0		39,841.60			EM//SM =80hr ; EM//TB =320hr ;			
7503-472		Install midplane cryostat sections & port boots	8	07DEC10	16DEC10	2	0		59,762.40			EM//SM =120hr ; EM//TB =480hr ;			
7503-473		Install cryostat circulation duct	3	17DEC10	21DEC10	2	0		19,920.80			EM//SM =40hr ; EM//TB =160hr ;			
730.8200	2	PTP and Cool down	3	22DEC10	03JAN11	2	0		68,103.20			EM//EM =80hr ; EM//SM =80hr ; EM//TB =480hr ;			
Subtotal			526	12NOV08	03JAN11		0		4,511,856.29			▼▼▼▼▼▼▼▼▼▼			