

NCSX Work Approval Form (WAF)

WBS Number: 15

WBS Title: Coil Support Structures

Job Number: 1501 and 1550

Job Title: Coil Support Structures Design and Fabrication

Job Manager: Fred Dahlgren

Description:

Design, procure and fabricate conventional coil structure.

Schedule:

See Attached

Approvals:

Job Manager

Date

Responsible Line Manager

Date

Project Manager

Date

Engineering Department Head

Date

**NCSX June 2007 ETC
TABLE I - DESIGN LABOR**

WBS Number: 15
WBS Title: Coil Support Structures
Job Number: 1501
Job Title: Coil Support Structures Design
Job Manager: Fred Dahlgren

Description:

Title I and II Engineering for PF Coils and Title III Support of Fabrication Effort.

Task ID	FY07\$K					HOURS															Basis of Estimate					
	41MS	48MS	37STK	35TRVL	31OT	ORNL EIM	ORNL DSN	EMEM	EMSM	EMSB	EMTB	EAEM	EAEM Dsr	EASB	EEEM	EESM	EESB	EETB	ECEM	ECSB		ECTB	RM2	RM3		
TITLE I AND TITLE II DESIGN COMPLETED																										
2 Requirements definition																										COMPLETED
3 Preliminary Re-Design																										COMPLETED
4 Preliminary Stress Analysis												70														Analysis approximately 80% - about 70 hours remaining
5 Preliminary CAD models and drawings													160													About 50% complete
6 PDR Preparation												10	10													
7 PDR												4	4													
8 Final design																										
9 Detail CAD drawings,BOM												20	320													
10 Integrated Stress Analysis												240														
11 FDR Preparation												10	5													
12 FDR												4	4													
13 Resolve chits												20	20													
14 Update C.S. Support Design												20	40													
15 Peer Review Updated C.S. Design												4	4													
16 Resolve Chits from FDR												20	8													
17 Prepare RFQ & SOW												24														
18 rebaseline exercise												40														
Subtotal Title I & II Design												486	575													
TITLE III																										
Vendor Oversight, Inspection												40														
Disposition of deviation requests and non-conformances												20														
Coordination of Procurement Actions												15														
Subtotal Title III Design	0	0	0	0	0	0	0	0	0	0	0	0	0	75	0	0	0	0	0	0	0	0	0	0	0	

Notes and Worksheets

NCSX June 2007 ETC
TABLE II- Materials and Subcontracts

WBS Number: 15
WBS Title: Coil Support Structures
Job Number: 1550
Job Title: Coil Support Structures Design
Job Manager: Fred Dahlgren

Description:

Procurement Strategies: (1) Single procurement with vendor purchasing all hardware (G11/Nuts/Washers/Other Misc Assy Hardware) vs splitting fabrication and assembly hardware & materials. (2) Fabricator and PPPL procures remaining items in two procurements - See Table V.

Inner TF Support Structure (36)			\$	166,414
Outer TF Support Structure (36)			\$	182,917
PF5/PF6 Support Bracket Assembly (66)			\$	265,701
PF5/PF6 Support Frame Assembly – Long (6)			\$	12,554
PF5/PF6 Support Frame Assembly – Short (3)			\$	8,134
TF Pre-Load Ring & PF4 Support (2)			\$	53,850
C.S. Coil Mounting Brackets (12)			\$	34,795
TF Coil Pre-Load Clamp Assemblies (36)			\$	20,214
PF4 Coil Mounting Clamp (12)			\$	16,711
MCWF-TF Mtg. Brkt. Spacer block & shim			\$	53,837
Machine/Base Support Interface			\$	55,680
Misc. Assembly Hardware			\$	21,070
		SUB-TOTAL:	\$	891,877
			\$	-
MATERIAL COST ADJUSTMENTS				
50% MATERIAL ALLOWANCE - ALUM5083 @ \$4.50/LB	\$	4.50		8350 \$ 18,788
SCRAP RECOVERY VALUE - @ \$.20/LB.	\$	0.20		(835)
		M&S TOTAL:	\$	909,830
PACKAGING, SHIPPING & INSPECTION			\$	25,000
		JOB SUB-TOTAL:	\$	934,830
Material escallator (10% of Aluminum cost IN FY'08)			\$	3,758
		JOB-TOTAL:	\$	938,587

THESE ESTIMATES ARE BASED ON SIMILAR PRIOR FABRICATIONS, MATERIAL & BUDGETARY QUOTES FROM POTENTIAL VENDORS, AND INTERNAL ESTIMATES FOR TIME & MATERIALS. LABOR RATES FOR MACHINING @ \$92.00/HR SLAC INTERNAL RATE & WEB SURVEY OF PUBLISHED MACHINE SHOP RATES. WELDER & GENERAL SHOP LABOR RATE USED WAS \$75.00/HR. BASELINE MATERIAL COST (INCONEL601 ROLLED PLATE: \$22.50/LB., AL.ALY.5083: \$4.50/LB) INCONEL718 HARDWARE QUOTE FROM B&G FABRICATORS INCONEL 718 B'VILLE WASHER QUOTE FROM SOLON AND QUOTES FOR ITEMS1 THRU 7 FROM PENNIRON CO. AND ITEMS 1 THRU 7 FROM PASSIAC COUTY WELDERS,INC. (ITEMS INCLUDED AS PARTIAL COST IN LINES 13 TO 17 ON THIS SHEET)

HUNTINGTON ALLOYS VERBAL QUOTE (13 WKS ARO/+CURR. SC.) PRO-RATED FROM 718: <http://www.recycle.net/Metal-E/nickel/index.html>

MAT'L. COST FACTOR 0.16 ALUMINUM VS. INCO625

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TABLE II- Materials and Subcontracts

WBS Number: 15
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SEE BACKUP DATA IN TABLE V FOR DETAILED BREAKDOWN:

Procurements	Totals	Adjustments from above rows27-33	
(1) The Structures - contract with Vendor for Fabrication	\$ 618,594	\$ 46,710	\$ 665,304
(2) PPPL Procurement of G11 & Teflon Parts	\$ 150,420		\$ 150,420
(3) PPPL Procurement of Inconel B718, Bolts, & Washers	\$ 104,187		\$ 104,187
(3) PPPL Procurement of Belleville Washers	\$ 18,695		\$ 18,695
	\$891,896.62		\$ 938,607
			1.076
1. Inner TF Support Structure -36			
1a - Support Brackets	\$ 67,651		
1b - G11 - CR Mounting Blocks	\$ 13,086		
1c - G11 - CR Side Wedges	\$ 14,904		
1d - Inconel Hardware	\$ 13,507		
1e - TF Bridge Clamp	\$ 11,906		
1f - PTFE Coated G11 - CR Wedge Assy	\$ 45,360		
2 Outer TF Support Structure-36			
2a - Support Brackets	\$ 84,154		
2b - G11 - CR Mounting Blocks	\$ 13,086		
2c - G11 - CR Side Wedges	\$ 14,904		
2d - Inconel Hardware	\$ 13,507		
2e - TF Bridge Clamp	\$ 11,906		
2f - PTFE Coated G11 - CR Wedge Assy	\$ 45,360		
3 PF5/PF6 Support Bracket Assembly -66			
3a - Bracket Assy	\$ 149,107		
3b - PF 5 Bridge Clamps	\$ 21,828		
3c - PF 6 Bridge Clamps	\$ 21,828		
3d - Inconel Hardware	\$ 47,749		
3e - Positioning Bracket Assy	\$ 25,190		
4 PF5/PF6 Support Frame Assembly Long -6			
4a - Curved Beam Angle (N.R.)	\$ -		
4b - Vertical Channels	\$ 3,713		
4c - Inconel Hardware	\$ 8,842		
5 PF5/PF6 Support Frame Assembly Short -3			
5a - Curved Beam Angle (N.R.)	\$ -		
5b - Vertical Channels	\$ 3,713		
5c - Inconel Hardware	\$ 4,421		
6 TF Pre-Load Ring & PF4 Support -2			
6a - Castings	\$ 46,930		
6b - Machining	\$ 6,920		
7 C.S. Coil Mounting Brackets -12			
7a - Inconel Support Brackets	\$ 32,585		
7b - Inconel Hardware	\$ 2,210		
8 TF Coil Pre-Load Clamp Assemblies -36			
8a - Stellite Castings	\$ 20,214		
			\$891,877.42
9 PF4 Coil Mounting Clamp -12			
9a - C&M Plates		\$ 4,968	
9b - Clean-up, descale, deburr		\$ 1,368	
9c - Inconel Hardware		\$ 2,210	
9d - G11 - CR 1/4" Insulation Pad		\$ 222	
9e - Teflon Pads		\$ 648	
9f - Inconel Plate (6 x 6 x 3/4" thick)		\$ 7,295	
10 MCWF-TF Mtg. Brkt. Spacer block & shim			
10a - C&M Blocks		\$ 22,080	
10b - Clean-up, descale, deburr		\$ 3,312	
10c - Inconel Hardware (INCO 3/4 - 10NC Hex Bolts)		\$ 6,230	
10d - Inconel Hardware (INCO 3/4" Flat Washers)		\$ 326	
10e - INCO 625 Plate (6 x 6 x 3" thick)		\$ 21,888	
11 Machine/Base Support Interface			
11a - C&M Plates		\$ 22,080	
11b - Weld Clevises & Side Plates		\$ 3,600	
11c - Clean-up, descale, deburr		\$ 1,104	
11d - C&M Spherical Brgs.		\$ 8,550	
11e - C&M G11 & Teflon Plates		\$ 2,208	
11f - INCO 625 Plates & Round Bar		\$ 12,312	
11g - G11 - CR Plate		\$ 474	
11h - Teflon Sheet		\$ 168	
11i - Inconel Hardware (R.S.B & fasteners)		\$ 5,184	
12 Misc. Assembly Hardware			
12a - G11 Bushings TF clamps		\$ 900	
12b - G11 washers TF clamps		\$ 288	
12c - G11 Bushings Frame Assy		\$ 420	
12d - G11 washers PF clamps		\$ 134	
12e - G11 bushings PF clamps		\$ 420	
12f - G11 washers Frame Assy		\$ 134	
12g - G11 bushings M/B interface		\$ 60	
12h - G11 washers M/B interface		\$ 19	
12i - Inconel 718 - 0.75" ID Belleville Washers		\$ 9,000	
12j - Inconel 718 - 1.03" ID Belleville Washers		\$ 9,695	
delivery packages			
TF assy station 5	\$ 222,897	239,728	
PF	\$ 239,009	257,056	
TF final assy station 6	\$ 74,064	79,657	
Final assy station 6	\$ 82,606	88,844	
	\$ 618,575	\$ 665,284	

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TABLE III - Fabrication and Assembly

WBS Number: 15
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In-house Fabrication and Assembly and Installation

Description: N/A
Worksheets

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TABLE IV - Uncertainty of Estimate and Residual Risk Assessment

WBS Number: 15
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<u>Uncertainty of the Estimate</u>					
	<u>High</u>	<u>Medium</u>	<u>Low</u>	<u>Uncertainty Range (%)</u>	<u>Comments/Other Considerations</u>
Job 1501				-10%/+15%	
Design Maturity		X			Only now approaching PDR stage, however nothing exotic. Standardized components.
Design Complexity			X		
Job 1550				-10%/+15%	
Design Maturity		X			Only now approaching PDR stage, however nothing exotic. Standardized components.
Design Complexity			X		
Other Comments:	There is a finite likelihood of material costs increasing, but already assumed an escalation of ~5%/year for Inconel, HOWEVER, recent history indicates much higher escalation (see Table V) Possibility that vendor will not deliver on time, however, significant float (~4 months exist off critical path) - however, could impact half-period and full-period assembly schedule if TF brackets delayed => other vendors could be identified.				

Note: High/Medium/Low uncertainty assessment from Job Manager. Uncertainty range based on ACEI recommended practice 18R-97 as amended for NCSX.

<u>Residual Impacts</u>					
<u>Risk</u>		<u>Likelihood of Occurring (%)</u>	<u>Mitigation Strategies</u>	<u>Consequence if Occurs</u>	
				<u>Cost</u>	<u>Schedule</u>
NONE					

**NCSX June 2007 ETC
TABLE V - Basis of Estimate**

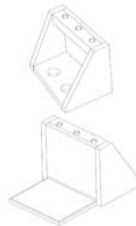
WBS Number: 15
WBS Title: Coil Support Structures
Job Number: 1550
Job Title: Coil Support Structures Design
Job Manager: Fred Dahlgren

M&S Estimate Backup

NCSX Coil Support Structure – 1501/1550 Re-baseline estimate – Rev.1 16 June 2007

1. Inner TF support Structure

1a. Supp't brkts. (72 req'd.)
 Cutting & machining6.0 hrs x \$92.00 = \$552.00
 Weld prep & weld2.2 hrs x 76.00 = 167.20
 Clean-up de-scale de-burr0.5 hrs x 76.00 = 38.00
 Mat'l: AlAly.5083 plate.....40 lbs. x 4.56 = 182.40



*1b. G11-CR Mtg. blocks (36 req'd.)
 Cutting & machining (2 pcs.)2.5 hrs x \$92.00 = \$230.00
 Epoxy adhesive bond to coil0.5 hrs x \$75.00 = 37.50
 Mat'l: G11-CR plate \$48.00 per pc.2 pcs. x \$48.00 = 96.00

*1c. G11-CR Side Wedge Shims (4 pcs. Req'd per set x 36 sets)
 Cutting & Machining wedges3.0 hrs. x \$92.00 = \$276.00
 Mat'l: G11-CR plate \$42.00 per pr.2 pcs. x 42.00 = 84.00
 Teflon pads 1/8" thk.2 pcs x 27.00 = 54.00

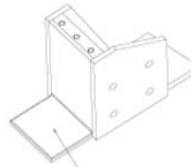
**1d. Inconel Hardware (36 sets Req'd.)
 (4) 1-8 N.C. x 2.5" Hex Head Bolts4 pcs. x \$50.40 = \$201.60
 (4) 1" Flat Washer – Heavy Series4 pcs. x 3.65 = 14.60
 (4) 1" Lock Washer4 pcs. x 2.95 = 11.80
 (6) 1/2-13 N.C. Hex Head Bolts6 pcs. x 19.80 = 118.80
 (6) 1/2" Flat Washers – Heavy Series6 pcs. x 2.65 = 15.90
 (6) 1/2" Split Lock Washer6 pcs. x 2.10 = 12.50

1e. T.F. Bridge Clamp (36 Req'd)
 Cutting & machining3.0 hrs x \$92.00 = \$276.00
 Mat'l: AlAly.5083 plate.....12.0lbs x 4.56 = 54.72

*1f. PTFE coated G11-CR wedge assemblies (72 Req'd.)
 Cutting & machining2 pcs. x 3.0 hrs x 92.00 = 550.00
 Teflon coating2 pcs @ \$40.00/pc. = 80.00

2. Outer TF support Structure

2a. Supp't brkts. (72 req'd.)
 Cutting & machining7.5 hrs x \$92.00 = \$690.00
 Weld prep & weld2.5 hrs x 76.00 = 190.00
 Clean-up de-scale de-burr0.5 hrs x 76.00 = 38.00
 Mat'l: AlAly.5083 plate.....55 lbs. x 4.56 = 250.80



*2b. G11-CR Mtg. blocks (36 req'd.)
 Cutting & machining (2 pcs.)2.5 hrs x \$92.00 = \$230.00
 Epoxy adhesive bond to coil0.5 hrs x \$75.00 = 37.50
 Mat'l: G11-CR plate \$48.00 per pc.2 pcs. x \$48.00 = 96.00

Outer TF support Structure (con't.)

*2c. G11-CR Side Wedge Shims (4 pcs. Req'd per set x 36 sets)
 Cutting & Machining wedges3.0 hrs. x \$92.00 = \$276.00
 Mat'l: G11-CR plate \$42.00 per pr.2 pcs. x 42.00 = 84.00
 Teflon pads 1/8" thk.2 pcs x 27.00 = 54.00

**2d. Inconel Hardware (36 sets Req'd.)
 (4) 1-8 N.C. x 2.5" Hex Head Bolts4 pcs. x \$50.40 = \$201.60
 (4) 1" Flat Washer – Heavy Series4 pcs. x 3.65 = 14.60
 (4) 1" Lock Washer4 pcs. x 2.95 = 11.80
 (6) 1/2-13 N.C. Hex Head Bolts6 pcs. x 19.80 = 118.80
 (6) 1/2" Flat Washers – Heavy Series6 pcs. x 2.65 = 15.90
 (6) 1/2" Split Lock Washer6 pcs. x 2.10 = 12.50

2e. T.F. Bridge Clamp (36 Req'd)
 Cutting & machining3.0 hrs x \$92.00 = \$276.00
 Mat'l: AlAly.5083 plate.....12.0lbs x 4.56 = 54.72

*2f. PTFE coated G11-CR wedge assemblies (72 Req'd.)
 Cutting & machining2 pcs. x 3.0 hrs x 92.00 = 550.00
 Teflon coating2 pcs @ \$40.00/pc. = 80.00

3. PF5/PF6 Support Brkt. Ass'y. (66 Req'd.)

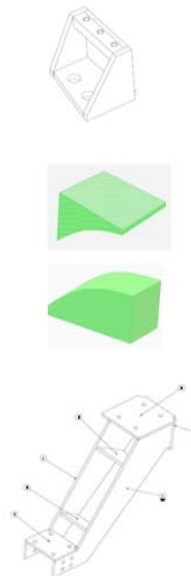
3a. Bracket Ass'y (66 Req'd.)
 Cutting & Machining12.0 hrs x \$92.00 = \$1104.00
 Weld prep & weld6.5 hrs x 76.00 = 494.00
 Clean-up de-scale de-burr1.5 hrs x 76.00 = 114.00
 Mat'l: AlAly.5083 plate.....120.0lbs x 4.56 = 547.20

3b. P.F. 5 Bridge Clamps (66 Req'd)
 Cutting & machining3.0 hrs x \$92.00 = \$276.00
 Mat'l: AlAly.5083 plate.....12.0lbs x 4.56 = 54.72

3c. P.F. 6 Bridge Clamps (66 Req'd)
 Cutting & machining3.0 hrs x \$92.00 = \$276.00
 Mat'l: AlAly.5083 plate.....12.0lbs x 4.56 = 54.72

**3d. Inconel Hardware (66 sets Req'd.)
 (4) 3/8-10 N.C. x 8.5" Hex Head Bolts ...4 pcs. x \$ 68.90 = \$275.60
 (4) 3/8-10 N.C. x 9.5" Hex Head Bolts ...4 pcs. x 73.90 = 295.60
 (4) 3/8-10 N.C. Hex Nuts4 pcs. x 24.80 = 99.20
 (8) 1" Flat Washer – Heavy Series8 pcs. x 3.65 = 29.20
 (8) 1" Lock Washer8 pcs. x 2.95 = 23.80

3e. Positioning Brkt. Ass'y. (21 Req'd)
 Cutting & Machining8.0 hrs x \$92.00 = \$ 736.00
 Weld prep & weld2.5 hrs x 76.00 = 190.00
 Clean-up de-scale de-burr1.5 hrs x 76.00 = 114.00
 Mat'l: AlAly.5083 plate.....35.0lbs x 4.56 = 159.60



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TABLE V - Basis of Estimate

WBS Number: 15
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4. PF5/PF6 Support Frame Ass'y Long Span (6 Ass'y. Req'd)

4a. Vertical channels (For 3 -Req'd. per ass'y)

Cutting & Machining2.0 hrs x \$92.00 = \$184.00
Clean-up de-scale de-burr0.8 hrs x 76.00 = 60.80
Mat'l: AlAly.5083 channel44.0lbs x 8.50 = 374.00

**4b. Inconel Mtg. Hardware (6 sets of 4 per ass'y)

(4) ½ -13 N.C. Hex Head Bolts4 pcs. x 24.50 = 98.00
(4) ½ -13 N.C. Hex Nuts4 pcs. x 16.80 = 67.20
(4) ½" Flat Washers - Heavy Series4 pcs. x 2.65 = 10.60
(4) ½" Split Lock Washer4 pcs. x 2.10 = 8.40

5. PF5/PF6 Support Frame Ass'y Short Span (6 Ass'y. Req'd)

5a. Vertical channels (For 3 -Req'd. per ass'y)

Cutting & Machining2.0 hrs x \$92.00 = \$184.00
Clean-up de-scale de-burr0.8 hrs x 76.00 = 60.80
Mat'l: AlAly.5083 channel44.0lbs x 8.50 =374.00

**5b. Inconel Mtg. Hardware (3 sets of 4 per ass'y)

(4) ½ -13 N.C. Hex Head Bolts4 pcs. x 24.50 = 98.00
(4) ½ -13 N.C. Hex Nuts4 pcs. x 16.80 = 67.20
(4) ½" Flat Washers - Heavy Series4 pcs. x 2.65 = 10.60
(4) ½" Split Lock Washer4 pcs. x 2.10 = 8.40



6. TF Pre-load Ring & PF4 Support Brkts (2 rings, 2 sets of brkts.)

6a. Base Ring

Castings 355 lbs x \$35.00 = \$12,425.00
Machining 120 hrs x 92.00 = 11,040.00

6b. PF4 Brkts Inco plate weldments - (6 Top & 6 Bottom)

(6) Cutting & Machining2.5 hrs x 6 x \$92.00 = \$1380.00
(6) Weld prep & weld 1.5 hrs x 6 x 76.00 = 684.00
(6) Clean-up de-scale de-burr 3.0 hrs x 6 x 76.00 = 228.00
(6) Mat'l: Inconel 625 plate 41.0lbs x 28.50 = 1168.50



7. C.S. Coil mtg. brkts. (2x=12 brkts total)

7a. Inconel Suppl't brackets (2 sets Req'd - 6 Top & 6 Bottom)

(6) Cutting & Machining 6.5 hrs x 6 x \$92.00 = \$3588.00
(6) Weld prep & weld 2.5 hrs x 6 x 76.00 = 1140.00
(6) Clean-up de-scale de-burr 3.0 hrs x 6 x 76.00 = 228.00
(6) Mat'l: Inconel 625 plate67.0lbs x 6 x 28.50 = 11,336.40

**7b. Inconel Mtg. Hardware (6 sets of 4 per ass'y)

(4) ½ -13 N.C. Hex Head Bolts4 pcs. x 24.50 = 98.00
(4) ½ -13 N.C. Hex Nuts4 pcs. x 16.80 = 67.20
(4) ½" Flat Washers - Heavy Series4 pcs. x 2.65 = 10.60
(4) ½" Split Lock Washer4 pcs. x 2.10 = 8.40

8. T.F. Pre-load clamp Assemblies

8a. Stellite casting (36 Required) \$350.00 x 36 = 12,600.00

(36) Inco ¼ -10NC Pivot Bolt. 1.25 grip 41.50 x 36 = 1,494.00
(36) Inco ¼ -10NC Hex Nut 24.80 x 36 = 892.80
(72) Inco ½ -13NC Hex Head Bolt 16.80 x 72 = 1,209.60
(72) Inco ½" Flat Washers 2.65 x 72 = 190.80
(72) G11-CR Washer 1.40 x 72 = 100.80
(72) G11-CR Sleeve 2.50 x 72 = 180.00
(36) Inco ¼-10NC" Jack Nut28.50 x 36 = 1,026.00
(36) Inco ¾" Swivel Eye-Bolt51.50 x 36 = 1,854.00
(36) G11-CR ¼" thk Insl. Pad18.50 x 36 = 666.00

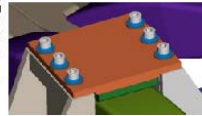


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TABLE V - Basis of Estimate

WBS Number: 15
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9. P.F. 4 Bridge clamps (12 req'd.)

9a. (1) C & M Plates 6" x 6" x 3/4"	4.5 lbs x 1 x \$92.00 =	414.00
9b. Clean-up de-scale de-burr	1.5 hrs x 76.00 =	114.00
**9c. Inconel Hardware		
(4) 1/2-13 N.C. Hex Head Bolts	4 pcs. x 24.50 =	98.00
(4) 1/2-13 N.C. Hex Nuts	4 pcs. x 16.30 =	67.20
(4) 1/2" Flat Washers - Heavy Series	4 pcs. x 2.65 =	10.60
(4) 1/2" Split Lock Washer	4 pcs. x 2.10 =	8.40
*9d. (1) G11-CR 1/2" thk. Insul. Pad	18.50 =	18.50
*9e. (2) Teflon pads	2 pcs. x 27.00 =	54.00
9f. 6 x 6 x 3/4" thick Inconel 601 plate	27.0lbs x 22.50 =	607.50

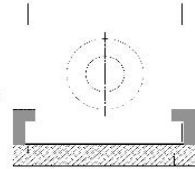


10. Inner & outer spacer blocks MCWF-TF supp't brkts (24 Req'd.)

10a. C & M blocks	10 lbs x 92.00 =	920.00
10b. Clean-up, de-scale & de-burr	1.5 hrs x 92.00 =	138.00
**10c. (4) Inco 1/2-10NC Hex Bolt	4.25 grip 64.90 x 4 =	259.60
**10d. (4) Inco 1/2" Flat Washers	3.40 x 4 =	13.60
10e. AlAly-5083 plate 6" x 6" x 3" thick 32lbs ea. X	\$4.50 =	144.00

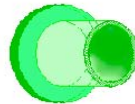
11. Machinebase support Interface (3 Req'd.)

11a. C & M plates	(11 parts) 80 lbs x 92.00 =	7,360.00
11b. Weld Clevises & side plates	16 lbs x 75.00 =	1,200.00
11c. Clean-up, de-scale & de-burr	4 hrs x 92.00 =	368.00
11c. C & M Clevis pins	4 lbs x 92.00 =	368.00
*11e. C & M G11 & Teflon sheets	3 lbs x 92.00 =	736.00
11f. Inco 625 plates & rnd. Bar	144 lbs x 28.50 =	4,104.00
*11g. G11-CR Plate	10" x 10" x 1" =	158.00
*11h. Teflon sheet	8" x 8" x 13" =	56.00
**11i. Inconel Hardware (2 sets Req'd.)		
(4) 1-8 N.C. x 2.5" Hex Head Bolts	4 pcs. x \$50.40 =	\$201.60
(4) 1" Flat Washer - Heavy Series	4 pcs. x 3.65 =	14.60
(4) 1" Lock Washer	4 pcs. x 2.95 =	11.80



12. Misc. Assembly Hardware

12a. G11 bushings TF clamps	360 x 2.50 =	900.00
12b. G11 washers TF clamps	360 x 0.80 =	288.00
12c. G11 bushings Frame Assy	168 x 2.50 =	420.00
12d. G11 washers PF Clamps	168 x 0.80 =	134.40
12e. G11 bushings PF Clamps	168 x 2.50 =	420.00
12f. G11 washers Frame Assy	168 x 0.80 =	134.40
12g. G11 bushings M/B interface	24 x 2.50 =	60.00
12h. G11 washers M/B interface	24 x 0.80 =	19.20
**12i. Inconel 718 .75 ID Belleville washers	720 x 12.50 =	9,000.00
***12j. Inconel 718 1.03 ID Belleville washers	360 x 26.93 =	9,694.80



*G11 & Teflon purchase
**Inconel 718 hardware purchase
***Inconel Belleville Washer purchase

Job 1501/1550 M&S Summary & Totals:

1. Inner TF Support Structure (36)		
1a I-C&M432		67,651.40
1b		13,086.00
1c		14,904.00
1d		13,507.20
1e I-C&M108		11,906.00
1f		45,360.00
2. Outer TF Support Structure (36)		
2a I-C&M1540		84,154.00
2b		13,086.00
2c		14,904.00
2d		13,507.00
2e I-C&M108		11,906.00
2f		45,360.00
3. PFS/PF6 Support Bracket Assembly (66)		
3a I-C&M504		149,107.00
3b I-C&M108		21,828.00
3c I-C&M108		21,828.00
3d		47,749.40
3e I-C&M168		25,190.00
4. PFS/PF6 Support Frame Assembly - Long (6)		
4a I-C&M12		3,712.80
4b		8,842.00
5. PFS/PF6 Support Frame Assembly - Short (3)		
5a I-C&M12		3,712.80
5b		4,420.90
6. TF Pre-Load Ring & PF4 Support (2)		
6a. I-C&M240		46,930.00
6b I-C&M15		6,920.00
7. C.S. Coil Mounting Brackets (12)		
7a I-C&M78		32,584.00
7b		2,210.40
8. TF Coil Pre-Load Clamp Assemblies (36)		
8a		20,214.00
9. PF4 Coil Mounting Clamp (12)		
9a I-C&M154		4,968.00
9b		1,368.00
9c		2,210.40
9d		222.00
9e		648.00
9f		7,295.00

**NCSX June 2007 ETC
TABLE V - Basis of Estimate**

WBS Number: 15
WBS Title: Coil Support Structures
Job Number: 1550
Job Title: Coil Support Structures Design
Job Manager: Fred Dahlgren

10. MCWF-TF Mtg. Brkt. Spacer block & shim	
10a I-C&M240	22,080.00
10b	3,312.00
10c	6,230.40
10d	326.40
10e	21,888.00
11. Machine/Base Support Interface	
11a I-C&M240	22,080.00
11b	3,600.00
11c	1,104.00
11d	8,550.00
11e	2,208.00
11f	12,312.00
11g	484.00
11h	168.00
11i	5,184.20
12. Misc. Assembly Hardware	
12a	900.00
12b	288.00
12c	420.00
12d	134.00
12e	420.00
12f	134.00
12g	60.00
12h	19.20
12i	9,000.00
12j	9,694.80
	SUB TOTAL: \$ 891,877.42
+ 50% mat'l. allowance on 8,350 lbs. AL. Aly. 5083-H116: 8,350 x 4.56 x 0.5 =	\$ 18,788.25
Less scrap value \$ 0.20/lb 8,350 x 0.20 x 0.5 =	- 835.00
	TOTAL COST \$ 909,830.67
	TOTAL M&S PF/TF COIL STRUCTURE* \$ 909,830.67
	ADD INSPECTION, PACKAGING & SHIPPING 25,000.00
	TOTAL COST FOB PLAINSBORO NJ \$ 934,830.67

*THIS DOES NOT INCLUDE THE CS SUPPORTS OR TRIM COIL SUPPORT, OR ENGINEERING, DESIGN AND ASSEMBLY LABOR.

NOTES:

- LABOR RATES BASED ON WEB SURVEY AND SLAC IN-HOUSE RATES
- 316L @ \$7.50/LB. RANGE OF THREE QUOTES ON .5" - .75" PLATE
- SOLUTION ANNEAL MAY ADD 15 - 20% . NO VENDOR WILL CERTIFY THE MAGNETIC PERMEABILITY AS LESS THAN 1.02 (1.2 - 1.5 TYPICAL)
- HARDWARE COSTS BASED ON 1 QUOTE B&G MFG. & MCMASTER-CARR CATALOG PRICING WHERE AVAILABLE. (INCONEL 718 - 4X MORE).
- INCONEL 625 PLATE WITH CURRENT COMMODITY SURCHARGES COST - \$28.50/LB. BASED ON FERGUSON METALS QUOTE (WEB SURVEY YIELDED \$29-32.00/LB. AND METAL SUPPLIER QUOTED \$48.50 FOR SAME. (\$22.50 INCONEL-601)
- \$10.50 APPROX. SCRAP INCONEL 718 PRICE PER LB.:
<http://www.recycle.net/specs/gr060152.html> <http://grn.com/a/0455.html>
- AlAly 5083-H116 quote From MetalsalesUSA -CEM Supply Harvey, La

ADDENDUM

MACHINING COST DIFFERENTIAL 316L VS. INCONEL 625

Total hours machining for 316L = 2832 hrs. x 3 = 8496 hrs
 (Per E.Perry estimate Inconel requires 3x machine time).
 For \$92.00 shop rate, increase total cost by \$521,088.00
 This has not been included in the above estimates.
 If we include this delta:

TOTAL COST: \$ 1,958,980.00

COST DIFFERENTIAL USING INCONEL 600/601

Note, to reduce machining & Material cost Inconel 600 is a more economical candidate material for low relative permeability. (A286, Aluminum, & Stialloy castings are also being considered). Material removal rates for 600/601 are comparable to machining 316/316L.

If Inconel 601 is used, the original estimate will be reduced by the cost differential between 625 and 601 which averages ~10% less or ~ 52KS. The 50% material allowance is reduced by ~26KS and the scrap value is assumed comparably less (~ 10KS). If we include these deltas: -78KS -10KS = -68KS net savings Inconel 625 -> Inconel 600.

SUB-TOTAL COST: \$ 1,214,694.80 - 68,000 = 1,146,694.80
 + 50% mat'l allowance on 18,489 lbs. Inconel 601, 18,489 x 22.50 x 0.5 = \$208,001.25
 Less scrap value \$ 7.50/lb 18,489 x 7.50 x 0.5 = - 69,333.75
 Add shipping inspection & packaging 25,000.00
JOB TOTAL COST \$ 1,310,362.30

COST DIFFERENTIAL - MARKET CONSIDERATIONS

Do to the volatility in the metals market for Ni, Cr, Mo, it is difficult to estimate the cost of materials for next fiscal year. Vendors are only quoting prices with ARO surcharges, but a conservative extrapolation of current material cost inflation would suggest an additional 10% will be likely by FY'08. In anticipation of these increases an additional 41.6KS will be used for this estimate.

TOTAL COST: \$ 1,351,962.25

NCSX June 2007 ETC
TABLE V - Basis of Estimate

WBS Number: 15
WBS Title: Coil Support Structures
Job Number: 1550
Job Title: Coil Support Structures Design
Job Manager: Fred Dahlgren

Bellville Washers

Main uncertainty:



Current Nickel price is ~ \$23,000/lb.
(Closing bid Friday 27 April was 48,700 per tonne - Bloomberg)



Additional Requests :

SOLON MANUFACTURING CO.
Quote Form

Reference # 85Q

FRED DAHLGREN
SPPS
P.O. BOX 481
PRINCETON, NJ 08542-0481
Phone: 609-542-9773
Fax:

P.O. Box 207
624 Canal Street
Chardon, OH 44024
Ph: 440-285-8717, Fax: 440-285-3047
Ph: 440-285-7143

Quote # 2007-0990
Quote Date 4/26/2007
Quote By ABH, H.
Page 1 of 1

Terms Not Established FOB Chardon, OH
E-mail: shomeyer@solonmfg.com

Part Number	ID	OD	Thick	Def.	OH	Load (lbs)	Qty	Price (ea)	IN STOCK
8480718	0.118	1.000	0.077	0.018	0.063	2200	300	\$3.843	
Part Number	ID	OD	Thick	Def.	OH	Load (lbs)	Qty	Price (ea)	LEAD TIME: 2 WEEKS
8480718	0.118	1.188	0.200	0.022	0.112	3150	300	\$5.807	
Part Number	ID	OD	Thick	Def.	OH	Load (lbs)	Qty	Price (ea)	IN STOCK
8480718	0.118	1.315	0.300	0.028	0.129	3200	300	\$7.278	
Part Number	ID	OD	Thick	Def.	OH	Load (lbs)	Qty	Price (ea)	IN STOCK
124112718	0.772	4.500	0.125	0.022	0.147	6200	378	\$12.658	
Part Number	ID	OD	Thick	Def.	OH	Load (lbs)	Qty	Price (ea)	200 PIECES IN STOCK, BALANCE IN 8 WEEKS ARO.
124112718	0.772	1.750	0.125	0.024	0.134	8000	373	\$18.136	
Part Number	ID	OD	Thick	Def.	OH	Load (lbs)	Qty	Price (ea)	223 IN STOCK, BALANCE IN 4-6 WEEKS ARO.
124112718	0.772	2.000	0.135	0.042	0.138	9700	373	\$24.845	
Part Number	ID	OD	Thick	Def.	OH	Load (lbs)	Qty	Price (ea)	IN STOCK
161242718	0.393	2.000	0.284	0.045	0.136	2200	178	\$14.061	
Part Number	ID	OD	Thick	Def.	OH	Load (lbs)	Qty	Price (ea)	70 PIECES IN STOCK, BALANCE IN 8 WEEKS ARO.
161180718	1.030	2.000	0.155	0.033	0.183	8800	178	\$26.621	
Part Number	ID	OD	Thick	Def.	OH	Load (lbs)	Qty	Price (ea)	35 PIECES IN STOCK, BALANCE IN 4-8 WEEKS ARO.
161180718	1.030	2.800	0.187	0.048	0.208	13400	178	\$34.167	

THANK YOU
APRIL HOMMEYER

Material Description
Austenitic 316 Nickel Alloy (ASTM B672, UNS S316)
Resistant to acids, alkalis, and organic solvents. A193-175 SS, RL 35-40.
Operating temperature range from -400° to 1100° F.
We reserve the right to change specifications, and without notice.
Finish: Scale Free (200) with chamfered edges.

Thursday, April 26, 2007

NCSX June 2007 ETC
TABLE V - Basis of Estimate

WBS Number: 15
WBS Title: Coil Support Structures
Job Number: 1550
Job Title: Coil Support Structures Design
Job Manager: Fred Dahlgren

APR.03'2007 08:56 2156221006 ERDP.BQREQ.COM #3781 P.001/001

Jack McAuliffe
From: Fred Dahlgren [mailto:fdahlgre@pppl.gov]
Sent: Wednesday, April 02, 2007 1:30 PM
To: Jack McAuliffe
Subject: Re: quote request - Gov- NEW JERSEY

Assembly Hardware

Current Surcharges on Materials



3475 Symmes Road
Hamilton, OH 45015

Jack,

Per our telcon., please revise quote request as follows:

- 718 Inconel Hex Head bolts - 1-8n.c. x 2.5", qty. 500 - 50.00 EACH
- 718 Inconel Hex Nuts - 1-8 n.c., qty. 500 - 38.00 EACH
- 718 Inconel Flat Washers Heavy series - qty. 500 - No Bid
- 718 Inconel Split Lock Washers - qty. 500 - No Bid
- 316/316L ss Hex Head bolts - 1-8 n.c. x 2.5" - 12.75 EACH
- 316/316L ss Hex Nuts - 1-8 n.c., qty. 500 - 9.00 EACH
- 316/316L ss Flat Washers Heavy series - qty. 500 - No Bid
- 316/316L ss Split Lock Washers - qty. 500 - No Bid

Regards, Fred

On Apr 2, 2007, at 11:15 AM, Jack McAuliffe wrote:

Fred,

Do not stock bolts listed. Can manufacture but need verification of material spec. Inconel 316 not a correct spec. Lead time at least 6 weeks. Advise

Jack McAuliffe

800-217-1360

Fax 215-822-1006



Jack McAuliffe
800-217-1380
4/3/07

VALTRA
SS. SWING BOLTS

DELIVERY - 6 WEEKS
FOB HATFIELD PA.

Subject: Quote Request

4/2/2007

Surcharge Totals for January 2007 - May 2007

Grades	January 1/1/07- 1/31/07	February 2/1/07- 2/28/07	March 3/1/07- 3/31/07	April 4/30/07- 4/30/07	May 5/1/07- 5/31/07
15-5	0.6247	0.6006	0.7188	0.8284	0.9719
15-7	1.6161	1.6736	1.7734	1.9641	2.2500
17-4	0.5527	0.6320	0.6346	0.7327	0.8630
17-7	1.1898	1.2753	1.3793	1.5773	1.8250
18SR	0.1159	0.1254	0.1318	0.1555	0.2028
201	0.7591	0.8050	0.8784	1.0079	1.1733
301 7.0%	1.1512	1.2545	1.3462	1.6370	1.7785
302/304/304L	1.3141	1.4215	1.5257	1.7421	2.0128
304-8.5%	1.3953	1.4924	1.6127	1.8459	2.1263
305	1.8722	2.0182	2.1772	2.4821	2.8553
309	1.9284	2.0788	2.2427	2.5561	2.9401
310	2.9875	3.2314	3.4810	3.9604	4.5393
316/316L	2.1488	2.2533	2.3962	2.6703	3.0543
317L	2.5755	2.6845	2.8430	3.1467	3.5894
321	1.4826	1.6016	1.7166	1.9582	2.2622
347	1.4814	1.5710	1.6970	1.9374	2.2351
409/409 Mod	0.1056	0.0940	0.1079	0.1319	0.1758
410/410S	0.0905	0.0793	0.0942	0.1201	0.1651
430	0.1046	0.0941	0.1105	0.1382	0.1885
434	0.3072	0.2898	0.3082	0.3398	0.4103
439	0.1359	0.1249	0.1404	0.1660	0.2140
440A	0.1046	0.0941	0.1105	0.1382	0.1865
Alloy 286	3.7698	4.1039	4.0626	4.3748	4.5669
Alloy 525	10.2462	10.9488	10.7978	11.5031	12.1638
Alloy 718	7.7847	8.4408	8.3178	8.8806	9.5080
Alloy HX	8.7172	9.2413	9.1269	9.7192	10.2307

Order Hotline
1.800.347.2376

www.fergusonmetals.com fax: 513.874.6657 salesquote@fergusonmetals.com

**NCSX June 2007 ETC
TABLE V - Basis of Estimate**

WBS Number: 15
WBS Title: Coil Support Structures
Job Number: 1550
Job Title: Coil Support Structures Design
Job Manager: Fred Dahlgren

Passaic County Welders Quote

QTY	DESCRIPTION	UNIT COST	TOTAL	NET UNIT WEIGHT	TOTAL
6	REGD—FF-6 VERTICAL STIFFENER DWG. SE151-182 REV.0	\$ 1,845.00	\$ 9,870.00	41.1	
12	REGD—FF-6 VERTICAL STIFFENER DWG. SE151-183 REV.0	\$ 1,310.00	\$ 15,720.00	44.0	
6	REGD—FF-6 SUPPORT ARC DWG. SE151-156 REV.0	\$ 2,471.00	\$ 14,826.00	54.4	
12	REGD—FF-6 SUPPORT ARC DWG. SE151-180 REV.0	\$ 3,263.00	\$ 39,156.00	107.6	
42	REGD—FF-6 PP-6 SUPPORT BRACKET DWG. SE151-179 REV.0	\$ 3,254.00	\$ 136,768.00	116.7	
72	REGD—COIL REAR LEFT SUPPORT DWG. SE151-177 REV.0	\$ 1,582.00	\$ 113,904.00	46.3	
72	REGD—TF COIL FRONT LEFT BRK. DWG. SE151-178 REV.0	\$ 1,424.00	\$ 102,528.00	33.2	
	SUB-TOTAL		\$ 428,292.00		

FOR WAYNE NJ
 THIS ESTIMATE WAS FOR 3/16L SOLUTION ANNEALED PLATE
 ESTIMATE FOR COST DELTA FOR INCONEL 601 @22.50/LB \$ 217,771.20
 SHIPPING, PACKAGING & INSPECTION \$ 15,000.00
 TOTAL ADJUSTED COST FOR ITEMS 1 THRU 7 \$ 651,063.20
 MY ESTIMATE FOR 7 ITEMS 1A,2A,3A,4A,4B,5A,5B +S,P&I \$ 628,795.00 ~1% LOWER
 NOTE: QUOTE FOR 7 ITEMS ONLY TF & PPS&I BRACKETRY
 NO HANDMADE, INSULATIONS, PFA SUPPETS, TF FREE LOAD, BRASS
 SUPPORT INTERFACE, ETC.

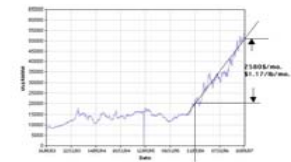
Penn Iron Quote

Qty	Part Name	Dwg. Number	Unit Cost	Total Cost	Unit Finish
6	channel	se151-152 RD	\$ 1,099.00	\$ 6,594.00	
12	channel	se151-153 RD	\$ 1,079.00	\$ 12,948.00	
6	suppt-curved beam short	se151-156 RD	\$ 1,590.00	\$ 9,540.00	
12	suppt-curved beam long	se151-160 RD	\$ 2,899.00	\$ 34,788.00	
42	Bracket Assy, Chamfered	se151-170 RD	\$ 2,392.00	\$100,464.00	
36	Outer Suppt. BMT Weldbase	se151-177 RD	\$ 1,343.00	\$ 48,420.00	
36	Outer Suppt BMT W/O base	se151-177 RD	\$ 1,188.00	\$ 42,768.00	
36	Inner Suppt BMT Weldbase	se151-179 RD	\$ 1,071.00	\$ 38,556.00	
36	Inner Suppt BMT W/O base	se151-179 RD	\$ 1,011.00	\$ 36,396.00	
	TOTAL:			\$331,770.00	

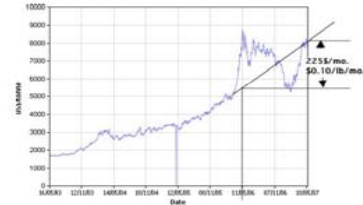
NOTE:
 Quote based on 3/16L weldments 42 qty. for item7
 Doesn't include MC-WF spacer brkts, TF coil bridge clamps,
 Assy H/dome, C11 insulation, TF pre-load ring, PFA ring, brkts., etc.
 Castaves on solution annealing and holding tolerances.
 ESTIMATE FOR COST DELTA FOR INCONEL 601 @22.50/LB WEIGHT x \$18.05/LB \$ 217,771.20
 SHIPPING, PACKAGING & INSPECTION \$ 15,000.00
 TOTAL ADJUSTED COST FOR ITEMS 1 THRU 7 \$564,541.20
 MY ESTIMATE FOR 7 ITEMS 1A,2A,3A,4A,4B,5A,5B +S,P&I \$628,795.00 ~1% HIGHER

**Material Escalation
Information**

Material price escalation - based on the prior 12 month history.



NICKEL PRICES
 For 81.17 lb/mo. Cost escalation, based on the current price of \$23,000/lb., the monthly percentage
 has reached 36.7% or ~42% per year
 Note: 1 metric tonne = 2205 lbs, pricing LBS (short and heavy)



COPPER PRICES
 For 10 cents/lb/mo. Cost escalation, based on the current price of \$3.64/lb., the monthly percentage

NCSX June 2007 ETC
 TABLE V - Basis of Estimate

WBS Number: 15
 WBS Title: Coil Support Structures
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 Job Title: Coil Support Structures Design
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