

NCSX Work Approval Form (WAF)

WBS Number: 135

WBS Title: Central Solenoid Support Structure

Job Number: 1353

Job Title: CS Support Structure Procurements

Job Manager: Fred Dahlgren

Description:

This effort covers manufacturing of the central solenoid support structure and integration of the PF1aU&L, with the structure. The pieces of structure are procured via one or more fixed price contracts. This structure is for MIE day-1 operations using the PF coils from NSTX. Labor for parts assembly activities in Job 1352. Installation labor in WBS 7.

Schedule:

See Attached

Approvals:

Job Manager	Date
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Responsible Line Manager	Date
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Project Manager	Date
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Engineering Department Head	Date
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NCSX June 2007 ETC
TABLE I - DESIGN LABOR

WBS Number: 135																											
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Job Number: 1353																											
Job Title: CS Support Structure Procurements																											
Job Manager: Fred Dahlgren																											
Description:																											
<i>Title I and II Engineering for PF Coils and Title III Support of Fabrication Effort.</i>																											
				FY07\$K					HOURS																		
Task ID	Comments			41MS	48MS	37STK	35TRVL	31OT	ORNL EM	ORNL DSN	EMEM	EMSM	EMSB	EMTB	EAEM	EASB	EEEM	EESM	EESB	EETB	ECEM	ECSB	ECTB	RM2	RM3	Basis of Estimate	
TITLE I AND TITLE II DESIGN COMPLETED																											
Title III Design																											
	Design PF1a Upper to lower interconnect bus															100											Based on prior experience with similar jobs (PLT, PDX, S1)
	Engr. & analysis of interconnect bus														80											Based on prior experience with similar jobs (PLT, PDX, S1)	
	Vendor Oversight, Inspection	2									40															Verbal quote from Construction Manager based on recent experience by shops in fabricating similar parts.	
	Disposition of deviation requests and non-conformances										20															Verbal quote from Construction Manager based on recent experience by shops in fabricating similar parts.	
	Coordination of Procurement Actions										10															Verbal quote from Construction Manager based on recent experience by shops in fabricating similar parts.	
	Subtotal Title III Design	2	0	0	0	0	0	0	0	0	70	0	0	0	80	100	0	0	0	0	0	0	0	0	0		
Notes and Worksheets																											

NCSX June 2007 ETC
TABLE II - Materials and Subcontracts

WBS Number: 135													
WBS Title: Central Solenoid Support Structure													
Job Number: 1353													
Job Title: CS Support Structure Procurements													
Job Manager: Fred Dahlgren													
Materials and Subcontracts (M&S)													Basis of Estimate
Description:													
This effort covers manufacturing of the interim central solenoid support structure and integration of the PF1aU&L, with the structure. The pieces of structure are procured via one or more fixed price contracts. This structure is for MIE day-1 operations using the old salvaged PF coils from NSTX. A new structure will be necessary for operations with the baseline PF1,2&3 coils.													
Purchased parts:													
upper and lower interface hub	\$123,488	see notes below											Includes Material surcharge as of May'07
brackets to TF structure	\$23,400												Includes Material surcharge as of May'07
spacers and tie rods	\$25,072												Includes Material surcharge as of May'07
<i>subtotal, purchased parts</i>	\$171,960												
outside engr rate =	130	\$ per hour											Not used in this estimate - build to print
outside fab rate =	92	\$ per hour											Based on SLAC internal rate & web survey
outside inspection/technician rate =	75	\$ per hour											Based on Lab shop rate & web survey
Worksheet:													
Center solenoid upperr interface hub													
Fabrication / parts costs													
Item / description		Value		Unit		Cost \$/unit		No.		Cost \$			
Center hub Weldment		92		lbs		28		1		\$2,576			Based on similar parts fabr. cost
Upper solenoid hub weldment Assy		236		lbs		28		1		\$6,608			Based on similar parts fabr. cost
Machining of upper hub weldments, 2 setups		64		hrs		92		1		\$5,888			Based on Lab Shop estimate
Inspection		8		hrs		75		1		\$600			Based on Lab Shop estimate
Insulation and shims between weldments		1		interface		1500		12		\$18,000			Based on similar parts fabr. cost
misc bolts and assembly hardware-upper		1		lot		10000		1		\$10,000			Based on B&G quote for Inconel 718 h'dware - See Table V
lower solenoid hub weldment Assy		236		lbs		28		1		\$6,608			Based on similar parts fabr. cost
Machining of lower hub weldments, 2 setups		64		hrs		92		6		\$35,328			Based on Lab Shop estimate
Inspection		8		hrs		75		6		\$3,600			Based on Lab Shop estimate
Insulation and shims between castings		1		interface		1500		12		\$18,000			Based on similar parts fabr. cost
misc bolts and assembly hardware-lower		1		lot		10000		1		\$10,000			Based on B&G quote for Inconel 718 h'dware - See Table V
Package & Shipping										\$5,000			Based on past experience on similar projects
										\$107,208			
Material Surcharges & delta: 316L - Inconel 601		564		lbs		20				\$11,280			Based on Huntington verbal Quote for Inconel 601
													Adjusted Total
										\$123,488			
Brackets to TF structure													
Fabrication / parts costs													
Item / description		Value		Unit		Cost \$/unit		No.		Cost \$			
Upper tie plate to TF coil structure		500		lbs		8		1		\$4,000			Based on similar parts fabr. Cost
Machining of upper and lower crown segment casting		40		hrs		92		2		\$7,360			Based on Lab Shop estimate
lower brackets to TF coil structure		30		lbs		8		6		\$1,440			Based on similar parts fabr. Cost
machining of lower brackets		16		hrs		92		6		\$8,832			Based on Lab Shop estimate
										\$12,800			
Material Surcharges & delta: 316L - Inconel 601		530		lbs		20				\$10,600			Based on Huntington verbal Quote for Inconel 601
													Adjusted Total
										\$23,400			

NCSX June 2007 ETC
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Materials and Subcontracts (M&S)							
							Basis of Estimate
Center Solenoid assembly hardware							
Item / Description	Value	Unit	Cost \$/unit	No Units	Cost \$		
1"OD, 96" long Tie Rods	90	lbs	25	6	\$2,262	Based on cost of threaded rod	
G-10 separation discs & misc.	150	lbs	20	7	\$21,000	Based on similar parts fabr. Cost	
		<i>subtotal of assembly hardware</i>			\$23,262		
Material Surcharges & delta: 316L - Inconel 601	90		20		\$1,810	Based on Huntington verbal Quote for Inconel 601	
				Total:	\$25,072		
Center Solenoid PF1a Upper to Lower interconnect							
Bus Fabrication / parts costs							
These estimates are based on prior job experience and quotes received for Inconel hardware from B&G and Solon Washers - Braze alloy-Mcmaster-Carr							
Item / description		lbs/ft.	\$/lb	No. of Units			
Copper OFHC extrusion 3/4"sq. w/.38dia hole	10	1.75	\$4.25	2	\$74.38		
CTD-112 (or equiv.) Epoxy/Glass pre-preg. Insulation 1" rolls		per roll	\$98.00	4	\$392.00		
Bend return & supply bus segments	12	hrs	\$81.00	2	\$1,944.00		
Wrap & cure bus segments	40	hrs	\$81.00	1	\$3,240		
Machine & assemble (braze) LN2 fittings	8	hrs	\$81.00	4	\$2,592.00		
Cut & bend Cu Jumpers	12	hrs	\$81.00	2	\$1,944.00		
Silver-braze & clean-up jumper lead-stem mtg. plates	8	hrs	\$81.00	8	\$5,184.00		
Cut & machine jumper/lead-stem mtg. plates	16	hrs	\$81.00	8	\$10,368.00		
Cut & Machine G11 clamps	12	hrs	\$81.00	3	\$2,916.00		
Hardware B'ville washers -Inconel718			\$38.50	64	\$2,464.00		
Hardware Inconel hex nuts 1/2-13			\$32.00	32	\$1,024.00		
Hardware Inconel 718 hex bolts 1/2-13 x 2"			\$42.00	32	\$1,344.00		
Silver brush plate all bolted bus surfaces			\$20.00	8	\$160.00		
Handy-Harman Silver braze BA9-1 easy-flo-45 filler alloy	5	oz.	\$109.83	1	\$109.83		
		<i>subtotal of assembly hardware</i>			\$33,756.21		
TOTAL JOB 1353					\$205,715.71		
Notes:							
Labor for parts assembly should be in Job 1352							
Labor for installation should be in Machine Assembly Task							

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TABLE III - Fabrication/Assembly Installation

WBS Number: 135																		
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Job Title: CS Support Structure Procurements																		
Job Manager: Fred Dahlgren																		
In-house Fabrication and Assembly and Installation																		
Description: N/A Assembly covered in job 1352																		
Worksheets																		
Labor for parts assembly should be in Job 1352																		
Labor for installation should be in Machine Assembly Task																		

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TABLE IV - Uncertainty of Estimate and Residual Risk Assessment

WBS Number: 135													
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Job Manager: Fred Dahlgren													
Uncertainty of the Estimate													
		<u>High</u>	<u>Medium</u>	<u>Low</u>	Uncertainty Range (%)	<u>Comments/Other Considerations</u>							
	Design Maturity	X			-5%/+10%	Design complete							
	Design Complexity			X		Simple weldments							
Other uncertainties not considered:													
(1) Material cost escalation higher than predicted. Perhaps 10% increase in material costs, but alternate materials are possible. (10% increase in mat'l \$ relatively small, ~1400lbs x \$3 = 4.2k\$ @)													
(2) Fabrication delays due to material availability. Huntington has quoted 13 weeks ARO. Alternate vendors possible, but very low consequence since could be assembled as part of last subassembly.													
Note: High/Medium/Low uncertainty assessment from Job Manager. Uncertainty range based on ACEI recommended practice 18R-97 as amended for NCSX.													
Residual Impacts													
							Cost Impact		Schedule Impact				
Job	Risk Description				Likelihood of Occurring	Mitigation Plan		Basis of estimate		Low	High	Low	High
NONE													
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=Unlikely (40%>P>10%), VU=Very Unlikely (P<10%), NC=Non-credible (P<1%)												

NCSX June 2007 ETC
TABLE V - Basis of Estimate

WBS Number: 135
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Job Number: 1353
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Job Manager: Fred Dahlgren

Basis of Estimate

APR.03'2007 08:56 2158221006

SHOP.BGMFG.COM

#3781 P.001/001

Jack McAuliffe

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

B&G Inconel Hardware
Quote

Jack,

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

- 718 Inconel Hex Head bolts - 1-8 n.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~~
- OFFER 8M- 316SS*
- 316/316L ss Hex Head bolts - 1-8 n.c. x 2.5", qty. 500 - ~~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



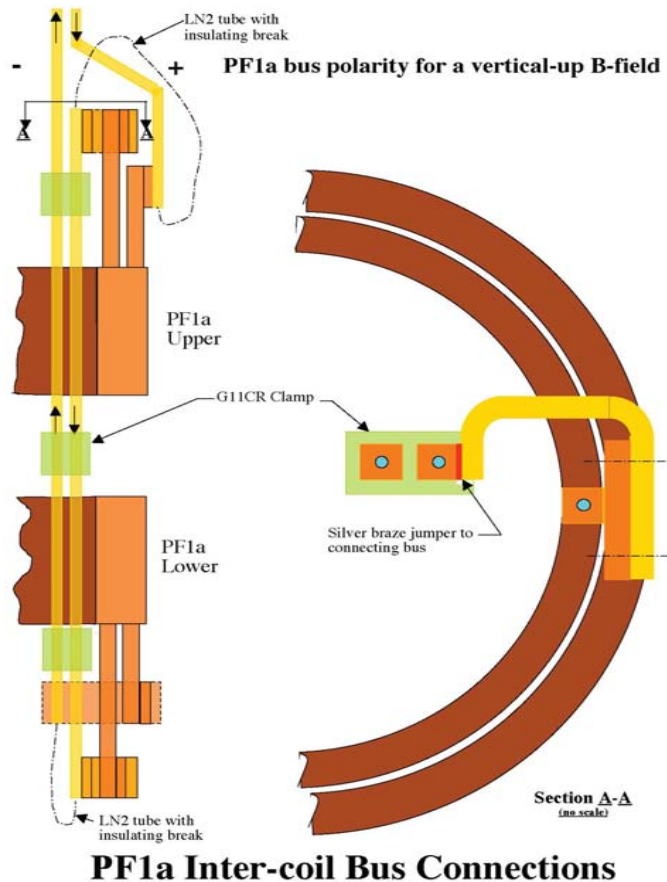
Jack McAuliffe
800-217-1360

4/8/07

VALTRA
SS. SWING BOLTS

Subject=Quote Request!

4/2/2007



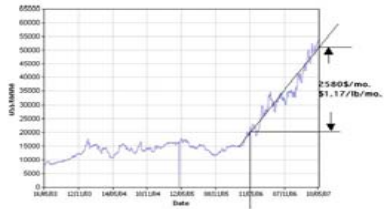
F.D. 9/15/06

NCSX June 2007 ETC
TABLE V - Basis of Estimate

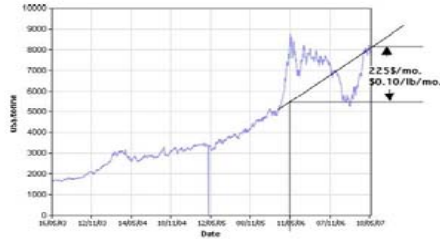
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Material Escalation Information

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



NICKEL PRICES
For \$1.17/lb/mo. Cost escalation, based on the current price of \$23.00/lb., the monthly percentage rise would be 5% or -60% per year.
Note: 1 Metric Tonne = 2200 lbs, pricing LME (cash purchased)



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

MOLYBDENUM - NORTH AMERICA
US\$ >>> Jan. 2002 to Mar.11, 2007



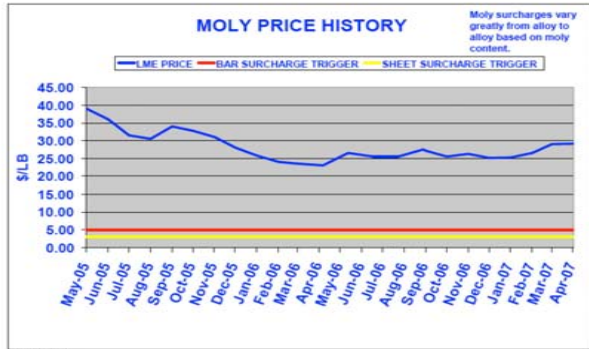
CURRENT PRICE
\$30.25/lb
WWW.ADANACMOLY.COM



ALUMINUM PRICES
Aluminum prices have been relatively stable over the past year

NCSX June 2007 ETC
TABLE V - Basis of Estimate

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From:FERGUSON METALS

04/20/2007 16:44 #165 P./001/001

3475 Symmes Road
Hamilton, OH 45015
Phone: 1-800-347-2376
Fax: 513-874-6857

FACSIMILE

TO: Fred FROM: Frank Mefford
fmeford@fergusonmetals.com

COMPANY: Princeton University DATE: 4/20/2007

FAX NUMBER: 609-243-3030 TOTAL NO. OF PAGES INCLUDING COVER: 1

RE: RFQ QUOTE VALID FOR: 15 Days

SALES QUOTE

Part No.	Description	MS	Width	Length	Quantity	Weight	Price
625 .500	36x120	5599	36	120	20	13,560#	16.00+sur
625 .750	36x120	5599	36	120	6	6,090#	16.00+sur

Quoted + surcharge at the time of shipment: 16.5
11.5
w surc. #/lb → \$ 27.50

FCB:45015
Estimated Lead Time: 14 weeks
** Subject to prior sale.

Thanks for the opportunity.

Frank Mefford
Frank Mefford

Inconel 625 Quote

A286?

In-Stock and On-Time
Specialty Stainless Steels & Alloys

NCSX June 2007 ETC
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3475 Symmes Road
Hamilton, OH 45015

Surcharge Totals for February 2007 – June 2007

Grades	February 2/1/07 - 2/28/07	March 3/1/07 - 3/31/07	April 4/1/07 - 4/30/07	May 5/1/07 - 5/31/07	June 6/1/07 - 6/30/07
15-5	0.6606	0.7188	0.8284	0.9719	1.0645
15-7	1.6736	1.7734	1.9641	2.2500	2.4095
17-4	0.5820	0.6346	0.7327	0.8630	0.9468
17-7	1.2753	1.3793	1.5773	1.8250	2.0024
18SR	0.1254	0.1318	0.1555	0.2028	0.2246
201	0.8050	0.8784	1.0079	1.1733	1.2887
301 7.0%	1.2545	1.3462	1.5370	1.7785	1.9520
302/304/304L	1.4215	1.5257	1.7421	2.0128	2.2098
304-8.5%	1.4924	1.6127	1.8419	2.1263	2.3341
305	2.0182	2.1772	2.4821	2.8553	3.1332
309	2.0786	2.2427	2.5561	2.9401	3.2309
310	3.2314	3.4810	3.9504	4.5333	4.9847
316/316L	2.2533	2.3962	2.6703	3.0543	3.2930
317L	2.6845	2.8430	3.1467	3.5994	3.8544
321	1.5916	1.7166	1.9552	2.2522	2.4679
347	1.5710	1.6970	1.9374	2.2351	2.4519
409/409 Mod	0.0940	0.1079	0.1319	0.1758	0.1861
410/410S	0.0793	0.0942	0.1201	0.1651	0.1777
438	0.0941	0.1105	0.1382	0.1865	0.2074
434	0.2898	0.3082	0.3398	0.4103	0.4320
439	0.1248	0.1404	0.1660	0.2140	0.2353
440A	0.0941	0.1105	0.1382	0.1865	0.2074
Alloy 286	4.1038	4.0626	4.3748	4.5969	5.2099
Alloy 625	10.9488	10.7978	11.5031	12.1638	13.6292
Alloy 718	8.4408	8.3176	8.9608	9.5080	10.7534
Alloy HX	9.2413	9.1268	9.7192	10.2307	11.4262

Order Hotline
1.800.347.2376

www.fergusonmetals.com fax: 513.874.8857 salesquote@fergusonmetals.com

5/7/2007 1:08:00 PM