

## NCSX Work Approval Form (WAF)

**WBS Number: 172**

**WBS Title: Base Support Structures**

**Job Numbers: 1702 and 1752**

**Job Title: Base Support Structure Design (1702)**

**Job Title: Base Support Structure Procurements (1752)**

**Job Manager: Fred Dahlgren**

**Description:**

This WBS element consists of the design and fabrication of the base support structure. The base support structure consists of the base column assemblies, interconnecting beams and column base hardware.

**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: 172  
WBS Title: Base Support Structures  
Job Numbers: 1702 and 1752  
Job Title: Base Support Structure Design (1702) and Base Support Structure Procurements (1752)  
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 EM	ORNL DSN	EADD	EMSM	EMSB	EMTB	EAD*	EASB	EEEM	EESM	EESB	EETB	ECEM	ECSB		ECTB	RM2	RM3	
<b>TITLE I AND TITLE II DESIGN COMPLETED</b>																								
Base Support layout & design							420																	Based on prior engineering experiences; e.g. S-1, PLT, PDX, PBX-m
Design engrg. & analysis								12					320											
PDR prep													12											
Disposition PDR chits													16											
FDR prep								16					16											
Prepare SOW/RFQ													12											
Disposition FDR chits								32					24											
<b>Total Title I &amp; II</b>							<b>480</b>						<b>400</b>											
<b>Title III Design</b>																								
Vendor Oversight, Inspection													20											
Disposition of deviation requests and non-conformances													16											
Coordination of Procurement Actions													8											
<b>Subtotal Title III Design</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>44</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	

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TABLE II- Materials and Subcontracts

WBS Number: 172

WBS Title: Base Support Structures

Job Numbers: 1702 and 1752

Job Title: Base Support Structure Design (1702) and Base Support Structure Procurements (1752)

Job Manager: Fred Dahlgren

Materials and Subcontracts (M&S)	Basis of Estimate
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Description:

The base support structure is the main gravity load carrying structure (~250,000lbs) for the entire machine. It must provide the gravity load path from the machine and distribute these loads to the test cell floor. It must also be capable of withstanding horizontal seismic accelerations of 0.13g and vertical accelerations of 0.07g.

Purchased parts:	(ft.)	lbs./ft.	\$/lb.	cost	
4 - W12 x 26 x 24' - 316L stainless steel	96	26	\$7.50	\$18,720.00	Verbal quote StainlessStructurals - recent (early April 2007) - \$/lb
4 - W8 x 15 x 24' - 316L stainless steel	96	15	\$7.50	\$10,800.00	Verbal quote StainlessStructurals - recent (early April 2007) - \$/lb
3/4" - 316L plate 36" x 48" base hub plate	4	95	\$7.50	\$2,850.00	Quote , metal suppliers online - See Table V
3/4" - 316L plate 36" x 48" top & bottom base column bases	4	95	\$7.50	\$2,850.00	Quote , metal suppliers online - See Table V
Weld rod & roto-bores				\$3,000.00	PPPL Shop estimate - see Table V - adjusted by WBS Manager
12 - Inconel 718 hex bolts 1-8 x 2.5" @ \$55 ea.				\$660.00	Quote B&G fabricators - See Table V
12 - Inconel 718 hex nuts 1-8 @ \$38 ea.				\$456.00	Quote B&G fabricators - See Table V
24 - 316 SS flat washers 1.03" ID @\$4.26 ea.				\$102.24	Catalog item McMaster-Carr - see Table V

**Total Materials** **\$39,438.24**

Labor - PPPL:	hrs.	
Welding (4hrs @ 48 places)	192	PPPL Shop estimate - see Table V - adjusted by WBS Manager
Welding (4hrs @ 24 places)	96	PPPL Shop estimate - see Table V - adjusted by WBS Manager
Cut & Drill plates	75	PPPL Shop estimate - see Table V - adjusted by WBS Manager

**Job Totals:** **363**

**NCSX June 2007 ETC**  
**TABLE III - Fabrication and Assembly**

**In-house Fabrication and Assembly and Installation**

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Included in Table II

TABLE IV - Uncertainty of Estimate and Residual Risk Assessment

WBS Number: 172

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Job Manager: Fred Dahlgren

**Uncertainty of the Estimate**

Job	High	Medium	Low	Uncertainty	Comments/Other Considerations
				Range (%)	
<b>Job 1702</b>				-10%/+15%	
Design Maturity		X			Design is near PDR, but nothing exotic Standard parts and components
Design Complexity			X		
<b>Job 1752</b>				-10%/+15%	
Design Maturity		X			Design is near PDR, but nothing exotic Standard parts and components
Design Complexity			X		
Other Comments:					
Possibility that vendor will not deliver on time, however, significant float (~4 months exist off critical path) => other vendors could be identified.					
There is a finite likelihood of material costs increasing, but already assumed an escalation of ~5%/year for Inconel, HOWEVER, recent history indicates possibility of a much higher escalation (Table V)					

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

**Residual Impacts**

Job	Risk Description	Likelihood of Occurring	Mitigation Plan	Basis of estimate	Cost Impact		Schedule Impact	
					Low	High	Low	High
Jobs 1702 and 1752 - 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=Unlikley (40%>P>10%), VU=Very Unlikely (P<10%), NC=Non-credible (P<1%)

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TABLE V - Basis of Estimate

WBS Number: 172  
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Job Manager: Fred Dahlgren

PPPL Engineering/Tech Shop Estimate

Metal Suppliers Internet Quote

**NCSX Base Support Structure Fabrication - Job 1752**

Preliminary fabrication estimate based on unsigned drawings received from J. Rushinski  
4/12/07

304 SS W8 x 15 equivalent, 6 pcs 24' @ \$2,797 ea*	\$17K
304SS W4 I-beam, 3 pcs 24' @ \$1,400 ea	\$ 5K
304SS 1/2" plate, 1 pc @ \$4,233 ea*	\$ 5K
Weld rod and rotobores	\$ 3K
Subtotal materials	\$30K
G&A on materials @ 25%	\$ 8K
<b>Total Materials</b>	<b>\$38K</b>

Welder @ 4 hrs per W8 I-beam "T" weld for 36 locations	144 MH
Welder @ 2 hrs per W4 I-beam "T" weld for 12 locations	48 MH
Metalsman to cut and drill beams	66 MH
<b>Total man-hours</b>	<b>258 MH</b>
<b>Total labor cost at \$81/hr loaded</b>	<b>\$21K</b>
<b>Total cost (loaded)</b>	<b>\$59K</b>

\*quote from Samson Metals 4/23/07

WBS 172 NCSX Base Support Structure Fabrication.doc  
Created on 5/15/2007 8:25:00 AM

Metal Suppliers Online Business Procurement Center 05/02/2007 11:42 AM

**Response To Request**

To: Fred Dahlgren  
PPPL  
PO Box 451  
Princeton, NJ 08543

Buyer Quote#: B-Q-3  
Supplier Quote#: rick a  
RFQ ID#: 106017

From: Metal Suppliers Online  
PO Box 711  
Hampstead, NH 03841  
p: (603) 329-0101  
f: (603) 329-0171  
sales@metalsuppliersonline.com

RFQ Exp Date	RFQ Del Date	Ship Via	F.O.B.	Freight Terms
4/30/2007	8 weeks ARO	No Preference	Shipping Point	Freight PPD @ All

Quantity	Units	Description	Unit Price	Total (\$ US)
10	pieces	Stainless Steel 316L Plate Thickness: 0.75 in Width: 36 in Length: 96 in solution annealed plate Domestic Material Required Shipping From: Rochester Hills, MI 48306	\$4,971.30/piece	\$49,713.00
<b>Subtotal:</b>				\$49,713.00
<b>Total:</b>				\$49,713.00

This purchase is tax exempt.  
We consider alternate offers.  
Accepted Payment term: New Account  
This offer expires in 10 days.

Get Freight Quoted Issue P.O. Issue P.O. w/exceptions

http://www.metalsuppliersonline.com/Shop/MyBuying/ViewResponse.aspx?RFQID=61008

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

**B&G Quote**

APR 02 2007 08:56 2158221006 8009-BGR05.COM #3781 P.02/021...

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

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**  
**QTY: 500 - 316 SS - 316 SS**  
 316/316L ss Hex Head bolts - 1-8 n.c. x 2.5" qty 500 - **18.75 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

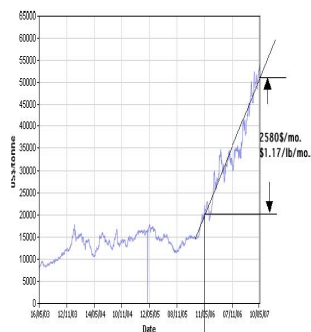
**B&G** Jack McAuliffe  
 800-217-1360  
 4/9/07

**VALTRA**  
 SS SWING BOLTS

Subject-Quote Request:

4/2/2007

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



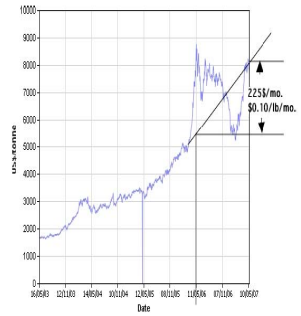
**NICKEL PRICES**

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 purchases)

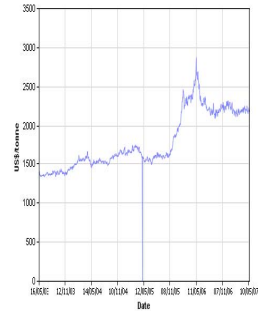
**Material Escalation  
Information**

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



**COPPER PRICES**

For 10 cents/lb/mo. Cost escalation, based on the current price of \$1.64/lb., the monthly percentage



**ALUMINUM PRICES**

Aluminum prices have been relatively stable over the past year



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 TABLE V - Basis of Estimate

