

NCSX Work Approval Form (WAF)

WBS Number: 133

WBS Title: External Trim Coils

Job Number: 1354

Job Title: Trim Coil Design and Procurement

Job Manager: Mike Kalish

Description:

Includes all activities to design and fabricate/procure trim coils needed for field error correction.

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

WBS Number: 133																													
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Materials and Subcontracts (M&S)																													
Description:																								HOURS					
	41MS	48MS	37STK	35TRV	L	31OT	ORNL EM	ORNL DSN	EEMEM	EEMSM	EEMSB	EEMTB	EAEEM	EASAB	EEMEM	EESM	EESB	EETB	ECEM	ECSB	ECTB	RM2	RM3	Basis of Estimate					
Procurement & Fabrication																													
Conductor Procurement	0.7																											Outokumpu Quote - see Table V	
Coil Tooling	12.5																											Everson quote for Jupiter 2 Coil - see Table V	
Fabrication of Coil	20.5																											Vendor Quote for Jupiter 2 Coil - see Table V	
Trim Coil Structure, Materials	5													24													Assumes Coils Bolted to Inconel Plate and mounted on studs (\$30/pound for Inconel Plate)		
Trim Coil Structure, Fabrication													40	16													Fab for Two plates		
Trim Coil Structure Installation													80	24													Two Techs Installing two coils on two plates, Studs into Mod Coil Form		
	38.70													120	64														

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TABLE III - Fabrication/Assembly Installation

In-house Fabrication and Assembly and Installation																	
Description: Incl in M&S Table II																	

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TABLE IV - Uncertainty of Estimate and Residual Risk Assessment

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Uncertainty of the Estimate

	<u>High</u>	<u>Medium</u>	<u>Low</u>	<u>Uncertainty Range (%)</u>	<u>Comments/Other Considerations</u>
Design Maturity		X			Early stages of determining trim coil requirements - but costs small (probably under \$100K)
Design Complexity			X	-10%/+15%	Present requirement is for a round two turn coil. Simple coil design.

Other comments: Although price of Cu variable (see Job 1352 discussion), so little Cu needed for these coils, no considered a significant uncertainty

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
1354	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

Notes:

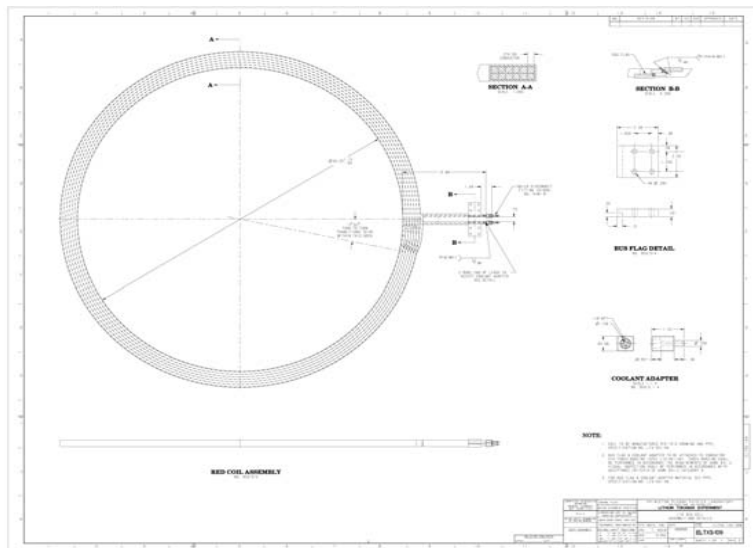
- [1] Low cost and schedule impacts are considered the minimum (0-percentile) impacts should the event occur.
High cost and schedule impacts are considered the maximum (100-percentile) impacts should the event occur
- [2] Cost impacts should be entered as man-hours (by demographic) and M&S direct cost 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%)

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M&S Estimate Backup

Estimate for More Complex Coil (based on Jupiter II)
 Drawing of 4th LTX Coil



Backup for LTX Costs

PRICE ANALYSIS WORKSHEET

DATE	REQUISITION NO.	REQUESTOR	POSUBCONTRACT
	48623	MS/GR/PP	07-018-W

COMPARISON OF COMPETITIVE QUOTES OR COMPARISON TO PRICE HISTORY FOR SAME/SIMILAR ITEMS

ITEM	DESCRIPTION	QTY	SUPPLIER PRICES	
			New England Trim Coil	Electric Time
1	LTX RED COIL	2	\$3,180.00	\$10,250.00
2	LTX BLUE COIL	2	\$8,900.00	\$12,400.00
3				
4				
5				
6				
7				
8				
9				
10				
Total:			\$24,080.00	\$45,970.00
FOR PAID:			DATE	DATE
DELIVERY:			AS REQUIRED	12 Wks
PAYMENT TERM:				

FOR PRICE HISTORY COMPARISON, IF APPLICABLE, DESCRIBE IMPACT OF TIME, QUANTITY, OR PRODUCT DIFFERENCES:

USE OF ROUGH YARDSTICKS (DESCRIBE BASIS BELOW OR ON ATTACHED SHEETS)

INDEPENDENT PRICE ESTIMATE (DESCRIBE BASIS BELOW OR ON ATTACHED SHEETS)

PPL-P04 (Rev. 9, 06/20/04)

Assumed 2 coils

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Outomumpo Estimate

PRINCETON PLASMA PHYSICS

FAX 609-243-3248
 Tel 609-243-2277



1 (1)
 May 9, 2007

RFO on copper conductor

Dear Mike,

Please find our offer as follows:

Product specification and quantity:

- * CDA102 Copper, soft temper
- * Size 20mm Square with round 9mm ID, Outokumpu tool # 8456
- * In pancake coils of approximately 100 ft
- * Qty to be determined later.

Pricing:

Fabrication cost:	Up to 500lbs	One lump sum \$3,980 plus copper value
	1,000lbs	FAB \$ 4.90/lb plus copper value
	2,000lbs	FAB \$ 3.10/lb plus copper value

For Silver-bearing copper (CDA 107) add \$0.16/lb

The copper value based on the Comex market for November 2004 shipments is currently \$ 1.57/ lb.

The copper value may be firmed for the month of shipment the day an order is placed, up to two weeks prior to the confirmed ex mill date, or will be automatically firmed at Outokumpu published price the Friday preceding the confirmed ex mill date.

Payment terms:

60 days from the date of invoice. Subject to credit approval.

Lead time and delivery terms:

Ex mill Pori, Finland, November 4, 2004 plus 4 weeks (estimated) ocean transit. Delivered Duty Paid (DDP Incoterms 2000) to Princeton, NJ.

Other Terms:

According to the Outokumpu Foricopper Oy's General Terms for Sales (has been supplied earlier). The interest rate in the USA for overdue payment is 12%.

Sincerely,

Outokumpu Copper – Electrical Power & Components

Petri Nordling
 Sales Manager

Cc: Asko Hakkinen, Paivi Nieminen, Denise Nolan

OUTOKUMPU COPPER – EPC Europe Division
 801 Pittsburgh Drive, Delaware OH 43015 / Tel. 740-368-7946 / Fax 740-363-3847

PPPL Calculation for Conductor Procurement

Copper Cost Estimate for Trim Coils
 Note : Includes 25% spare in final cost calculation

$$\text{Circumference} = (.5m) \times \pi$$

$$\text{Length} = 4 \times \text{Circumference}$$

$$.323 \frac{\text{lb}}{\text{in}^3} \left[(.797\text{in})^2 - \pi \left(\frac{.354\text{in}}{2} \right)^2 \right] \text{Length} = 41.624\text{lb}$$

$$\text{Weight} = .323 \frac{\text{lb}}{\text{in}^3} \left[(.797\text{in})^2 - \pi \left(\frac{.354\text{in}}{2} \right)^2 \right] \text{Length}$$

For 2 coils using Outo Kumpu Quote

$$\text{Weight} = 2 \times 1.25 \left(\frac{3.10 + 1.57}{\text{lb}} \right) = 485.958 \text{ dollars at time of quote}$$

$$\text{Weight} = 2 \times 1.25 \left(\frac{3.10 + 3.14 + 16}{\text{lb}} \right) = 165.98 \text{ dollars}$$

inflated to 407
 2-10=engineering
 3-14=copper
 16= silver bearing

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Basis of Tooling Estimate

RFQ-23-2004 14:30 6107465230 P.02/03



April 22, 2004

Ms. Ariene White
Princeton University
Plasma Physics Laboratory
PO Box CN-17, MS-12
Princeton, NJ 08543

Subject: RFQ Req. # 04-042-W
Everson Tesla Quotation No. 4039

Ms. White,

Thank you for your interest in Everson Tesla, Inc. and your Request for Quotation for the Jupiter 2 Electro Magnetic Coils. We are pleased to provide the following offer.

Jupiter 2 Electro Magnetic Coils:

Quantity: 10 each

Unit Price: \$4,775.00 USD each

Total Price: \$47,750.00 USD

Tooling Charge: \$12,450.00 (Non-recurring one time charge for 1 combination winding mandrel/mold and lead formers)

Scope of Work: Manufacture 10 each, Jupiter 2 Electro Magnetic Coils per Drawing # B-J2P001 and # B-J2P002, Rev. 0, dated 3.23.04

Delivery: 16 weeks ARO

Payment Terms: Net 30 days
FOB Destination
Freight Terms: Prepaid & Included

Tooling: Will be invoiced upon completion, Net 30 days

Price Validity: 60 days

We thank you for your inquiry and look forward to working with you on this project. Please feel free to call with any questions or concerns.

610 Daniels Road - Nazareth, PA 18064 • (610) 746-1530 • FAX (610) 746-4830
www.evertesla.com