

**Job 1260 Neutral Beam Transition Duct**

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|  | SC Project Review of NCSX, April 8-10, 2008 |  |

**(NBTD)**

P. L. Goranson

**Functional requirements**



• **NBTD provides interface for:**

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|  | SC Project Review of NCSX, April 8-10, 2008
P. L. Goranson - page 2 |  |

**- Man access into Vacuum Vessel (opening 13.5” wide x 34” tall)**

**- Mounting vacuum pumping system (13.5” id Port)**



**- Mounting Neutral Beam units**

**- Mounting diagnostics**

**- Mounting Lateral Supports and positioning**

**VV toroidally**

* **In addition, the NBTD must penetrate and**

**seal to the Cryostat.**

* **NBTD operates at 350C at its mounting flange during bakeout; most**

**of construction must be Inconel.**

**Design Status**



* **Models were completed (2003) and were reviewed several years**

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|  | SC Project Review of NCSX, April 8-10, 2008
P. L. Goranson - page 3 |  |

**ago**

- **Must reaffirm design, hold peer review and work toward SRD**

- **A PDR is required**

* **Baseline was changed for a time to incorporate simplified ducts**

**(Man Access Ports) which did not mount NB’s.**

* **Lateral support drawings were completed.**

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|  | SC Project Review of NCSX, April 8-10, 2008
P. L. Goranson - page 4 |  |

**Vacuum Pumping Port**

**NB Port**

**Man Access**

**VV Interface**

**Lateral Support (top and bottom)**



**NBTD showing Lateral Supports**

**TOP VIEW**

**NBTD Preliminary Drawings**

SC Project Review of NCSX, April 8-10, 2008

P. L. Goranson - page 5



**Based in recent MDL & NCSX experience**

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**Assume 2 people for ~1/2 Weeks - based on MDL & NCSX experience**

**Assume 2 drawings @ 20 hr each - based on MDL & NCSX experience**

**Assume 3 drawings @ 40 hr each - based on MDL & NCSX experience**

**Assume 1 drawing @ 40 hr each - based on MDL & NCSX experience**

**Assume 1 drawing @ 40 hr each - based on MDL & NCSX experience**

**Assume 1 drawing @ 40 hr each - based on MDL & NCSX experience**

**Based in recent MDL & NCSX experience**

**Milestone - no resources**

**Based in recent MDL & NCSX experience**

**Assume 2 drawings @ 40 hr each - based on MDL & NCSX experience**

**Based in recent MDL & NCSX experience**

***Subtotal Title III Design 140***

**Procurement coordination 20**

**Update of drawings as Needed 80**

**Title III**

**Disposition of deviation requests and non-conformances 40**

**800**

***Subtotal Title I & II Design***

**Resolve PDR Chits 40**

**Final Design Review 0**

**Prepare for FDR Neutral Beam Transition Duct 40**

**Stress analysis 160**

**Review of Drawings 40**

**Review and Update Misc Det & Cuts Dwgs 40**

**Review and Update Weldment Dwgs 120**

**Review and Small Large Rect Port Dwg 40**

**Review and Update Large Rect Port Dwg 40**

**Review and Update Port Mod Dwg 40**

**Resolve PDR Chits 40**

**PDR for NBTD 0**

**Prepare for PDR Neutral Beam Transition Duct 40**

**Review and Update Assbly Dwgs 80**

**Title I an II Design**

**Peer Review to Establish Requirements 80**

**Labor Cost**

SC Project Review of NCSX, April 8-10, 2008

P. L. Goranson - page 6



**M&S Cost**

Costs reflects recent significant increase in Inconel price.



Lateral supports added.

This element consists of the port duct, seals, and all cover flanges

weight of shell assembly, with ports 1400 lbs

$/lb for fabrication 51 $/lb Includes recent vendor Inconel quotes

subtotal, fab cost shell **$71,400**

Ports

8" o.d. flange, 6" tube 225

no. of 16.5" ports

o.d. rotatable cover flange $/ea MDC catalog 10

no. of 8" ports MDC catalog 10

1 25

7ea

cost for 8" ports $2,450

14.5" x 16.5" flange with tube(ss) 1500 $/ea **NCSX/MDL experience**

blank 14.5" x 16.5" flanges(ss) 1000 $/ea **NCSX/MDL experience**

no. of 14.5" x 16.5" ports 2ea

cost for 14.5" x 16.5" ports $5,000

16.5" o.d. flange, 14" tube 1000 $/ea MDC catalog 10

16.5" o.d. rotatable cover flange 710 $/ea

2ea

8"

$/ea

$3,420

cost for 16.5" ports

large square flange cover, ss $4,000

o-ring seals for diamond flange and square flange $2,530

subtotal, ports **$17,400**

Fabricate and install lateral support $8,000$/ea

number of supports 2 ea

subtotal for support **$16,000**

Total, each nbi port duct extension **$104,800**

no. of nbi duct extensions 3

**total, 3 extensions $314,400**

None of the above includes an interface to the cryostat.

SC Project Review of NCSX, April 8-10, 2008





P. L. Goranson - page 7

**Schedule & Staffing**

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P. L. Goranson - page 8 |  |

**Schedule**





**Staffing**

**P. L. Goranson – 80% during Title I & II design.**

**Gary Lovett – 100% during Title I & II.**

**Schedule and Cost Risk**



**Uncertainty of the Estimate**

**Uncertainty**

**High Medium Low Range (%)**

**Design Maturity X**





**-10%/+15%**

**Design Complexity X**

**Other Comments:**

**Mitigation**

**Cost Impact Schedule Impact**

**Likelihood**

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|  | SC Project Review of NCSX, April 8-10, 2008
P. L. Goranson - page 9 |  |

**Job Risk Description of Occurring Mitigation Plan Basis of estimate Low High Low High**

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|  |
| **1260 Design is vintage and revisit could result in criteria U Schedule was made more Engineering hours to redo 200 hrs 400 hrs 0 0** |
| **changes, i.e. diagnostic requirements, number of aggressive with early start to models and hold design ORNL EM ORNL EM****ports, NB alignment, further design review, etc. assure ageement with design. review.** |