<i>TO</i> :	P. Heitzenroeder
FROM:	M. Cole

SUBJECT: NB Transition Ducts Job 1260

Date: September 15, 2008

Scope

This job covers the design, procurement, fabrication, and Title III support of the NB port extension.

Work in this WBS ends with the installation of the NB port extension installed on the machine.

<u>Status</u>

Early in the project the NB port was placed on hold in favor of a less expensive design for startup. We were asked to return to the early NB port configuration as defined in Job 1260. When the job was restarted we had investigated areas of man access from a safety perspective and found that modifications to the port size to agree with safety's requirements could be made. Interface issues with the cryostat were being investigated and will be reported in Job 823. The design of the NB port was being reviewed to determine if the port still met the original requirements for diagnostics, vacuum pumping, and NB positioning. At the time of the closeout we were preparing for a preliminary discussion to determine if the port was acceptable as is or if modifications to the design would be required.

Interfaces

Vacuum Vessel Neutral Beam Port, WBS 12, SE120-004 Cryostat, WBS 17, STB-CRYOSTAT.ASM Vacuum Pumping, WBS 22 Neutral Beam, WBS 25 Diagnostics, WBS 3

Specifications

No additional specifications were identified as being needed at the time of the closeout.

Schematics and PIDs

None Required

Models

NB Port Extension, SE122-068.ASM

Drawings

No Drawings had been completed at the time of the closeout.

Analyses

No analysis had been completed at the time of the closeout. A structural and thermal finite element analysis would be required as part of the completion of detailed design.

Testing

None required

Costs/Schedule

Cost estimates were updated on the latest WAF and were included in the 08 Lehmann review.

								FY08 FY09 FY10
1260-80	Prep for PDR	65	3	OJUN08	30SEP08	318	30,200.00	cmiem=200
1260-95	PDR	0			30SEP08	318	0.00	
1260-100	Design Update and review	65	0	10CT08*	12JAN09	318	99,486.80	omlem= 440; ea//em=160
1260-110	FDR	0			12JAN09	318	0.00	
1260-120	Requisition, Bid and Award Duct contract	40	1	3JAN09	09MAR09	318	0.00	
1260-130	Fabr & deliver 3 port duct extensions incl suprts	260	0	10CT09*	18OCT10	174	420,831.66	41=\$314.4k
1260-140	Title III	402	1	3JAN09	18AUG10	1.054	16,188.70	

Remaining Work

- Analysis of vacuum loading on NB port
- Prepare and present PDR. Resolve comments from PDR.
- Complete design and drawings of Neutral Beam port.
- Prepare and present FDR. Resolve comments from FDR

Lessons Learned: None

<u>Conclusion</u>: At the time of Project termination, the work on the preliminary design was just commencing (See April 08 Lehman Presentation by Paul Goranson - attached)



Job 1260 Neutral Beam Transition Duct (NBTD)

P. L. Goranson



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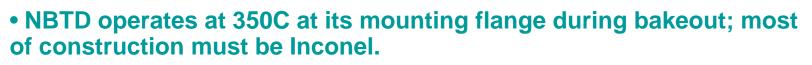
Functional requirements



- NBTD provides interface for:
- 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

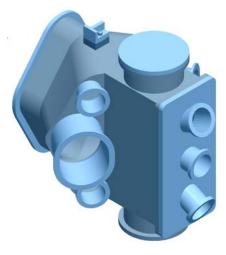
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• In addition, the NBTD must penetrate and seal to the Cryostat.









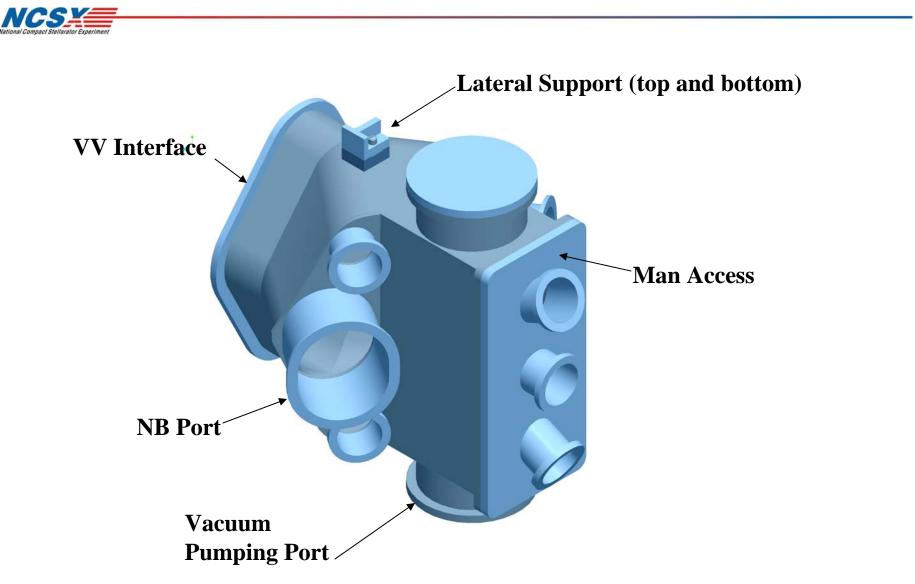


- Models were completed (2003) and were reviewed several years ago
 - Must reaffirm design, hold peer review and work toward SRD
 - A PDR is required
- Baseline was changed for a time to incorporate simplified ducts (Man Access Ports) which did not mount NB's.
- Lateral support drawings were completed.





NBTD showing Lateral Supports



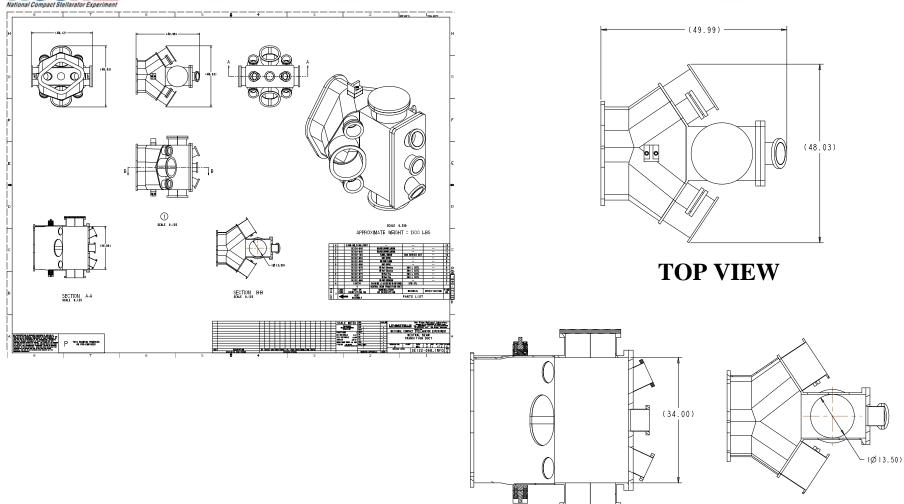


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NBTD Preliminary Drawings







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Labor Cost



Title I an II Design				
Peer Review to Establish Requirements	80			
Review and Update Assbly Dwgs	80			
Prepare for PDR Neutral Beam Transition Duct	40			
PDR for NBTD	0			
Resolve PDR Chits	40			
Review and Update Port Mod Dwg	40			
Review and Update Large Rect Port Dwg	40			
Review and Small Large Rect Port Dwg	40			
Review and Update Weldment Dwgs	120			
Review and Update Misc Det & Cuts Dwgs	40			
Review of Drawings	40			
Stress analysis	160			
Prepare for FDR Neutral Beam Transition Duct	40			
Prepare for PDR Neutral Beam Transition Duct PDR for NBTD Resolve PDR Chits Review and Update Port Mod Dwg Review and Update Large Rect Port Dwg Review and Small Large Rect Port Dwg Review and Update Weldment Dwgs Review and Update Misc Det & Cuts Dwgs Review of Drawings Stress analysis Prepare for FDR Neutral Beam Transition Duct Final Design Review Resolve PDR Chits Title III Disposition of deviation requests and non-conformances Update of drawings as Needed	0			
Review of Drawings Stress analysis Prepare for FDR Neutral Beam Transition Duct Final Design Review Resolve PDR Chits				
Review of Drawings Stress analysis Prepare for FDR Neutral Beam Transition Duct Final Design Review Resolve PDR Chits				
	800			
Title III				
Disposition of deviation requests and non-conformances	40			
Update of drawings as Needed	80			
Procurement coordination	20			

Subtotal Title III Design

Based in recent MDL & NCSX experience

Assume 2 drawings @ 40 hr each - based on MDL & NCSX experience Based in recent MDL & NCSX experience Milestone - no resources

Based in recent 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 Assume 3 drawings @ 40 hr each - based on MDL & NCSX experience Assume 2 drawings @ 20 hr each - based on MDL & NCSX experience Assume 2 people for ~1/2 Weeks - based on MDL & NCSX experience Based in recent MDL & NCSX experience

Based in recent MDL & NCSX experience Based in recent MDL & NCSX experience Based in recent MDL & NCSX experience



140



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 \$/lb for fabrication	1400 lbs <u>51</u> \$/lb_Include \$71,400	es recent vendor Inconel quotes
subtotal, fab cost shell	φ/1,400	
Ports 8" o.d. flange, 6" tube 8" o.d. rotatable cover flange no. of 8" ports cost for 8" ports	225\$/ea 125\$/ea 7ea \$2,450	MDC catalog 10 MDC catalog 10
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 cost for 14.5" x 16.5" ports 16.5" o.d. flange, 14" tube 16.5" o.d. rotatable cover flange no. of 16.5" ports cost for 16.5" ports	2ea \$5,000 1000 \$/ea 710 \$/ea 2ea \$3,420	MDC catalog 10
large square flange cover, ss o-ring seals for diamond flange and square flange	\$4,000 \$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 no. of nbi duct extensions	\$104,800 3	
total, 3 extensions	\$314,400	
None of the above includes an interface to the cryostat.	ril 9 10 2009	



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Schedule & Staffing



Schedule

Activity MIL		LE Activity		SHIFT	TS Forecast	Forecast	Total	Cost to				
ID	-STONE	Description	(work		Start	Finish	Float	Complete	FY08	FY09	FY10	
	LEVEL	~	days]							
1260-90		Prep for PDR	65		30JUN08	30SEP08	318	30,200.00		omlem=200		
1260-95		PDR	0			30SEP08	318	0.00		\checkmark		
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1260-130		Fabr &deliver 3 port duct extensions incl suprts	260		01OCT09*	180CT10	174	420,831.66				41=\$314.4k
1260-140		Title III	402		13JAN09	18AUG10	1,054	16,188.70				NLEM =100hr ;

Staffing

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

Gary Lovett – 100% during Title I & II.

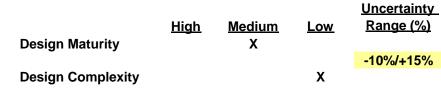




Schedule and Cost Risk



Uncertainty of the Estimate



Other Comments:

Mitigation

	-				Cost	Impact	Schedule Impact	
Job	Risk Description	Likelihood of Occurring	Mitigation Plan	Basis of estimate	Low	High	Low	High
1260	Design is vintage and revisit could result in criteria changes, i.e. diagnostic requirements, number of ports, NB alignment, further design review, etc.	U	Schedule was made more aggressive with early start to assure ageement with design.	Engineering hours to redo models and hold design review.	200 hrs ORNL EN	400 hrs I ORNL EM	0	0



