

NCSX Vacuum Water & Utility Gas

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Outline

- Scope / Requirements
- Interfaces
- Design plans
- Material and Labor Estimates
- Schedule
- Risks and uncertainty

Scope

- **Water Cooling Systems**
 - Provide cooling water for the Vac Pumping System
 - Provide drops for future NB Vac Pumps
- **Utility Gas Systems**
 - Compressed air manifold
 - Vacuum Vent piping

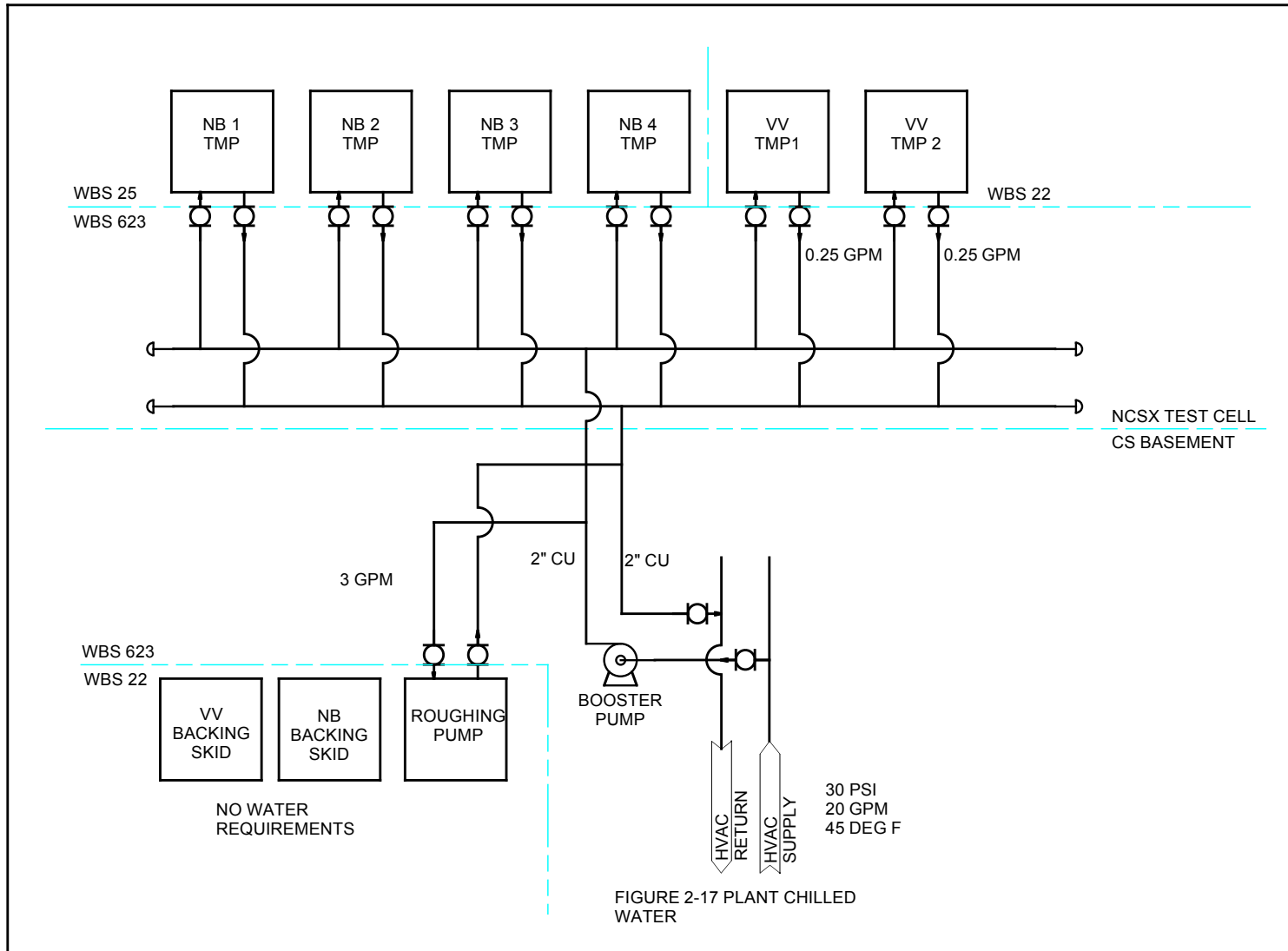
Water System Requirements

- **Vacuum Pumping System Water**
 - Requirements
 - Load: 5-10 gpm
 - Fluid: Treated Water
 - Pressure: 140 psig
 - Temperature: Ambient
 - Controls: Local, Manual control of pump
 - Provide a small loop <10 gpm
 - Includes design, fabrication and installation
 - Install Heat exchanger & pump

Water System Interfaces

- Vacuum Pumping System
 - Interfaces via the cooling water connection to the vacuum pumps below the NCSX
- Heat sink
 - Tie in to existing HVAC cooling water system
 - Connection in the NCSX Test Cell Basement
- Power
 - Local power supplied from local MCC (<10 hp)
- Mechanical
 - Interfaces to the machine platform for support of piping

Water System Design Plan



Water System Estimate

Task	41 M&S	EMEM hrs	EMSB hrs	EMTB hrs	EASB hrs
Design					
Conceptual Design		40			20
Layout Drawings		10			20
Final Design		40			160
Fab / Installation				265	
Piping Estimate	\$22,970				
Supervision		50	30		
Test, PTP		8		40	

Water System Material and Labor Estimate



Component	*Total Labor Manhours	*M&S (\$) (in 2002 \$)
Copper Piping	38	\$3,970
Equipment	133	\$6,948
Adders (see below)	94	5,459.1
ESTIMATE TOTAL	265	16,377.3
CURRENT Year / No. Yrs.	2007	5
ESCALATED TOTAL	265	\$22,970

*Rates taken from 2002 RS Means Plumbing Estimating guide

Water System Material and Labor Estimate

Applicable Adders

15%	Overhead Work (15% Labor) *
10%	Piping Insulation (10% Material) *
40%	Added for Fittings (% Labor and Material) *

*Rates taken from 2002 RS Means Plumbing Estimating guide

- Work performed by PPPL Techs / Engineers

Water Systems Schedule

- Design work starts May 2010
- Installation is completed in Feb 2011 in time for Vacuum System Ops
- This work is off the critical path by 100 days

61 - Water Systems

Job: 6101 - Water Systems-DUDEK

613 - Vacuum Pumping System

			Dur		Start	Finish	Float
6101-100		Design Vac Pmp water sys	45		03MAY10*	06JUL10	100
6101-105		Procure Hardware and materials Vac Pmp water	90		07JUL10	10NOV10	100
6101-110		Fabricate and Install Vac Pmp water sys	40		11NOV10*	17JAN11	100
6101-115		Test Vac Pmp water sys	22		18JAN11	16FEB11	100

Water Systems Risk and Uncertainty

Uncertainty of the Estimate	Evaluation	Comment
Design Maturity	Medium	Design not complicated, but still in a conceptual stage
Design Complexity	Low	Standard piping - off-the-shelf components
Uncertainty Range	-10%/+15%	

No residual risk impacts were identified

Gas Utilities Requirements

- Requirements
 - Flavors: Compressed Air, Vac. Vent
 - Pressure: 90 psig , 14.7 psia
 - Design: Copper manifold

Gas Utilities Interfaces

- Interfaces to the atmosphere outside the building (rooftop vent)
- Manifold around machine interfaces to the platform for support
- Vent manifold interfaces to the vacuum vessel pumping system

Gas Utilities Estimate

	M&S	EMEM hrs	EMTB hrs	EASB hrs
Preliminary Design		60		80
Final design		20		80
Installation		40	322	
Procurements	\$24,398			
Pre Ops Testing		8	40	

- Estimate: Use past experience on NSTX, Cost Estimating Guide
- Work performed by PPPL Techs

Gas Utilities Schedule



- Design work starts Oct 2010
- Installation is completed in Apr 2011 in time for Vacuum System Ops
- This work is off the critical path by 134 days

63 - Utility Systems

Job: 6301 - Utility Systems-DUDEK

			Dur		Start	Finish	Float
6301-001		Vac Vent and Air sys- Prelim Dsn	20		01OCT10*	28OCT10	134
6301-005		Vac Vent and Air sys- PDR	1	R	29OCT10*	29OCT10	134
6301-009		Vac Vent and Air sys- Final dsn	10		01NOV10*	12NOV10	134
6301-010		Vac Vent and Air sys- FDR	1	R	15NOV10*	15NOV10	134
6301-013		Vac Vent and Air sys- Procure hardware and	60		16NOV10	17FEB11	134
6301-017		Vac Vent and Air sys- Fabricate and Install	40		18FEB11*	14APR11	134
6301-020		Vac Vent and Air sys-Test	10		15APR11*	28APR11	134

Utility Systems Risk and Uncertainty

Uncertainty of the Estimate	Evaluation	Comment
Design Maturity	Medium	Design not complicated, but still in a conceptual stage
Design Complexity	Low	Standard piping - off-the-shelf components
Uncertainty Range	-10%/ +15%	

No residual risk impacts were identified