

**NCSX Vacuum Water & Utility**

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

**Gas**

L. F. Dudek

**Outline**



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

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**Scope**



* Water Cooling Systems

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Ð Provide cooling water for the Vac Pumping System

Ð Provide drops for future NB Vac Pumps

* Utility Gas Systems

Ð Compressed air manifold

Ð Vacuum Vent piping

**Water System Requirements**



* **Vacuum Pumping System Water**

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– 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**

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* Vacuum Pumping System

Ð 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

Ð Local power supplied from local MCC (<10 hp)

* Mechanical

Ð Interfaces to the machine platform for support of

piping

FIGURE 2-17 PLANT CHILLED WATER

CS BASEMENT

NCSX TEST CELL

WBS 22

0.25 GPM

VV
  
TMP 2

30 PSI 20 GPM 45 DEG F

0.25 GPM

VV
  
TMP1

2' CU

NB 4
  
TMP

BOOSTER
  
PUMP

2' CU

NB 3
  
TMP

ROUGHING
  
PUMP

NB 2
  
TMP

3 GPM

NB
  
BACKING
  
SKID

NO WATER REQUIREMENTS

NB 1
  
TMP

VV
  
BACKING
  
SKID

WBS 22

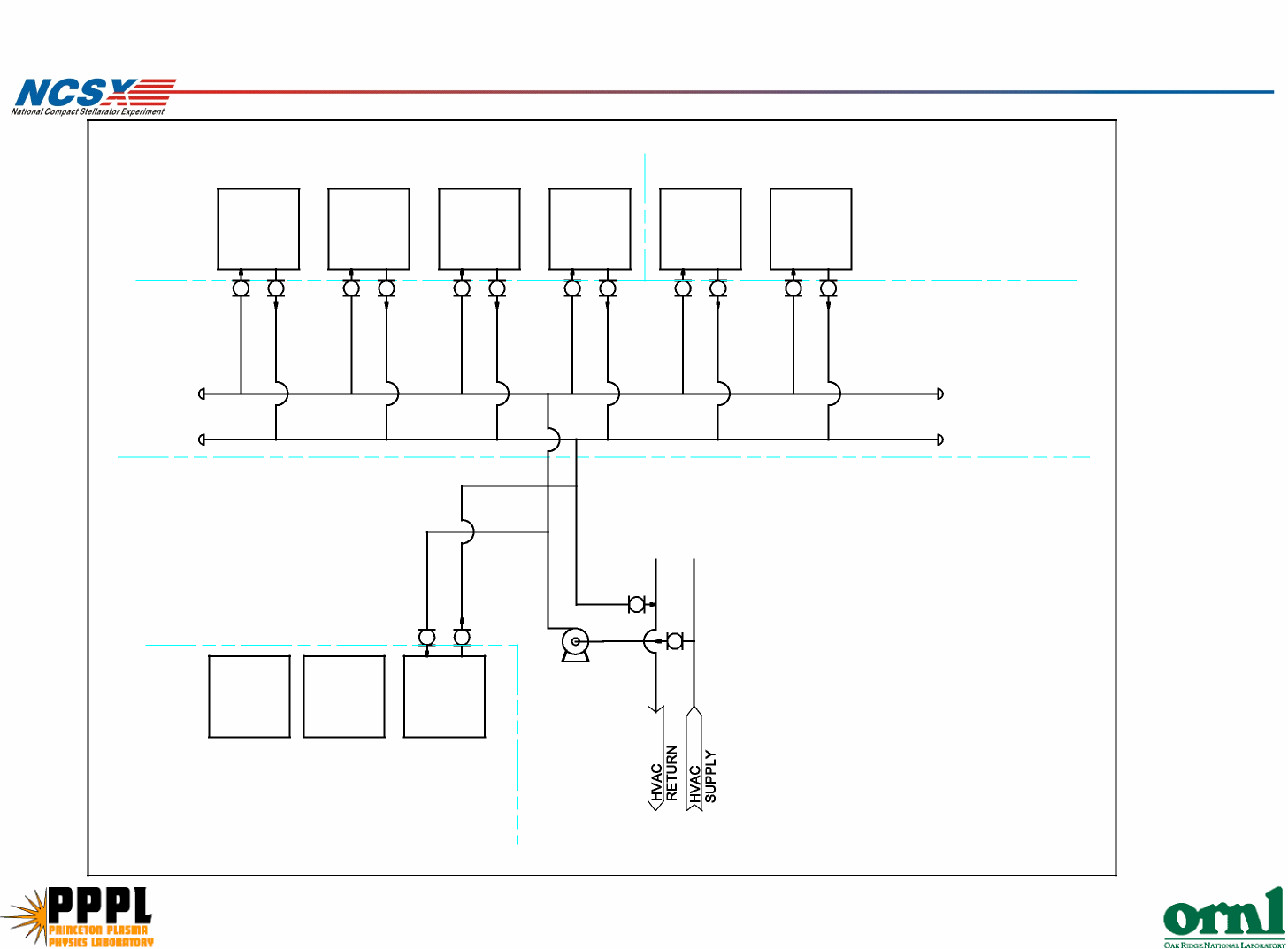
WBS 623

WBS 623

WBS 25

**Water System Design Plan**

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**Water System Estimate**



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| **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 |  |

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| **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

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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

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**Water Systems Schedule**

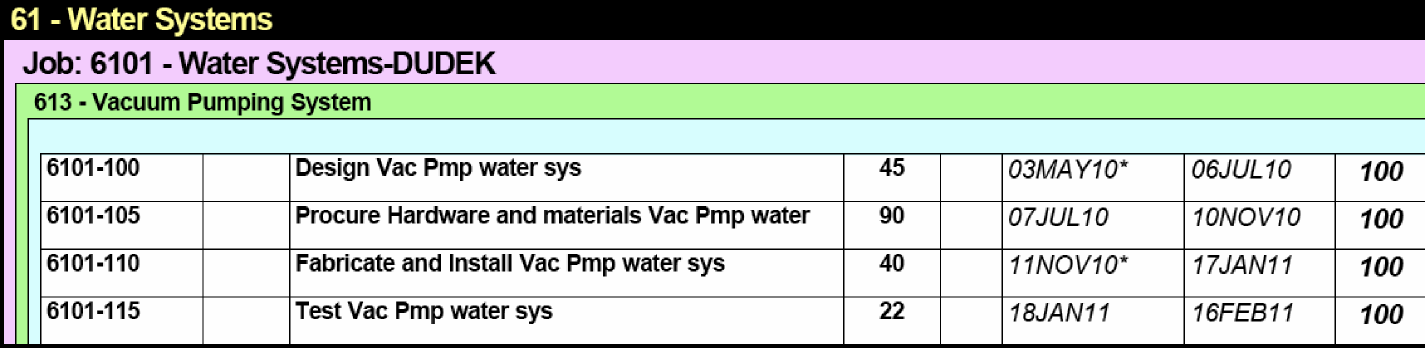


* Design work starts May 2010
* Installation is completed in Feb 2011 in time for

Vacuum System Ops

* This work is off the critical path by 100 days

Dur Start Finish Float



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**Water Systems Risk and Uncertainty**



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| --- | --- | --- |
| 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 | -1 0%/+1 5% |  |

No residual risk impacts were identified

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**Gas Utilities Requirements**



• Requirements

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Ð Flavors: Compressed Air, Vac. Vent

Ð Pressure: 90 psig , 14.7 psia

Ð Design: Copper manifold

**Gas Utilities Interfaces**



* Interfaces to the atmosphere outside the building

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(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

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**Gas Utilities Schedule**



• Design work starts Oct 2010

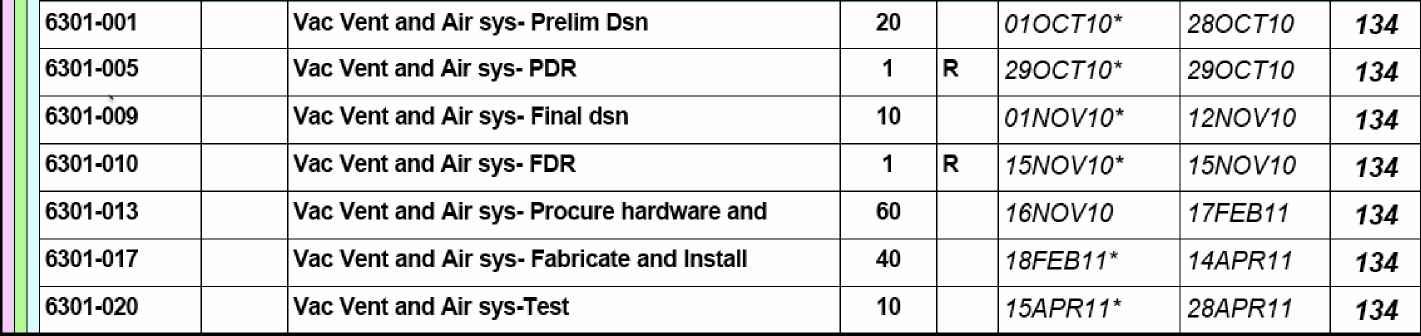
* Installation is completed in Apr 2011 in time for

Vacuum System Ops

* This work is off the critical path by 134 days



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| Dur Start Finish Float |



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**Utility Systems Risk and Uncertainty**



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| 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

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