NCSX CRYOGENICS DESIGN DEVELOPMENT STATUS WBS-63

March 14, 2002

GJG

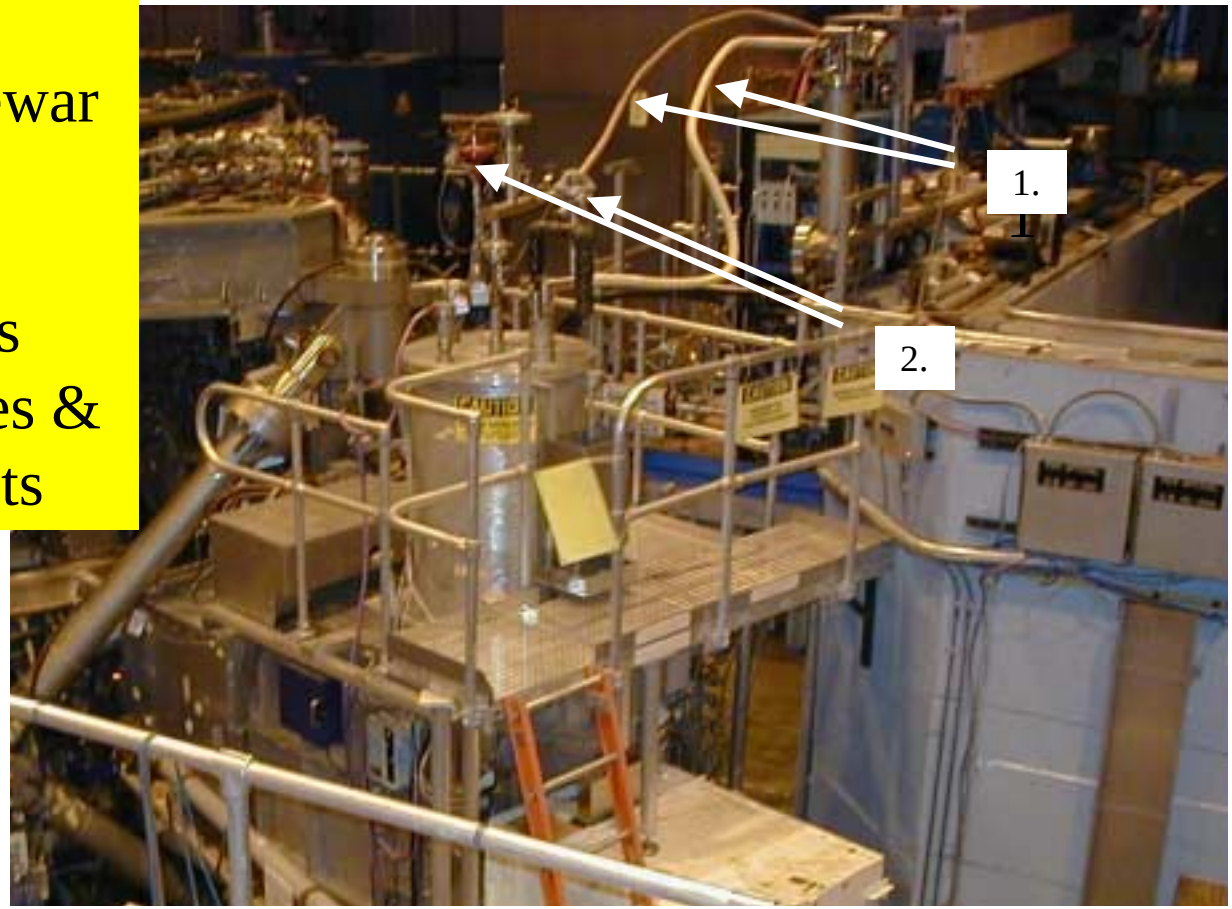
PURPOSE OF STATUS REVIEW

- Review serves as a design intent checkpoint
- These concepts will serve as the basis for the upcoming cost and schedule exercise
- Known requirements for technical design will be presented
- Approximate schedule for estimate will be discussed

NCSX SITE EQUIPMENT STATUS

PBX-M (ORNL) beamline's dewar hookup:

1. LN_2 & LHe Transfer Lines
2. Control Valves & Misc. Elements

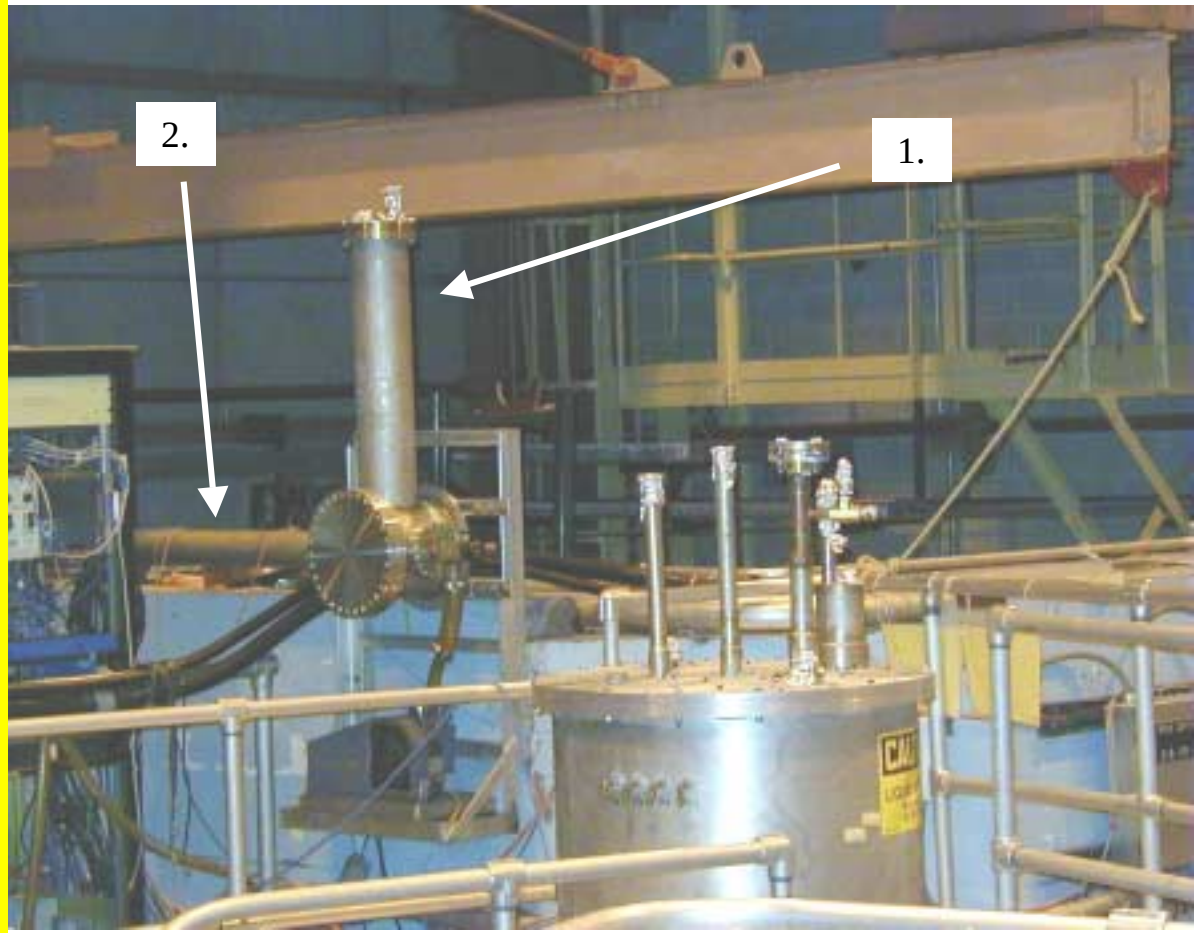


NCSX SITE EQUIPMENT STATUS

PPPL care taking staff has carefully removed and stored the transfer lines, valves, etc.

Upcoming effort will remove and retain:

1. Twin bayonet heads
2. LN_2 -traced LHe rigid lines



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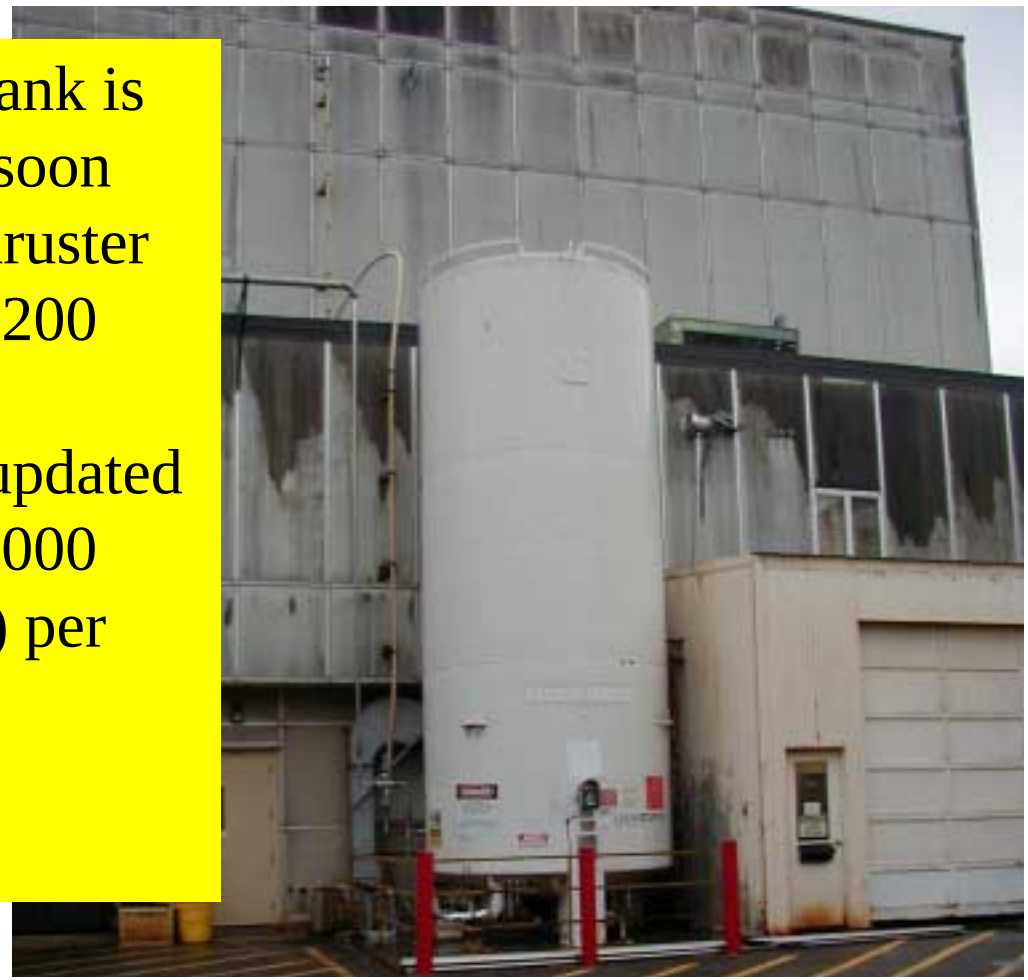
NCSX SITE EQUIPMENT STATUS

The 9,000 gallon LN_2 tank is in service and will soon support the Hall Thruster Project at less than 200 gallons per day

The NCSX heat load (updated 3/13/02) is about 6,000 gallons (one trailer) per plasma day

This tank is fine!



NCSX SITE EQUIPMENT STATUS

Helium Dewar Shed:

The PBX-M implementation of the ORNL beams featured a once-through, then vent to atmosphere LHe system. NCSX should use the same approach.

A 1000 gallon portable dewar is forked from the vendor's trailer and moved through the overhead door.

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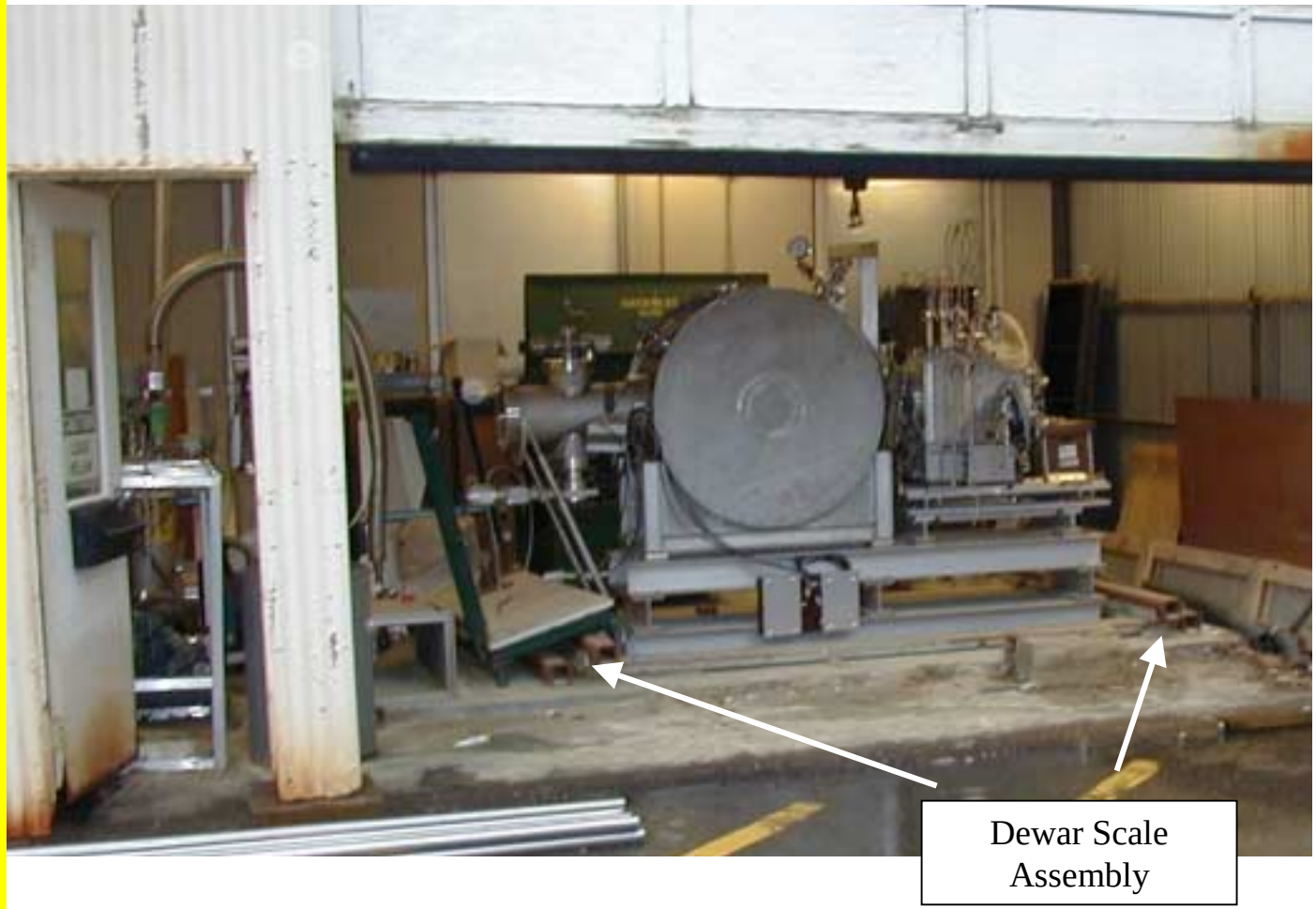
NCSX SITE EQUIPMENT STATUS

The shed is past due for corrosion control and paint.

The dewar scale (mandatory for ops) requires rehab or replacement



NCSX SITE EQUIPMENT STATUS

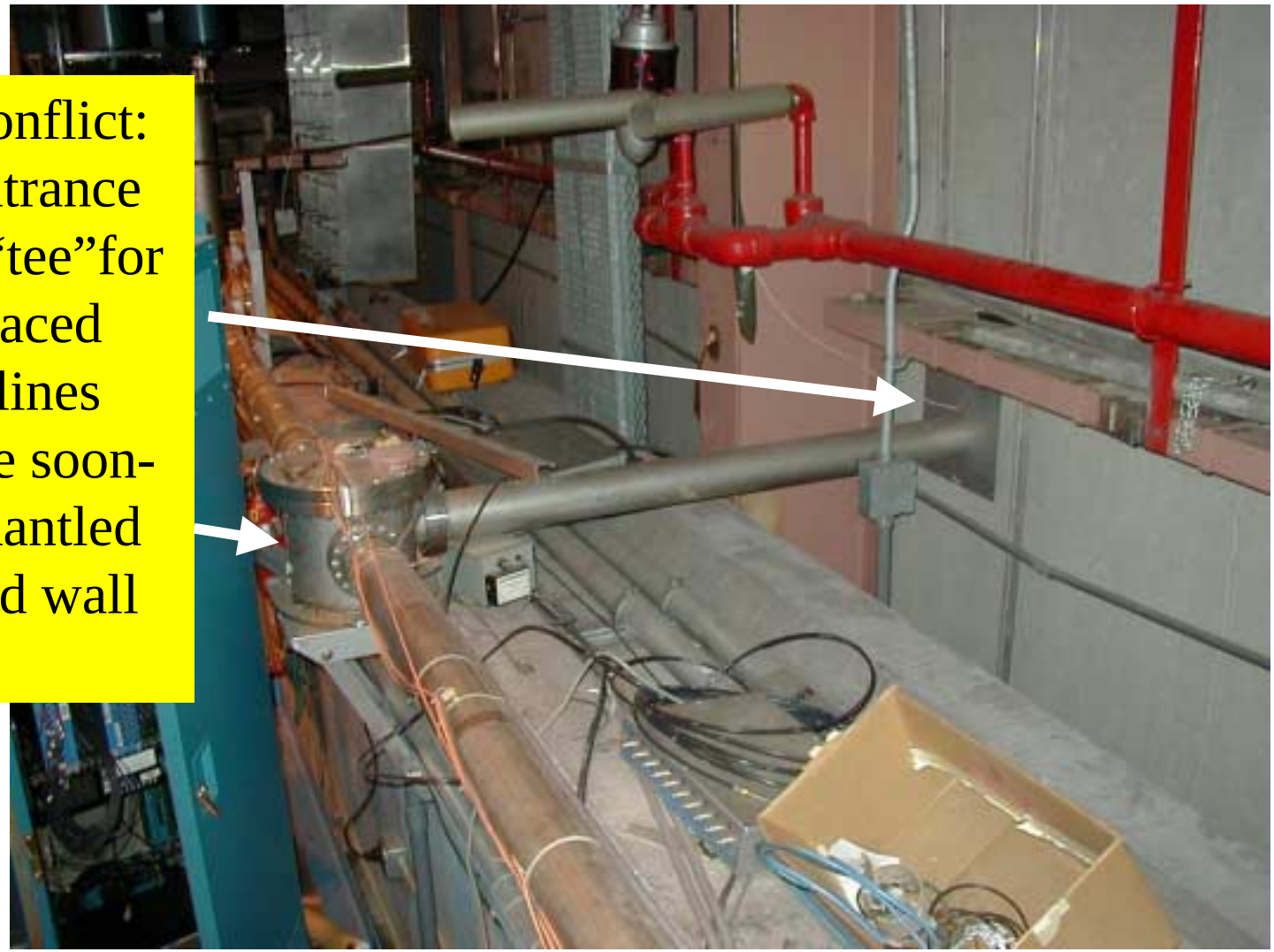
The LHe spear, hose, and phase separator are in serviceable condition. Some new seals and start-up labor will be required.

NCSX SITE EQUIPMENT STATUS

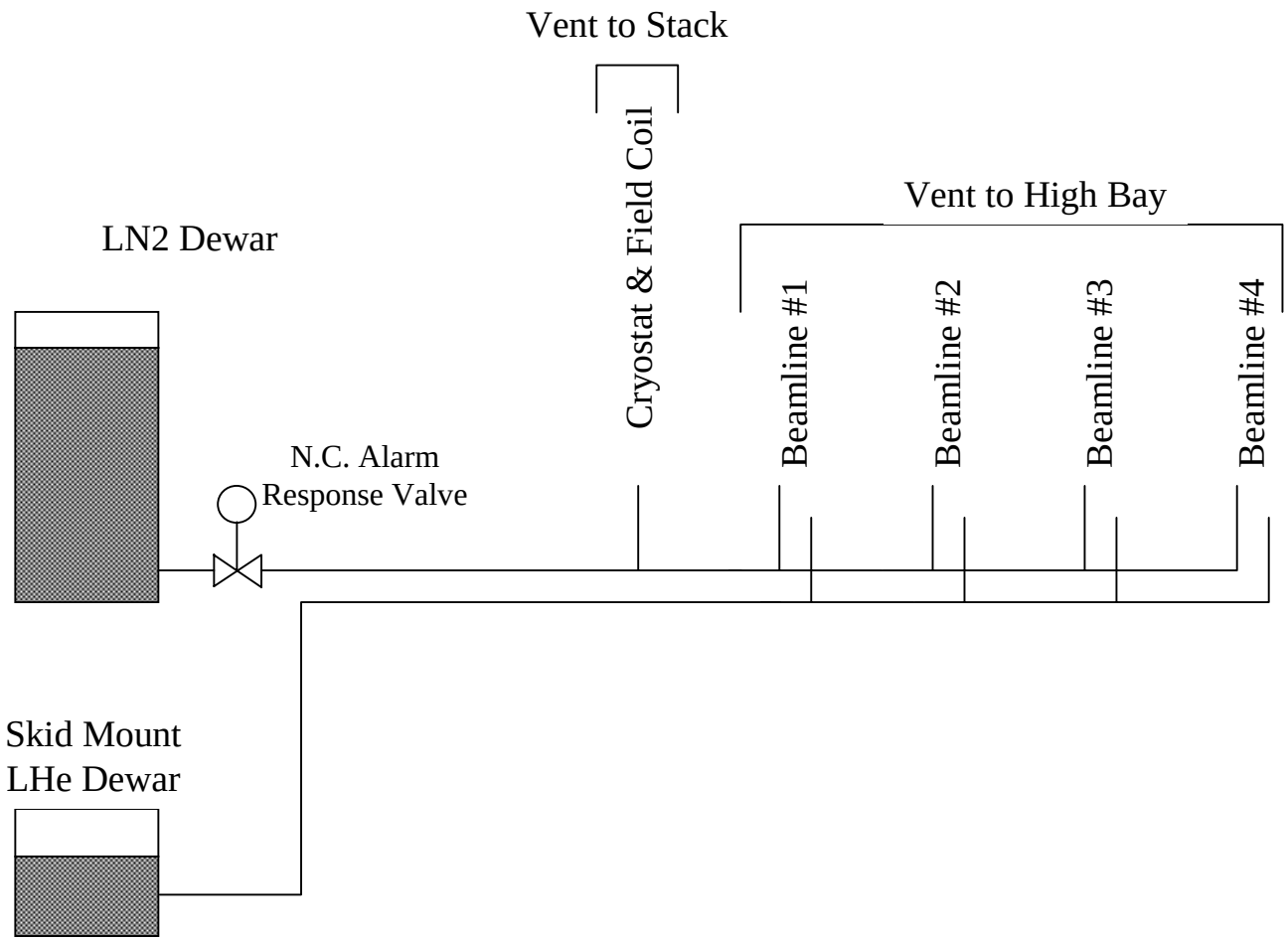
This is an example of LN_2-traced LHe cryo line and is very similar to the lines in the PBX-M area.

NCSX SITE EQUIPMENT STATUS

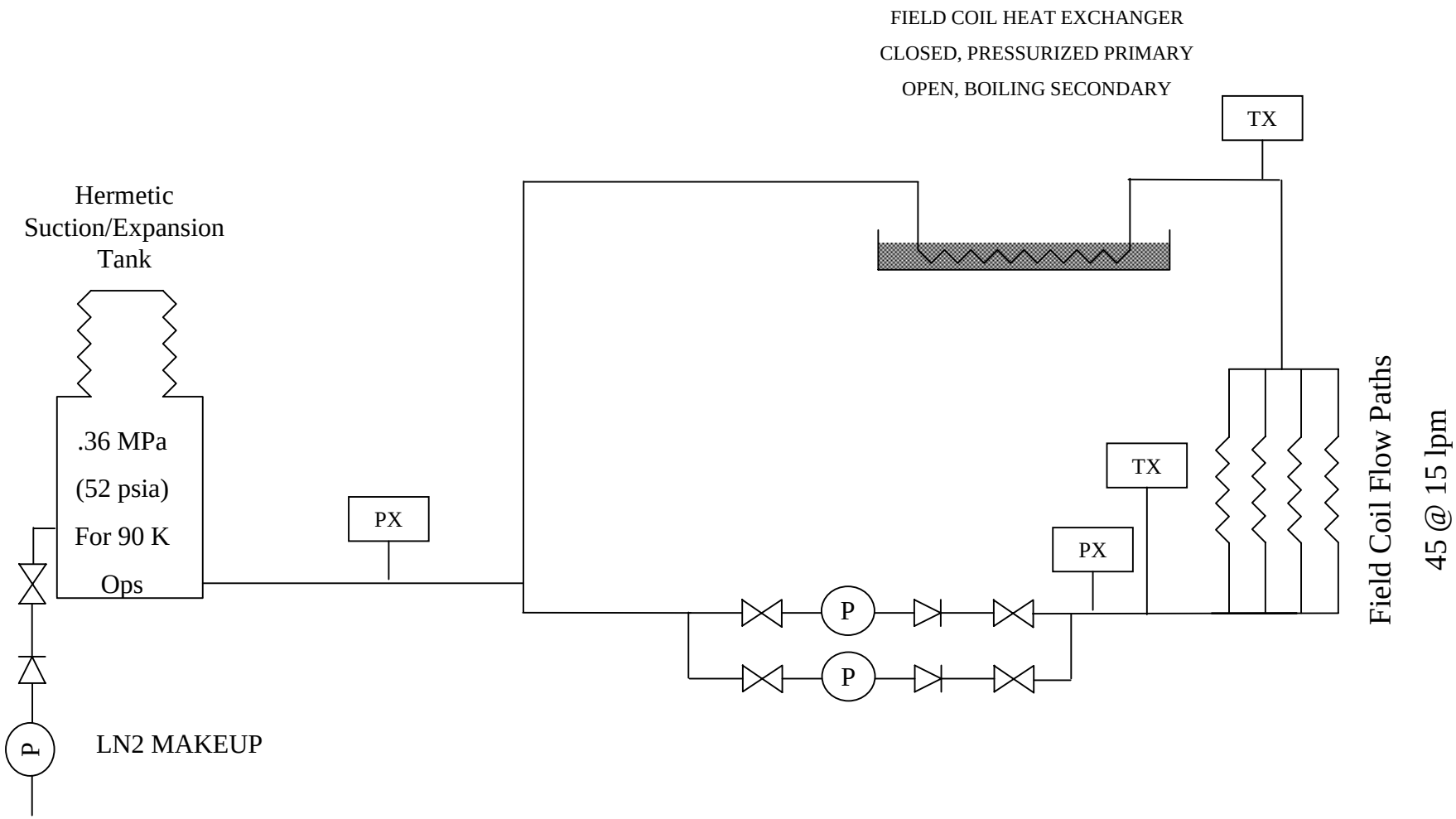
Unfortunate conflict:
The service entrance and main "tee" for the LN_2 -traced LHe rigid lines rests on the soon-to-be-dismantled north shield wall



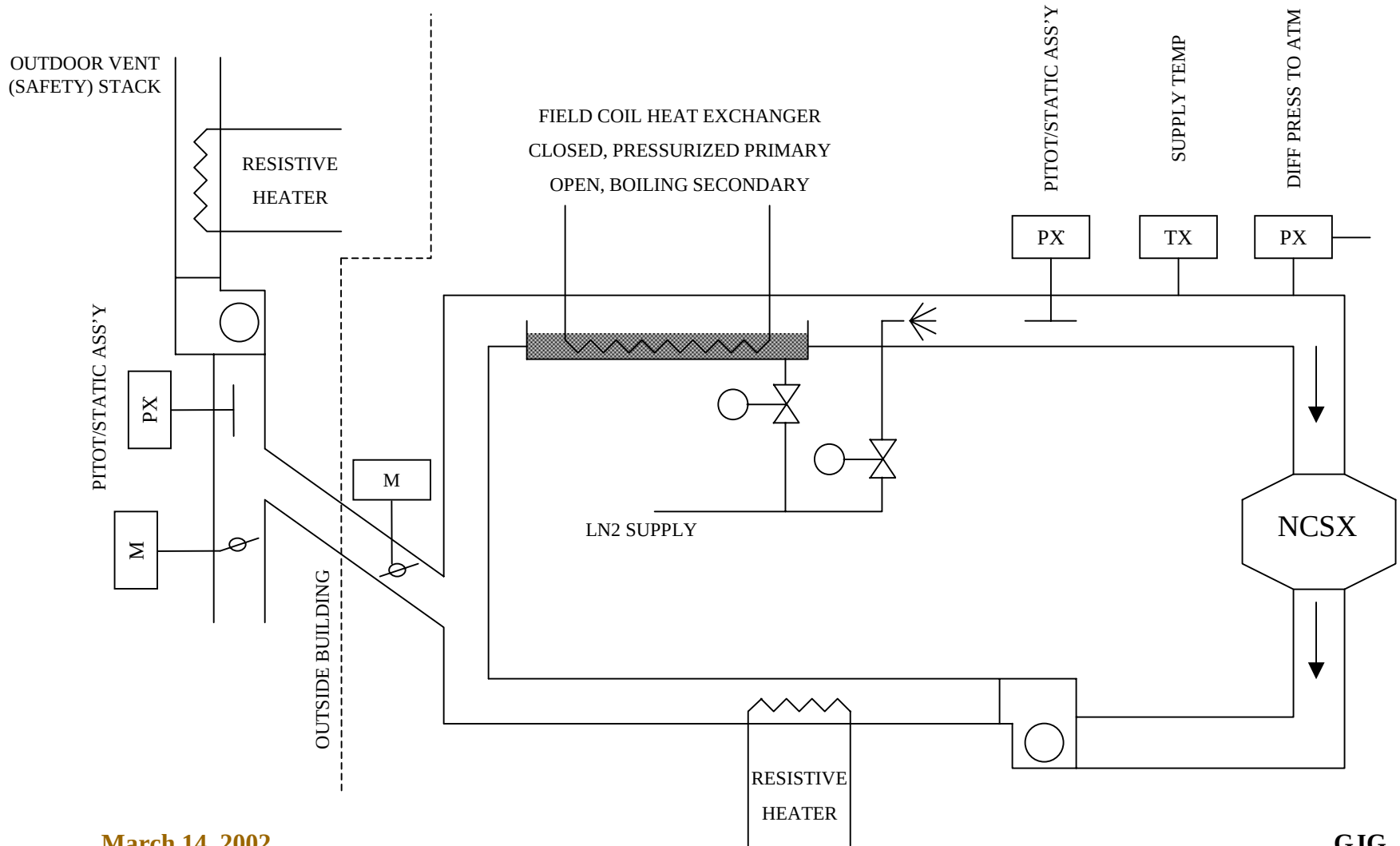
SIMPLIFIED LIQUID CRYOGEN DISTRIBUTION



SIMPLIFIED LN_2 FIELD COIL COOLING SUPPLY



SIMPLIFIED GN_2 CRYOSTAT COOLING SUPPLY



WBS-63 REQUIREMENTS

- Vent effluent gases without personnel injury
- Survive worst probable indoor liquid spill without personnel injury
- Deliver about 6000 LN_2 gal/day to cryostat, field coil cooling, and beam pumps
- Deliver about 200 liters/day LHe to beam pumps for PBX-M-style beam ops

WBS-63 REQUIREMENTS, CONTINUED

- Remove 6E7 kJ/pulse from field coils at ABOUT a flow rate of 15 l/s and pressure drop of 1.4 MPa to support a 15 minute machine cycle.
- Circulate warming and cooling GN_2 around machine at *** kg/sec (pressure drop?) to support a thermal cycle of time of *** hours (days?)

INTERFACE CONTROL - WHO HAS THE WBS BALL? WHO PAYS?

- Oxygen Level Monitors – Multiple Locations
- N_2/Air Exchange Emergency Blower
  - Changes Air in TC VERY Quickly
  - Needs Review, Maybe Not Necessary (NC valve?)
- Magnet Coolant Flow Monitoring
- Magnet Flow Balancing Valves/Plumbing
- Cryostat High/Low Pressure Monitor and Control Algorithms
- High Current 480 VAC circuits