

Mobile Arm Retrieval System (MARS)

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy
Office of River Protection under Contract DE-AC27-08RV14800



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Mobile Arm Retrieval System (MARS)

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Mobile Arm Retrieval System (MARS)

PRESENTATION AT
2009 DOE OFFICE OF
WASTE PROCESSING
TECHNICAL
EXCHANGE...DENVER, CO

May 20, 2009





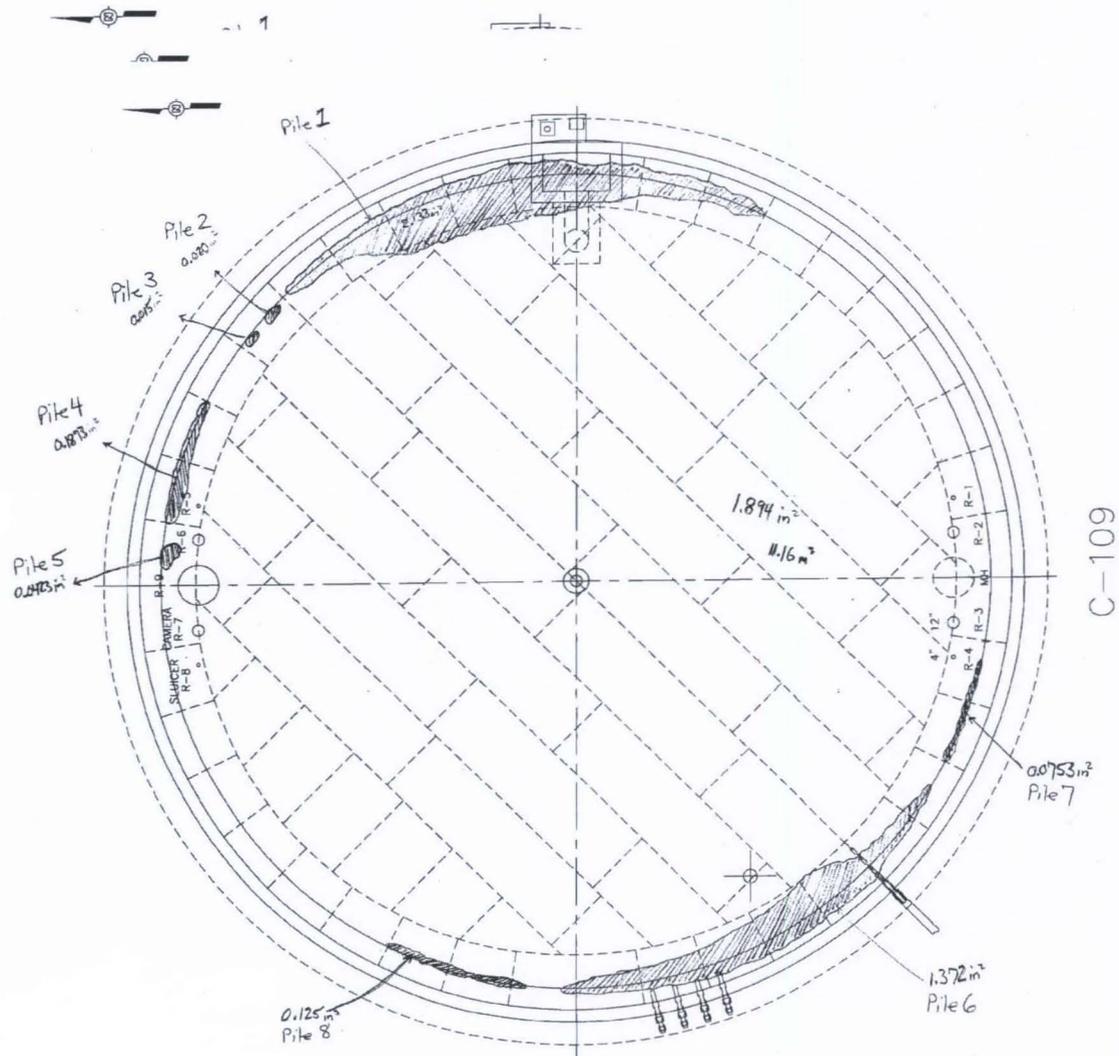
Presentation Agenda

- Background
- Schedule
- Design Strategy
 - Sound Tank System
 - Assumed Leaking Tank System
- Key Technical Issues
- Design Progress
- Fabrication Progress
- Testing Progress
- Q & A

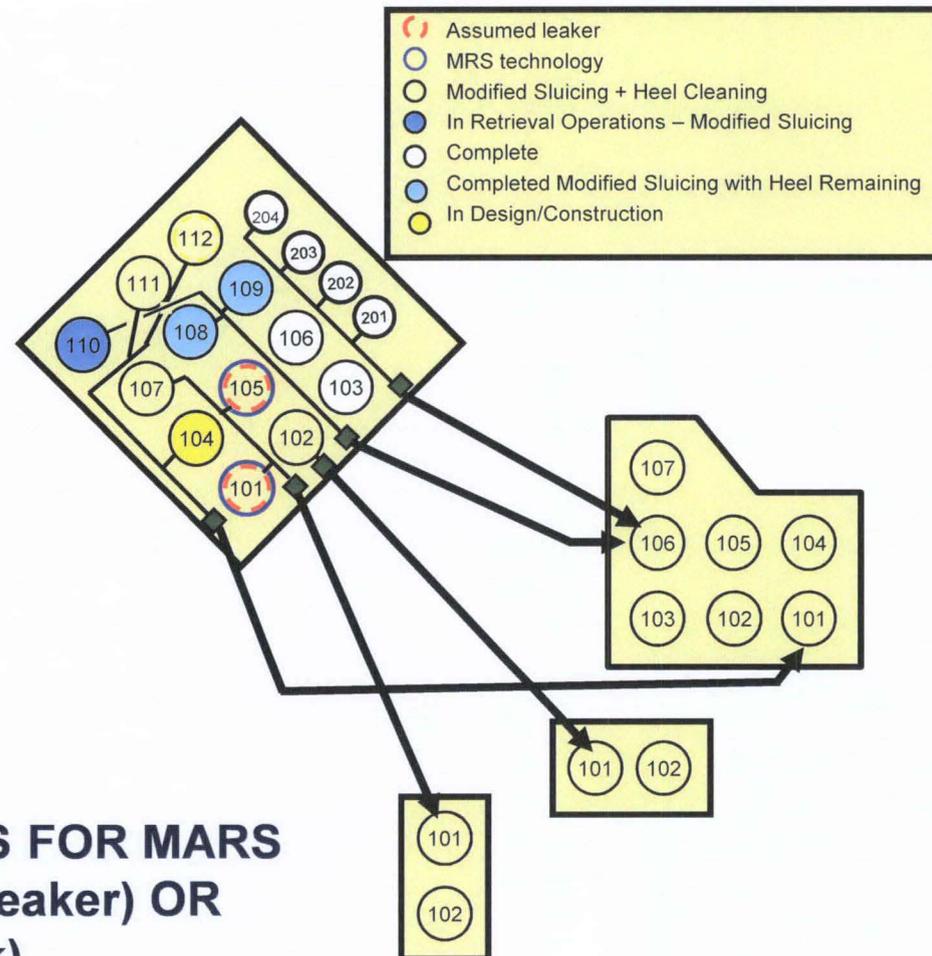
Background

- DST Space is Limited Until WTP is On Line
 - C-Farm, A-Farm, AX-Farm
- Use of Sluicing for Bulk Retrieval has been Effective, however:
 - Hard Heel and Residuals remain (e.g., 7,000 to 8,000 gallons in C-108/C-109)
- Required to remove key radionuclides to the maximum extent technically and economically practical (DOE M 435.1-1)
- Method of Retrieving Waste from Assumed Leakers

Background- Sludge Mounds in C-109



Background

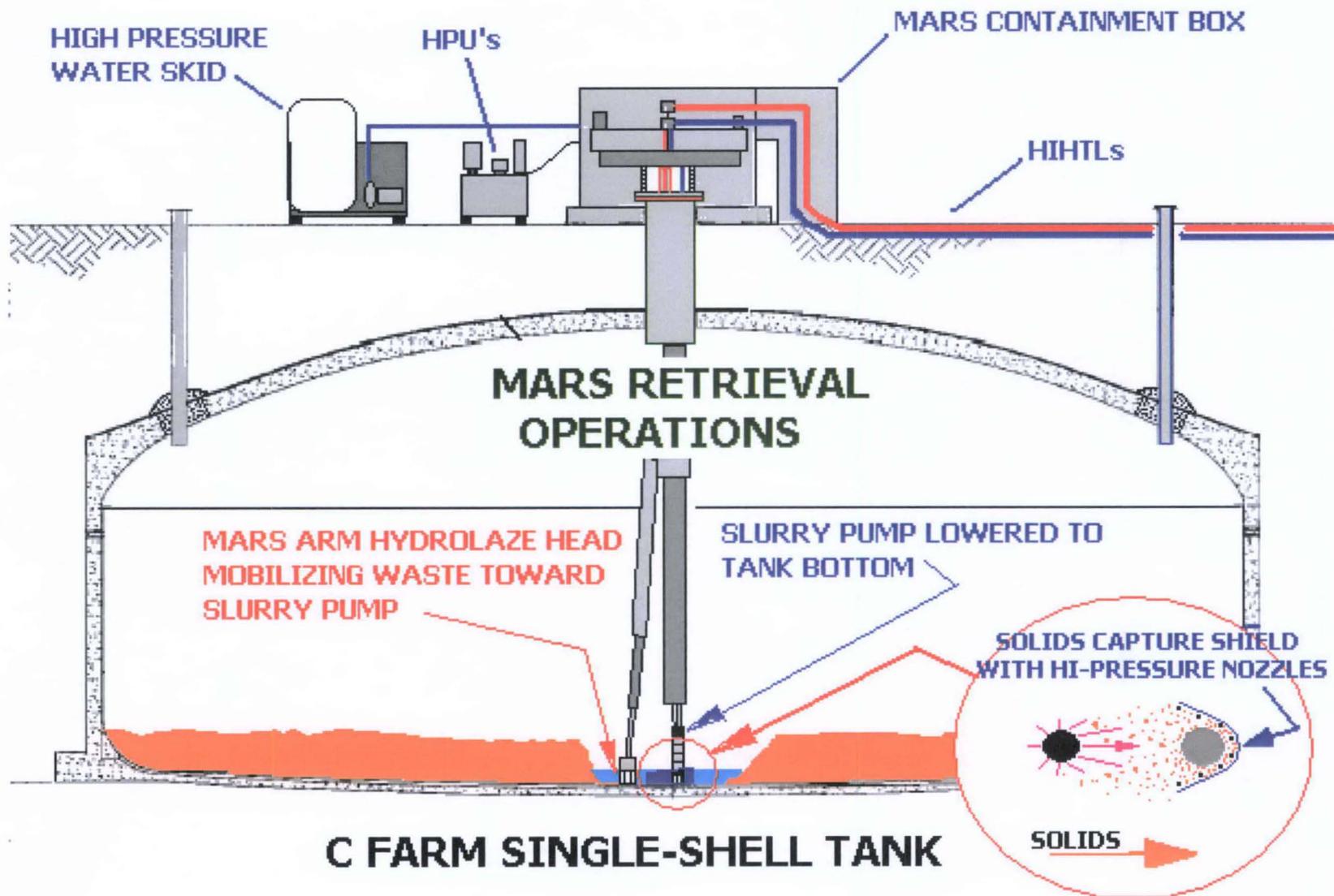


MARS Schedule

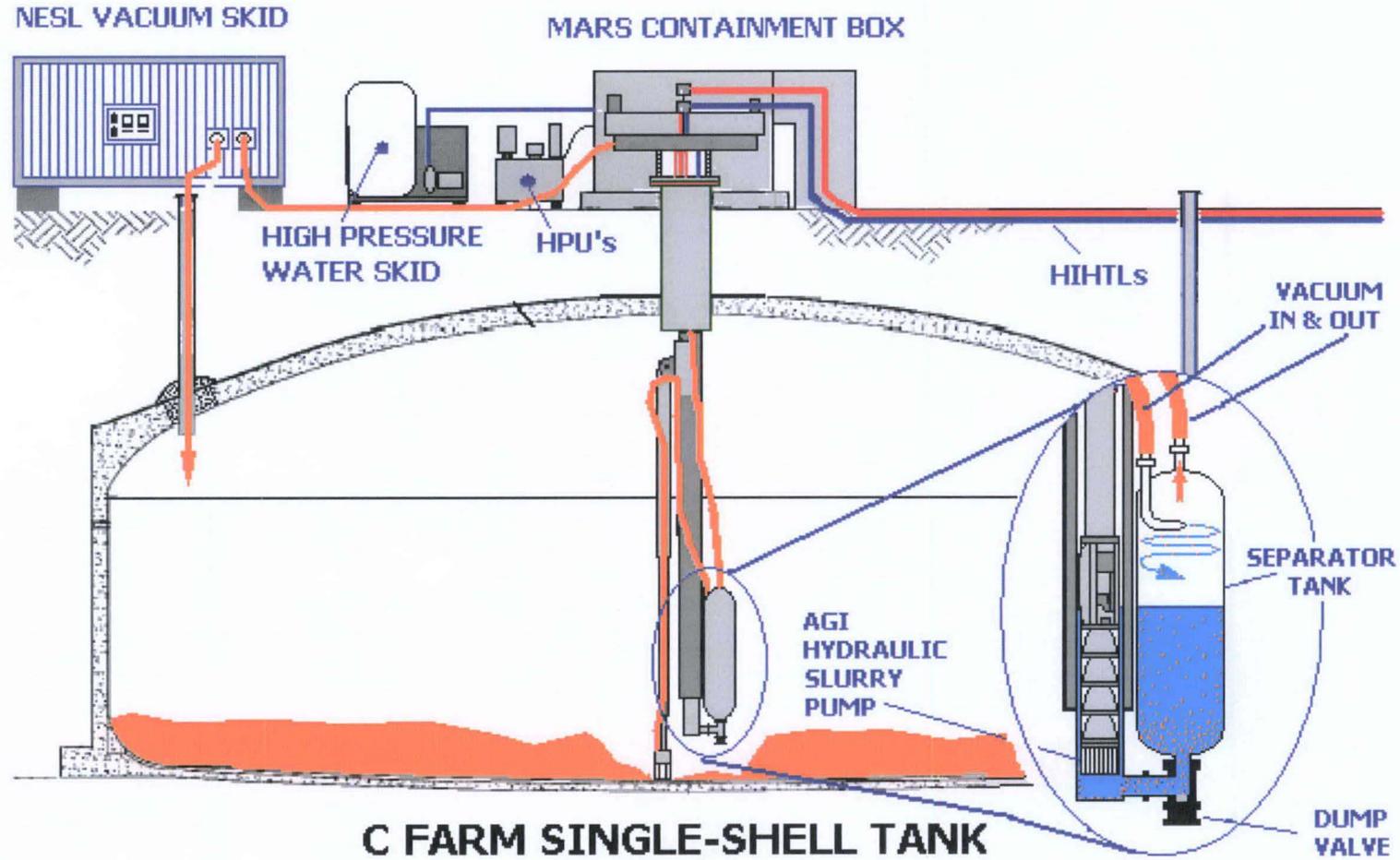
Schedule

- Phase I Testing June 10, 2009
 - Proof of Principle/Component testing
- Preliminary Design Jun 22, 2009
- Final Design August 4, 2009
- Phase II Testing September 29, 2009
 - System Testing

MARS Design Strategy- Sound Tank System



MARS Design Strategy- Assumed Leaking Tank System



Key Technical Issues

- Arm Robustness
 - Hose Management
 - Carriage Elbow Pivot Point
 - Waste Mobilization Concepts
 - Mobility
 - Radiation Shielding / Dome Loading
 - Complexity
-

MARS Design Progress

Design

- Same arm for retrieving either an assumed leaking tank or a sound tank
- Installation of Large, Centrally-Located Riser Required (~42-inch)
- Vacuum system (For assumed leaking tanks)
 - Use existing vacuum skid
 - Vacuum Separator Tank (VST); tank in SST
- Waste Pumping System
 - Centrifugal Pump for both:
 - Vacuum System (Assumed Leaking Tanks)
 - Sluicing System (Sound Tanks)

MARS Design Progress

Design

- Mast, Carriage, and Arm design
 - Modular approach
 - Focus on Highest Factor Of Safety possible
 - Steel construction using 5-segment arm (Adaptation of commercial technology)
 - In-tank hose management
- Turntable
- Containment Box Design
 - Focus on minimizing dome load, while providing acceptable radiation shielding (ALARA)
 - Dose limited by use of:
 - Rotary union
 - Vertical pump hose management

MARS Design Progress

Design

- Portable Instrument and Valve Box
- Control System
 - Controlled from a temporary trailer/control room
 - Human factors and lessons learned are being incorporated into the system design
 - General Service; Safety Significant interlocks are hard-wired
- Wrist and End Effectors
 - Required to be robust; many options considered
 - Current design has protective cage
 - Design allows for change-out if necessary
 - Adapting commercially available technology

MARS Fabrication Progress

Fabrication

- Arm(s) received (Commercial Units), and are being adapted for use with MARS.
- Support Structure (12' X 12' structure) welding complete
- Support Structure top and adapter
- Turntable barrel being fabricated by support vendor
- Test tank fabricated by local vendor
- Mock up of mast and carriage planned (parts on order)
- Test end effectors fabricated

MARS Fabrication Progress

**Commercial Arm
Received at Fabricator**



MARS Fabrication Progress



MARS Fabrication Progress



MARS Fabrication Progress



MARS Fabrication Progress

TEST ARM- FULLY EXTENDED



MARS Fabrication Progress



**SUPPORT PLATFORM
(WELD INSPECTION)**

MARS Fabrication Progress



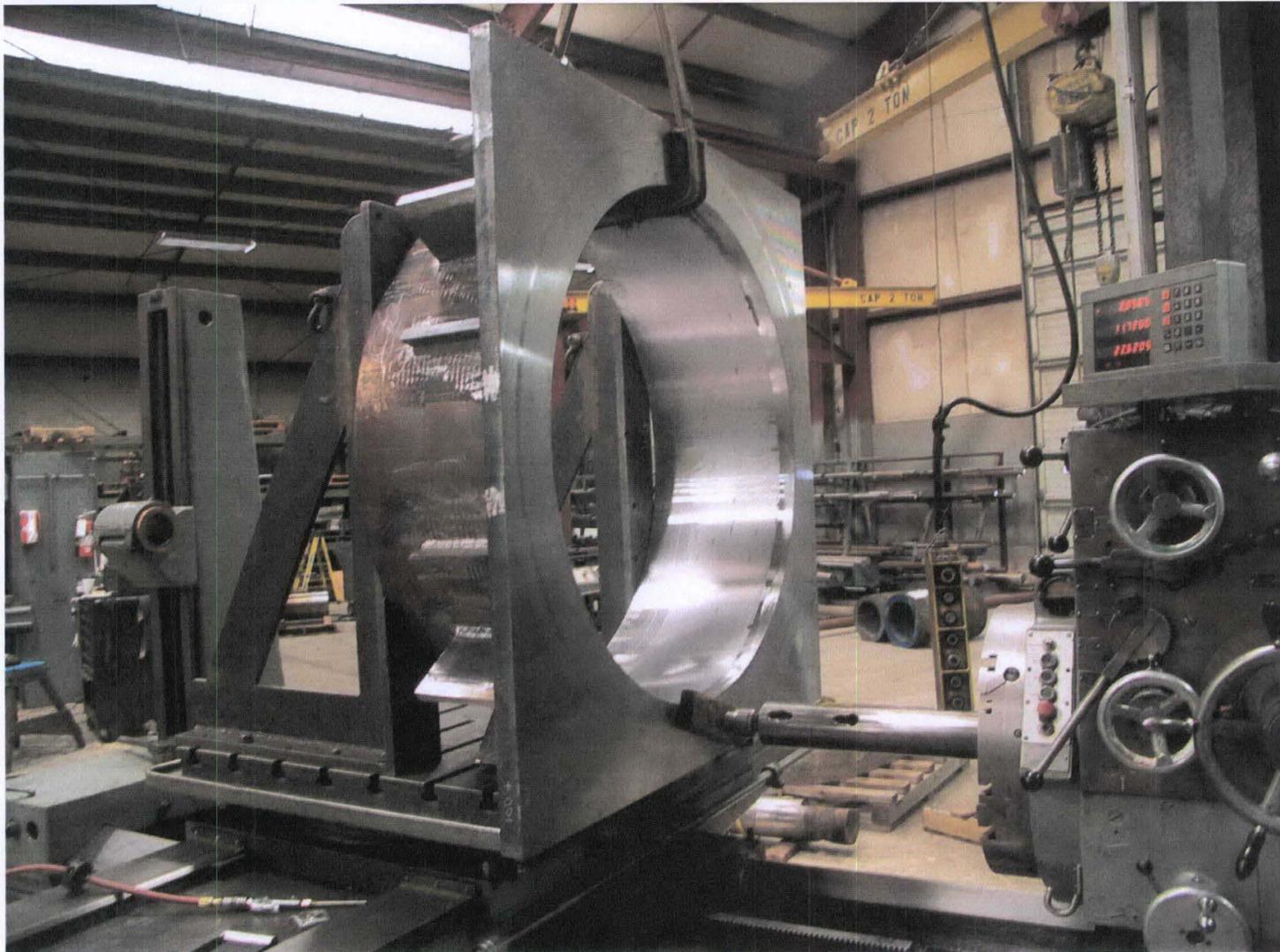
SUPPORT PLATFORM:
2-INCH PLATE

MARS Fabrication Progress



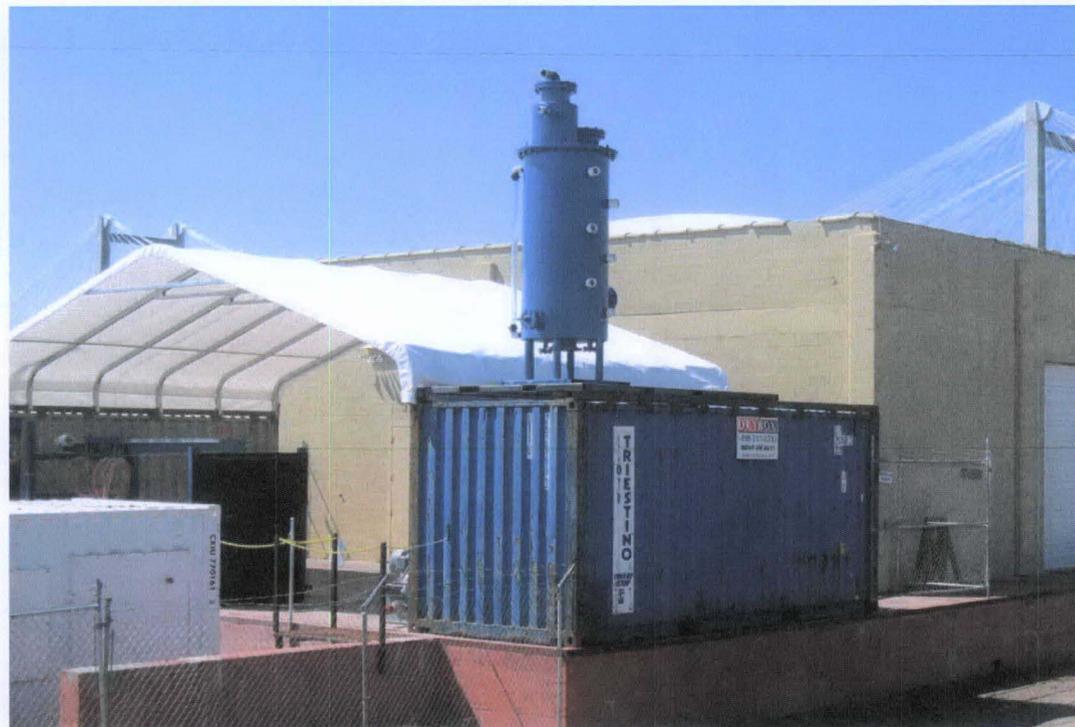
**SUPPORT PLATFORM
2-INCH ADAPTER
RING**

MARS Fabrication Progress



MILLING PLATE AT LAMPSON FACILITY IN PASCO, WA

MARS Fabrication Progress



**VACUUM SEPARATOR
TEST TANK**

MARS Fabrication Progress

VACUUM SKID:

- Fully containerized
- Liquid Ring Vacuum Unit
- Remotely-Operated...controlled by a PLC



MARS Testing Progress

Testing

- Consists of 3 areas: Proof of Principle, Phase I, Phase II
- Proof of Principle Status:
 - Low/High Pressure nozzle tests complete
 - Initial system feasibility test completed
 - Vacuum system performance tests (ongoing)
 - End effector configuration tests (planned)
 - Pump Backstop initial tests (planned)

MARS Testing Progress



**TEST JIG
(NOZZLE CONFIGURATION)**

MARS Testing Progress



**LOW PRESSURE
IN DEEP CUT**



Mar 05 2009 - VID00036.wmv

TEST VIDEO

