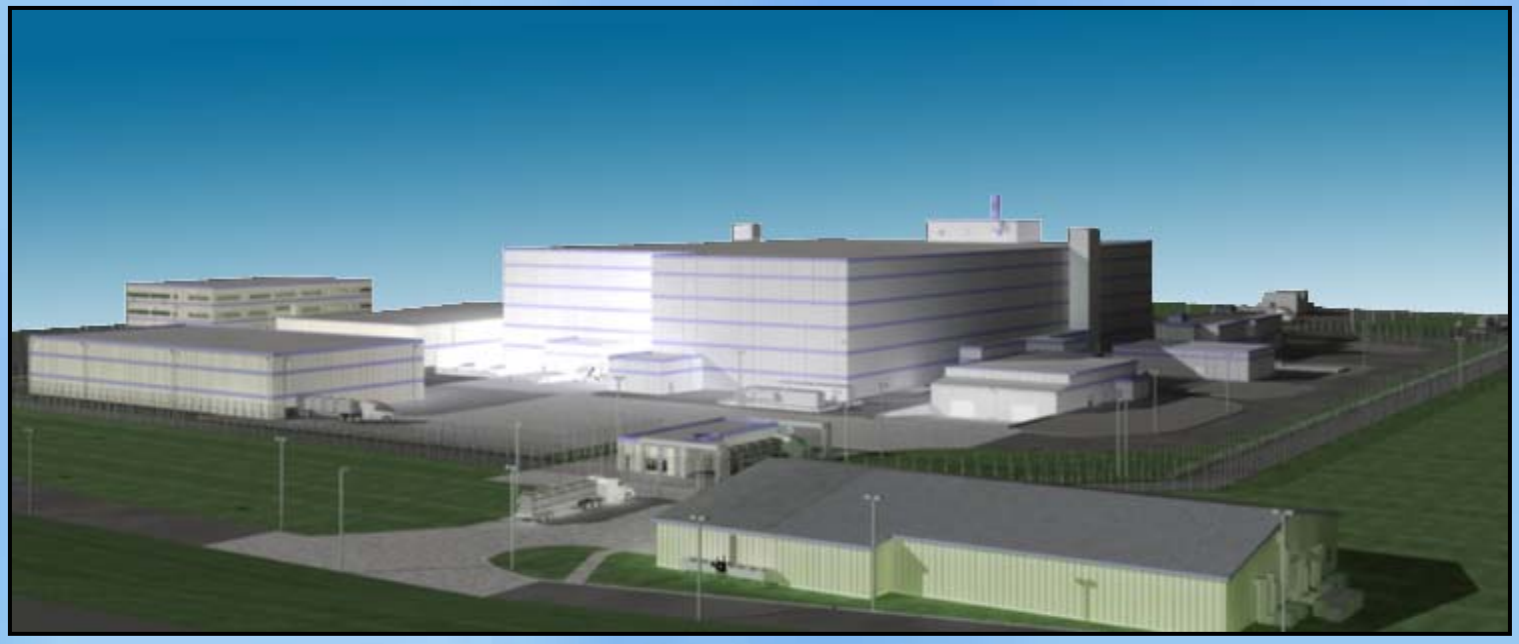
MOX FUEL FABRICATION FACILITY

NNSA National Nuclear Security Administration

DOE 2010 ISM Champions Workshop

The Safety Component of Design for the MOX Fuel Fabrication Facility (MFFF)



ISA: Confinement of Radioactive Materials at MFFF

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Presenter

- Jeff Matties is an electrical engineer in the Nuclear Safety Group working on the MOX Project for Shaw AREVA MOX Services here at Savannah River Site (SRS). He is an employee of AREVA Federal Services. He has worked on the MOX Project since 2004.
- Mr. Matties has 25 years of experience in the nuclear field. Mr. Matties supports updates to the Integrated Safety Analysis, the License Application, and the Loss of Confinement Nuclear Safety Evaluation for the MOX Fuel Fabrication Facility (MFFF) under construction at SRS. Mr. Matties has supported projects at SRS since 1990.

Confinement of Radioactive Materials

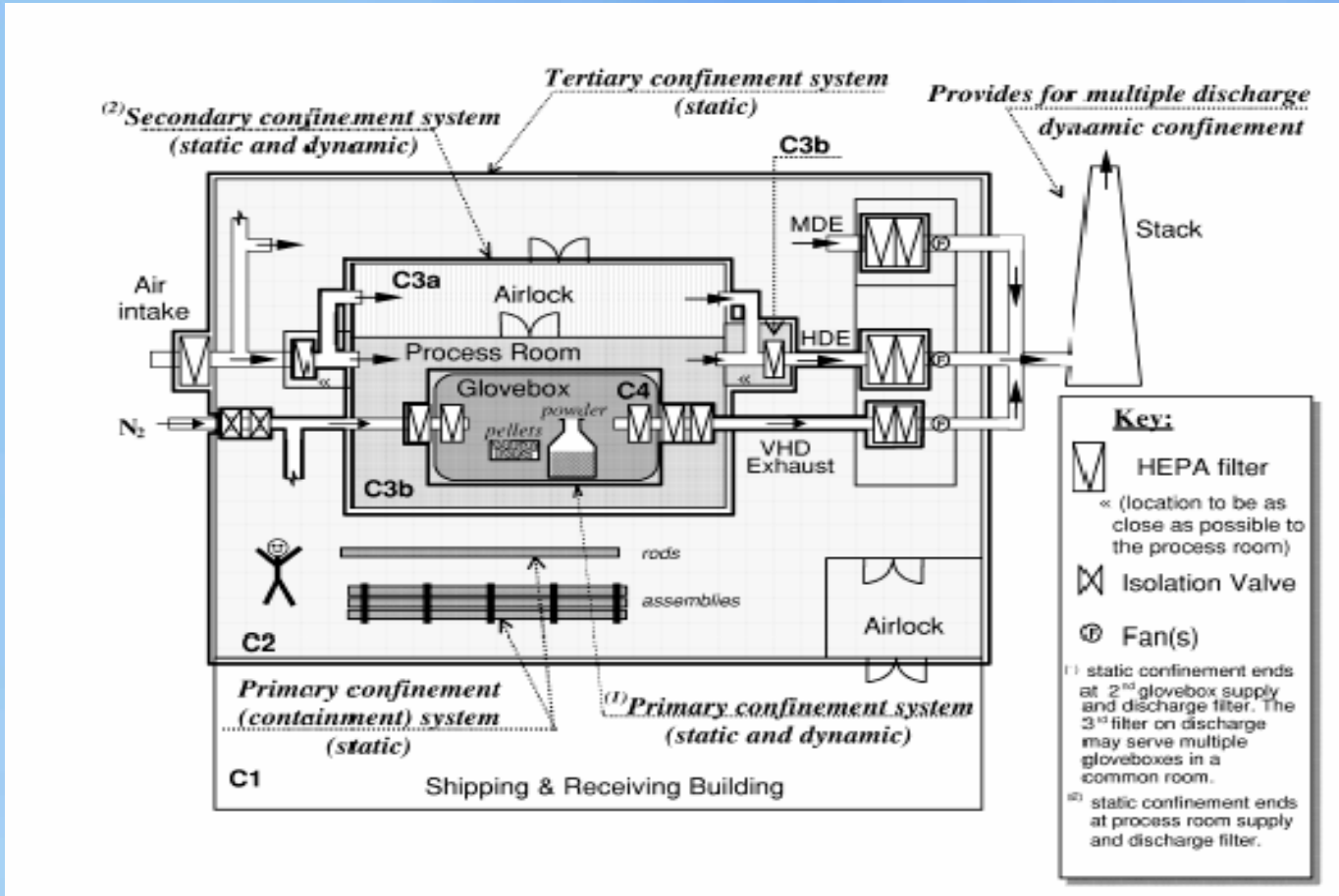
- The basic function of the MFFF confinement and related systems is to control and prevent the dispersal of radioactive and other hazardous materials within the facility and to the environment.
- Confinement of radioactive and other hazardous material is provided by dividing the MOX Fuel Fabrication building (BMF) into multiple confinement zones, with each zone based on different potentials for contamination.

Confinement Levels of the BMF

- Three confinement levels:
  - primary: C4: glovebox, process vessels, tanks, piping
  - secondary: PC: process cell and C3: glovebox room
  - tertiary: C2: corridor

  external environment: C1: truck bay
- Each confinement level consists of static barriers and dynamic HVAC systems.
- Pressure gradients between confinement zones ensure that leakage airflows are from the zones of lowest contamination risk to zones of increasing contamination

Powder Confinement Systems



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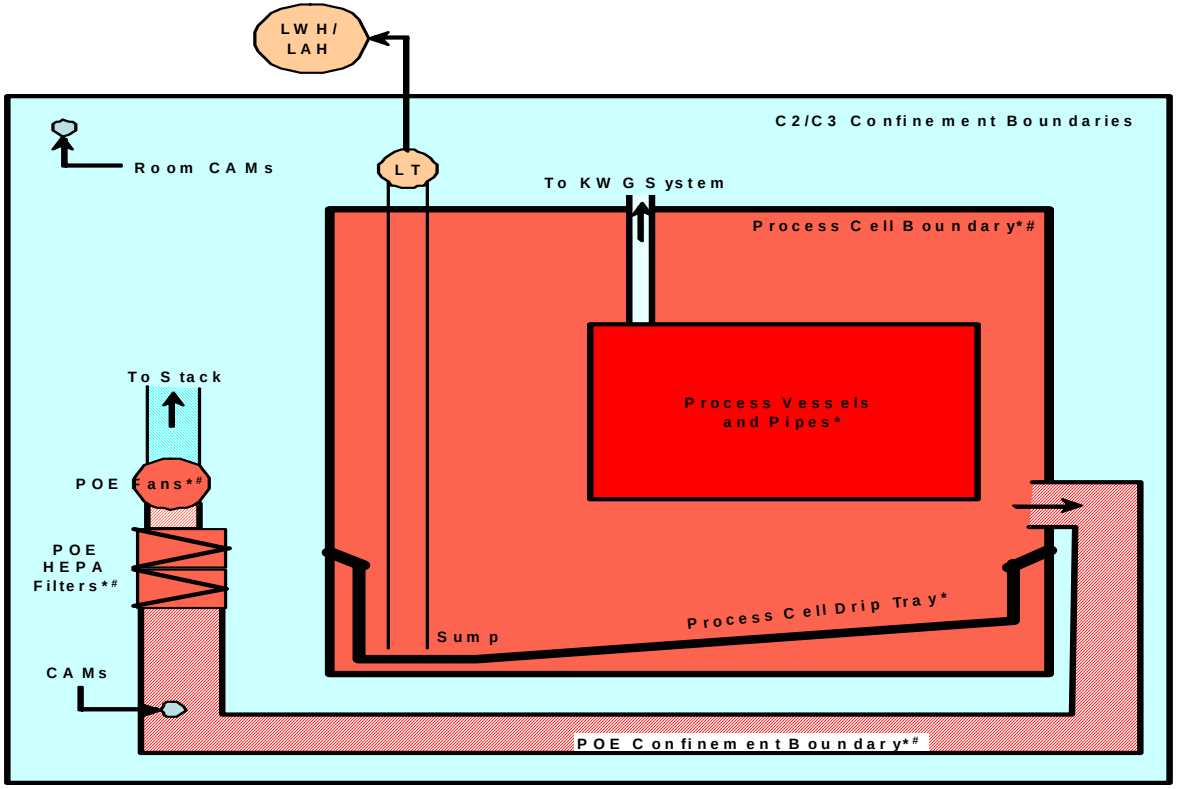
Process Cell Safety Features



* – IROFS for this Event Group
\# - Component of Process Cell Confinement System
CAMs – Continuous Air Monitors
LAH – High Level Alarm (in control room)
LWH – High Level Warning (in control room)
LT – Level Transmitter

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Overall Approach to Confinement Safety Analysis

Preliminary Hazards Analysis>

Preliminary Accident Analysis>

Process Hazards Analysis>

Dose Consequence Analysis>

Loss of Confinement Nuclear Safety Evaluation

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Loss of Confinement NSE Preparation

- Preliminary Hazards Analysis used to identify hazards and LOC events
- Preliminary Accident Analysis initially documented event scenario consequences for Safety Assessment of Design Basis
- Process Hazards Analysis for process units evaluated LOC events and suggested IROFS for ISA Phase
- Subsequent dose consequence calculation established maximum doses for LOC events

Loss of Confinement NSE Preparation
(Cont'd)

- Characterized safety strategy for LOC events: prevention or mitigation or both
- Selected Items Relied on for Safety (IROFS) for LOC events
  (active or passive engineered controls and administrative controls)
- Major IROFS: Ventilation Systems (VHD, HDE, POE, KWG)
- Demonstrated IROFS reliability

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IROFS Reliability Demonstration

The following criteria form the basis for the IROFS reliability demonstration:

- Application of single failure criterion
- Application of industry codes and standards
- Application of the MOX Project Quality Assurance Program
- Application of management measures.

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Summary

- The LOC NSE incorporates the results of the PHA, the PrHA, and the dose consequence analysis to demonstrate that the performance requirements of 10 CFR §70.61 are satisfied.
- This demonstration includes identifying the safety strategy for each LOC event scenario and the IROFS required implementing the strategy.
- IROFS designation has impact on design.

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