
Mechanical Systems – A Summary of NRC's Evaluation of DCS's Proposed MOX Facility

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IMPORTANT CONCEPTS FOR MECHANICAL DESIGN

- 1. Design Bases for Principle Structures, Systems, and Components**
 - 2. Capacity**
 - 3. Redundancy and Diversity**
 - 4. Safe Shutdown**
 - 5. Welded Construction**
 - 6. Passive Features/Remote Operation**
 - 7. Corrosion Resistance and Corrosion Allowances and Monitoring Programs**
 - 8. Personnel Protection**
 - 9. Seismic Design**
 - 10. Impact of Non-Principle Structures, Systems, and Components on Safety-Related Systems**
 - 11. National Codes and Standards: Such as American Society of Mechanical Engineers’ Boiler and Pressure Vessel Code, Sections VIII on Construction of Pressure Vessels, American Institute of Steel Construction N-690 Specification for Design, Fabrication, and Erection of Steel Safety-Related Structured for Nuclear Facilities, AWS D1.3 Structural Metal Welding Code for Sheet, ASME B31.3, Process Piping**
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PURPOSE OF NRC STAFF REVIEW

- ! Determine whether the material transport systems’ principle structures, systems, and components (PSSCs) and their design bases have been adequately addressed.
- ! Ensure that the Construction Authorization Request addresses
 - " PSSC design bases.
 - " Baseline design criteria and defense-in-depth.

FOCUS OF REVIEW

- ! PSSCs and supporting equipment.
- ! Safety of workers, public, and environment.
Equipment interaction, reliability, safety, unanalyzed hazards, and unidentified events.
- ! Historical performance of similar systems.

OUTCOME

- ! DCS committed to design & build facility in accordance with widely accepted industry codes and standards.
 - ! for MATERIAL TRANSPORT SYSTEMS: DCS meets requirements for defense-in-depth and basic design criteria; design basis provides reasonable assurance for protection against natural phenomena and potential accidents.
 - ! for FLUID TRANSPORT SYSTEMS: based on an open item regarding system design for corrosion the staff cannot conclude the design bases provides reasonable assurance for protection against natural phenomena and potential accidents.
 - ! for FLUID SYSTEMS: based on 4 open items regarding system design the staff cannot conclude the design bases provides reasonable assurance for protection against natural phenomena and potential accidents (no PSSCs identified for nitrogen system and seismic isolation valves)
 - ! for HEAVY LIFT CRANES: DCS meets requirements for defense-in-depth and basic design criteria; design basis provides reasonable assurance for protection against natural phenomena and potential accidents.
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OPEN ITEMS

- The design of the seismic isolation valves (includes all systems penetrating MFFF walls except for fire protection system, Section 5.0)
- The design basis for the corrosion allowances that will be used on systems that will not be readily accessible for inspection (for example, double-walled piping and piping in process cells)
- Accident scenario of flammable/explosive gases (hydrogen) to insufficient purging in the sintering furnace airlock. (safety significance of nitrogen system)
- No PSSCs have been identified for the nitrogen blanket on the hydroxylamine and hydrazine tanks. (explosive accumulations of gases)
- No PSSCs have been identified for the calciner carbon bearing. (confinement of material)
- The design basis for the non-PSSC instrument air system. (impact on connected systems)

CLOSED ITEMS

- System-level descriptions and examples of components that are PSSCs. Such as: redundant brakes with fail-safe design, structural oversizing of drive equipment, overspeed detection, mechanical stops, overtorque detection, electrical interlocks, magnetic grippers, glovebox hoods, and shielding.
 - Design bases for the Material Transport System.
 - Non-PSSC status for Heavy Lift Equipment.
 - Design bases for 3013 Canister, waste drums, fresh fuel casks, transfer containers
 - The National Codes and Standards that will be used to design and construct the fluid transport system.
 - Fluid systems will be in double-walled piping or in process cells
 - Design bases for materials of construction
 - Emergency Diesel Generator Fuel Oil & Exhaust System
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