AP1000 Main Control Room In-leakage

DCWG, February 12, 2009

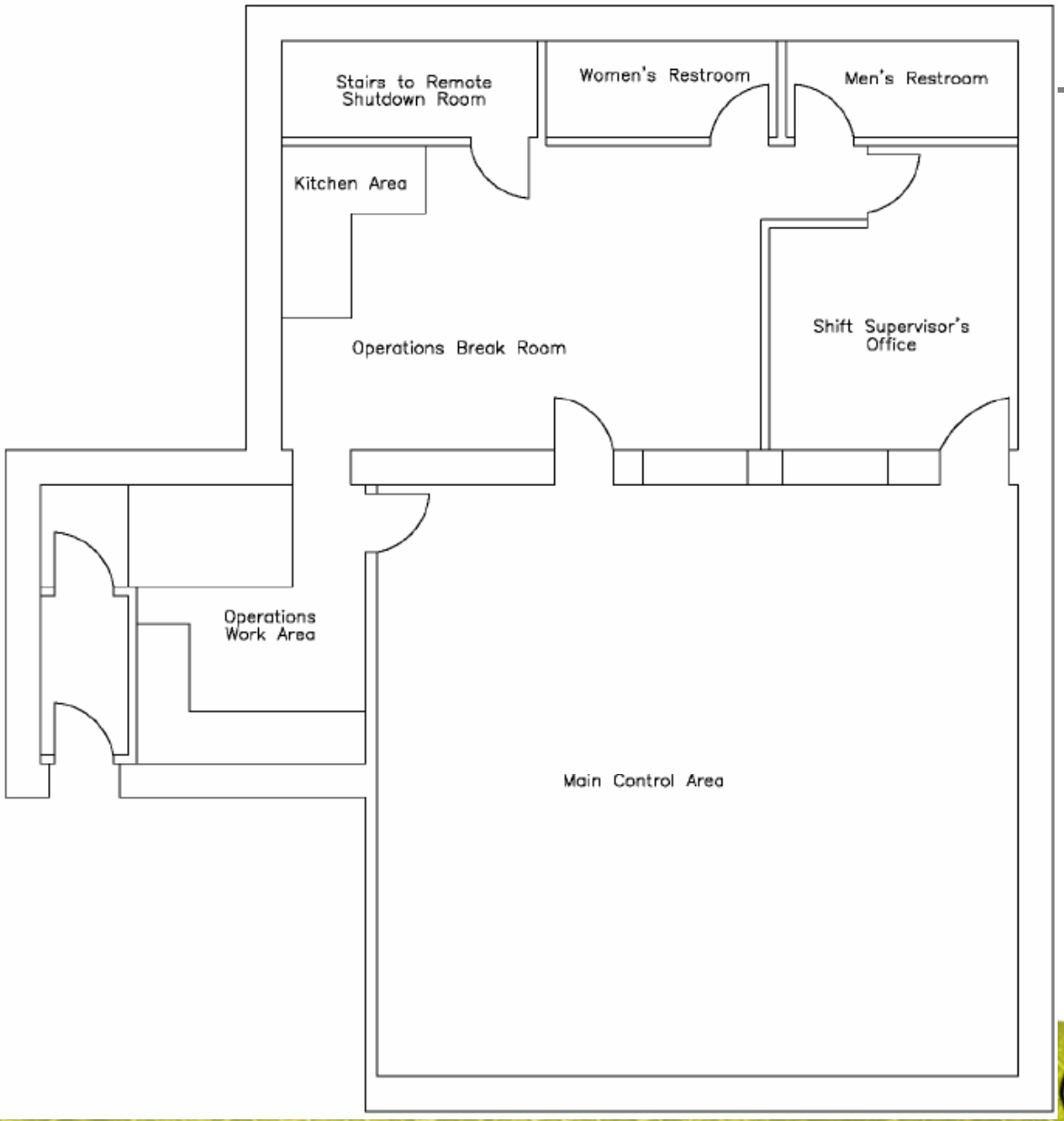
Objectives:

- Present Westinghouse's position with regard to AP1000 response to the Main Control Room (MCR) Dose Analysis
- Clarify NRC concerns with the Westinghouse position
- Establish a path forward to close any unresolved issues

Westinghouse's understanding of NRC concerns

- Zero inleakage
- Licensees demonstration of zero inleakage
- Tech Spec on Control Room inleakage
- Basis for 1.5 cfm effective inleakage assumption in the dose analysis and the impact of the vestibule purge flow
- Change to the logic of Main Control Room Emergency Habitability System (VES) actuation following a LOCA

MCR Layout


Stairs to Remote Shutdown Room
Women's Restroom
Men's Restroom
Kitchen Area
Operations Break Room
Shift Supervisor's Office
Operations Work Area
Main Control Area

Leaktightness

- The main control room pressure boundary is designed for low leakage
  - cast-in-place reinforced concrete walls and slabs
    - The interior or exterior surfaces of the main control room envelope (walls, floor, and ceiling) are coated with low permeability paint/epoxy sealant
  - constructed to minimize leakage through construction joints and penetrations
    - The outside surface of penetration sleeves in contact with concrete are sealed with epoxy crack sealer
    - The piping and electrical cable penetrations are sealed with qualified pressure-resistant material compatible with penetration materials and/or cable jacketing
    - Inside surfaces of penetrations and sleeves in contact with commodities (i.e., pipes and conduits, etc.) are sealed

Leaktightness Design (continued)

- Main control room pressure boundary HVAC isolation valves are qualified to shut tight against control room pressure

Leaktightness (continued)

- When the main control room pressure boundary is isolated in an accident situation, there is no direct communication with the outside atmosphere, nor is there communication with the normal ventilation system
- The design of the emergency habitability system (VES) provides 65 cfm ±5 cfm from air tanks to the control room and maintains it in a pressurized state
- Leakage **from** the main control room pressure boundary is the result of an internal pressure of at least 1/8-inch water gauge provided by VES Operation.
- The VES is a self-contained system. There is no interaction between other zones and pressurized equipment
- The path for the purge flow out of the main control room is through the vestibule entrance and this results in a dilution of the activity in the vestibule and a reduction in the amount of activity that might enter the main control room

MCR Entry

- Double-door vestibule restricts the volume of contaminated air that can enter the main control room from ingress and egress
- Vestibule is purged by the pressure relief damper discharge flow during VES operation
- The emergency exit door (stairs to elevation 100′) is normally closed, and remains closed under design basis source term conditions

Testing

- Preoperational Baseline testing
- Self-assessment of the VES at three years
- Periodic test at six (6) years in conjunction with other ASME inservice testing requirements
- Additional Testing
  - Repair or replacement of components
  - Identification of previously unidentified condition

Expected Post LOCA VBS-VES Sequence

- Following a LOCA, the VBS is isolated and the VES is actuated on low pressurizer pressure

Inleakage Assumptions in Dose Analysis

- The path for the purge flow is out of the main control room, through the vestibule and into the hallway
- Even though purge flow is from the control room to the vestibule and out of the vestibule, 5 cfm is assumed to move from the hallway into the control room
- The 5 cfm is to account for ingress and egress through 2 doors and the vestibule
- The radioactivity in the 5 cfm assumed to be going into the control room is diluted by the purge flow from the control room
- To model this dilution in the dose analysis an unfiltered inleakage rate of 1.5 cfm is modeled

Tech Spec for "Control Room Habitability"

- AP1000 Control room design is different than operating plants
- Differential pressure surveillance (SR 3.7.6.10) provides a reliable method for demonstrating control room envelope (CRE) integrity for this design
- Tracer gas surveillance is not practical for a pressurized control room envelope supplied by air tanks and not HVAC Ducts

Next Steps

- A “Focus” meeting should be held with the NRC staff in the upcoming weeks so that the NRC staff’s concerns can be addressed