



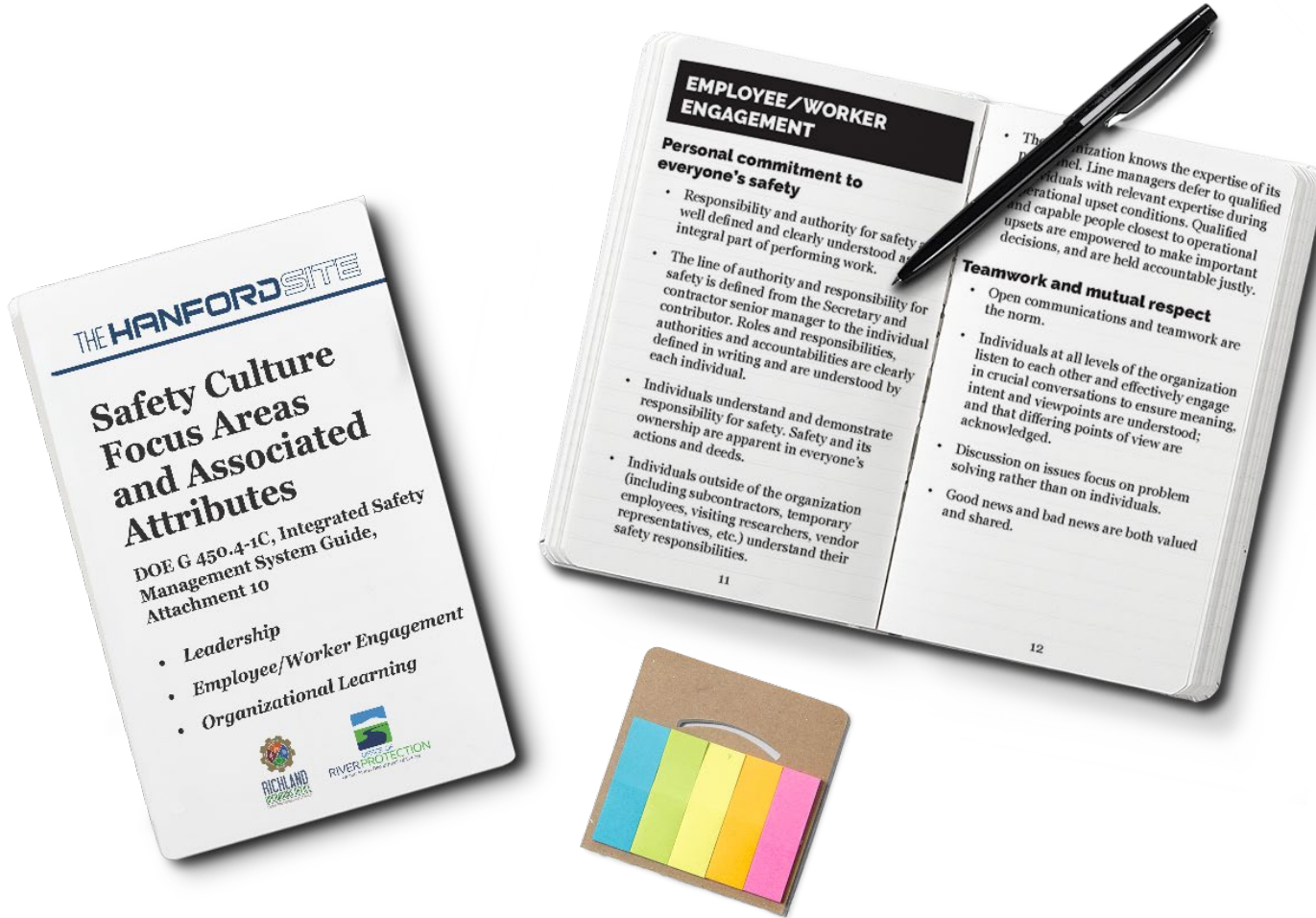
# THE HANFORD SITE

## **242-A Evaporator Briefing on Changes to Design/Operational Improvements**

U.S. Department of Energy

*October 12, 2022*

- Safety Culture Topic
- Introductory Remarks
- Background
- Hierarchy of Controls and Control Selection
  - Seismic Analysis
  - Fire Protection
- Questions



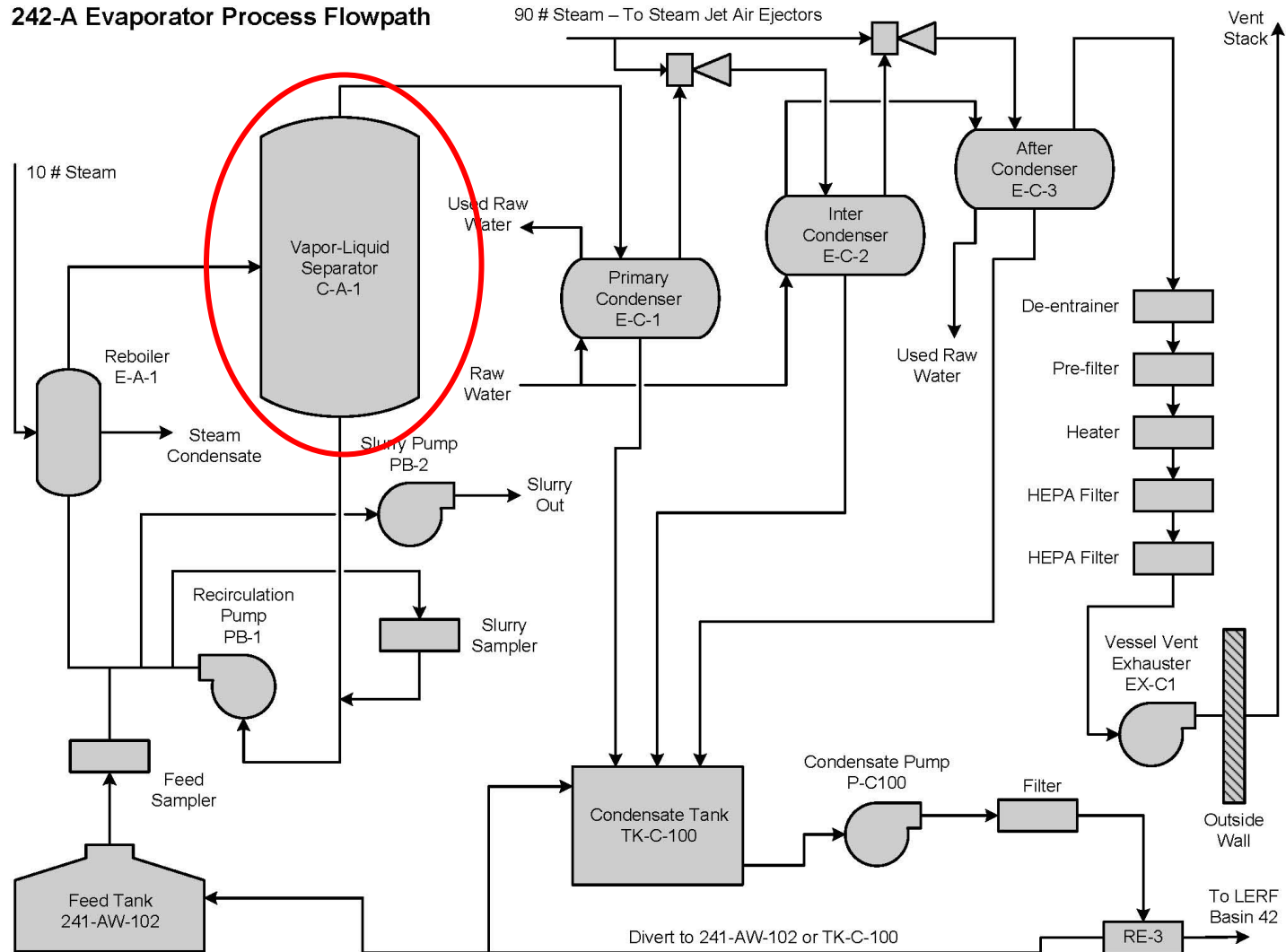
# 242-A Evaporator



April 2021

# Process Flowpath

242-A Evaporator Process Flowpath





Dump valve in the evaporator room



Dump valve in the evaporator room



Valve actuator in the condenser room

- DOE commitments:
  - Design/Operational Improvement 2: Implement design changes to ensure three credited valves in safety-significant vessels fail safe in the event of a facility fire
  - Design/Operational Improvement 3: Modify vessel seismic dump system to automatically initiate upon detection of a seismic event
- Defense Nuclear Facilities Safety Board letter dated July 19, 2022, transmitting the *Proposed Safety Approach for 242-A Evaporator Facility*

- Proposed safety basis changes – seismic
- Updated probabilistic seismic hazard analysis in 2014 lead to determination that the 242-A Evaporator control room would withstand the event



242-A Evaporator monitoring and control system



- Lack of adequate structural calculations
  - RPP-CALC-64961, 242-A Control Room Seismic Calculation, released on December 17, 2021
  - Facility walkdown completed; no structural modifications to the original design and no structural degradation was observed
- Lack of human response analysis
  - Safety basis will be revised to provide discussion of the actions and timeline provided under the administrative control (AC) Key Element 5.9.6 for response to a seismic event



Shutdown hand switch located outside of the 242-A Evaporator

- Lack of technical basis for changes
  - Based on the updated Control Room Seismic Calculation, the 242-A Evaporator control room would survive the design basis event
  - While the use of an automated safety-significant (SS) seismic shutdown is possible, controls are not required to be designated as SS for a beyond design basis event
  - Controls are allocated requiring operator activation of a seismic switch

- Proposed safety basis changes – fire
- Changes proposed because:
  - Unable to find safety-significant valves that would passively fail to a safe state at high temperatures
  - An alternate strategy to relocate safety equipment to separate fire areas is not viable
- Controls proposed to overcome technical issues:
  - Evaporator and pump room transient combustible material controls (specific administrative control [SAC])
  - New SAC controlling combustible material in the condenser room
  - Maintain operability of the valves in the event of a fire

- Changes to fire detection strategy
  - Added a SAC to limit combustible loading in the condenser room to protect against unacceptable fire temperatures
  - Preventative control rather than reactive
- Inadequate fire modeling code
  - Consolidated Model of Fire and Smoke Transport (CFAST) and Fire Dynamics Simulator (FDS) used
  - Concern regarding nonconservative limit for the allowed mass of Class A combustibles on the basement level was addressed by removing the matting



Crews removing matting in basement of 242-A Evaporator

- Lack of technical basis for changes
  - The initial solution: SS solenoid valves that passively fail at high temperatures
  - Subsequent proposed solution: A safety system to detect heat and put plant into a safe state. This required separation of components to prevent common mode failure
  - Final solution: Prevent heat sufficient to exceed the design temperature of the credited components
  - Additional defense-in-depth will be provided by a new NFPA 72 compliant heat detection and alarm interface to protect SS equipment

- We have made changes to the facility, changes to our technical documents, and changes to the DSA
- We have SS engineered controls and detection to respond to hazards (C-A-1 flammable gas and overflow) and protect the facility worker consequences
- We have a SAC to protect the SS equipment
- Multiple SS switches, one outside the building for manual shutdown
- The resultant control strategy is robust and reliable

# Questions?

The Hanford Reach  
White Bluffs Overlooking the Columbia River