The Waste Treatment Plant Fire Protection Challenges:

A Perspective from a DOE FPE

DOE/Contractor
Fire Protection Workshop
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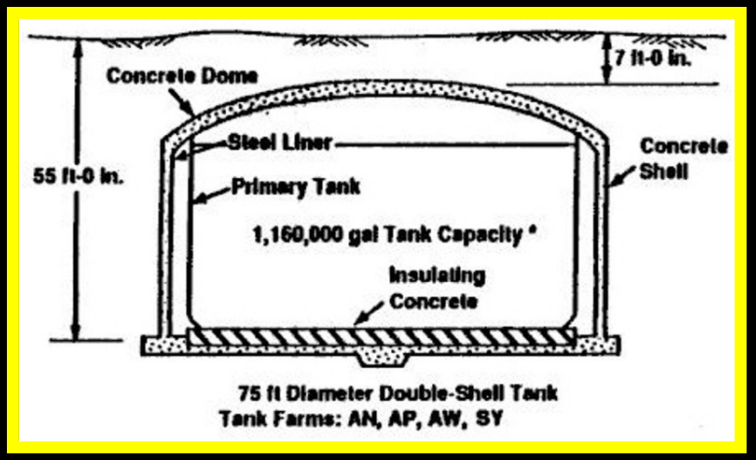
The Principle WTP Challenge

To <u>concurrently engineer and construct</u> multibillion dollar unique radioactive chemical/glass processing facilities to vitrify Hanford Tank Waste and meet all pertinent DOE, DNFSB, State and taxpayer expectations and/or requirements in a cost and time effective manner.

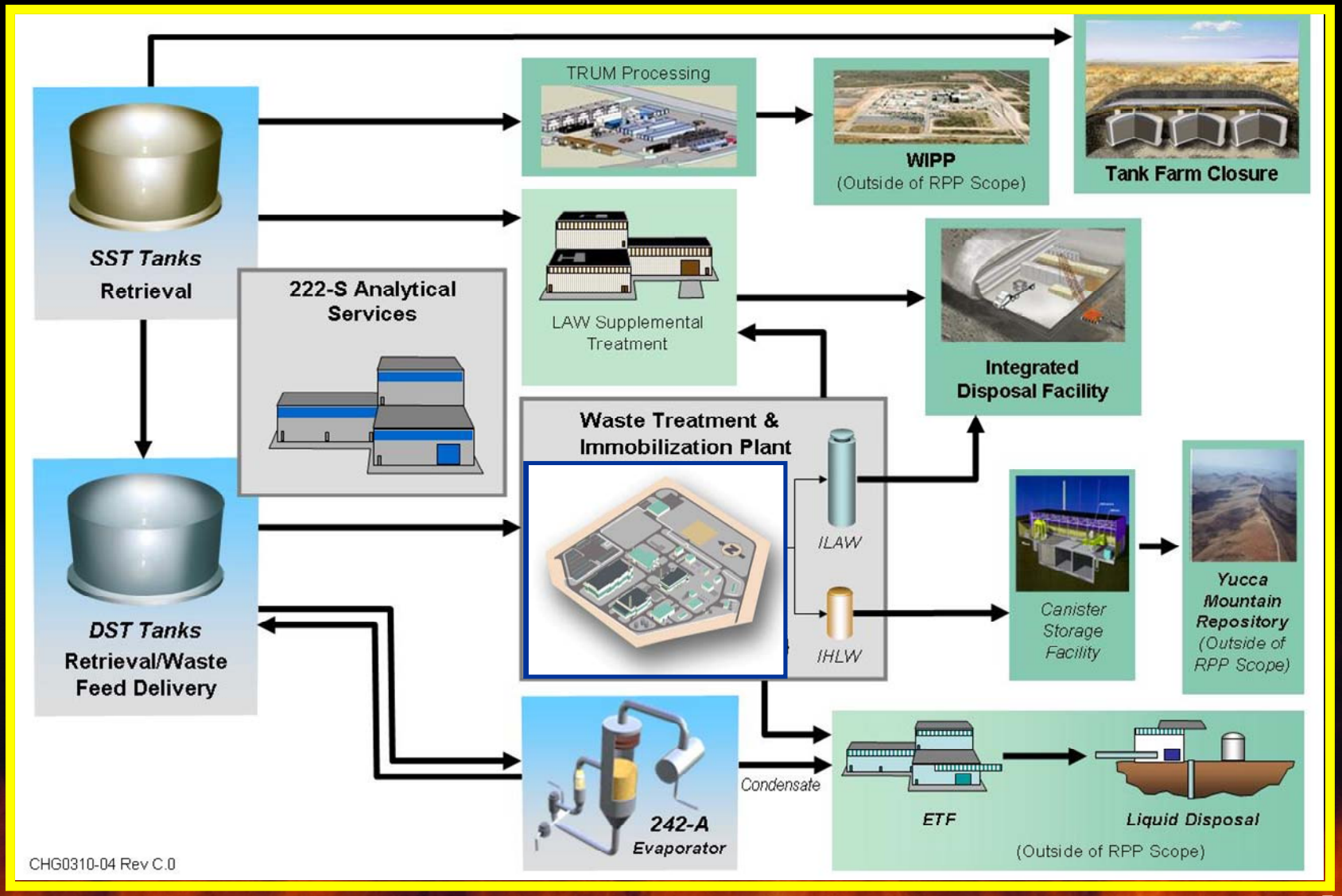
Hanford Radioactive Tank Waste

Construction of "Tank Farms"

Tank Farm Waste Today



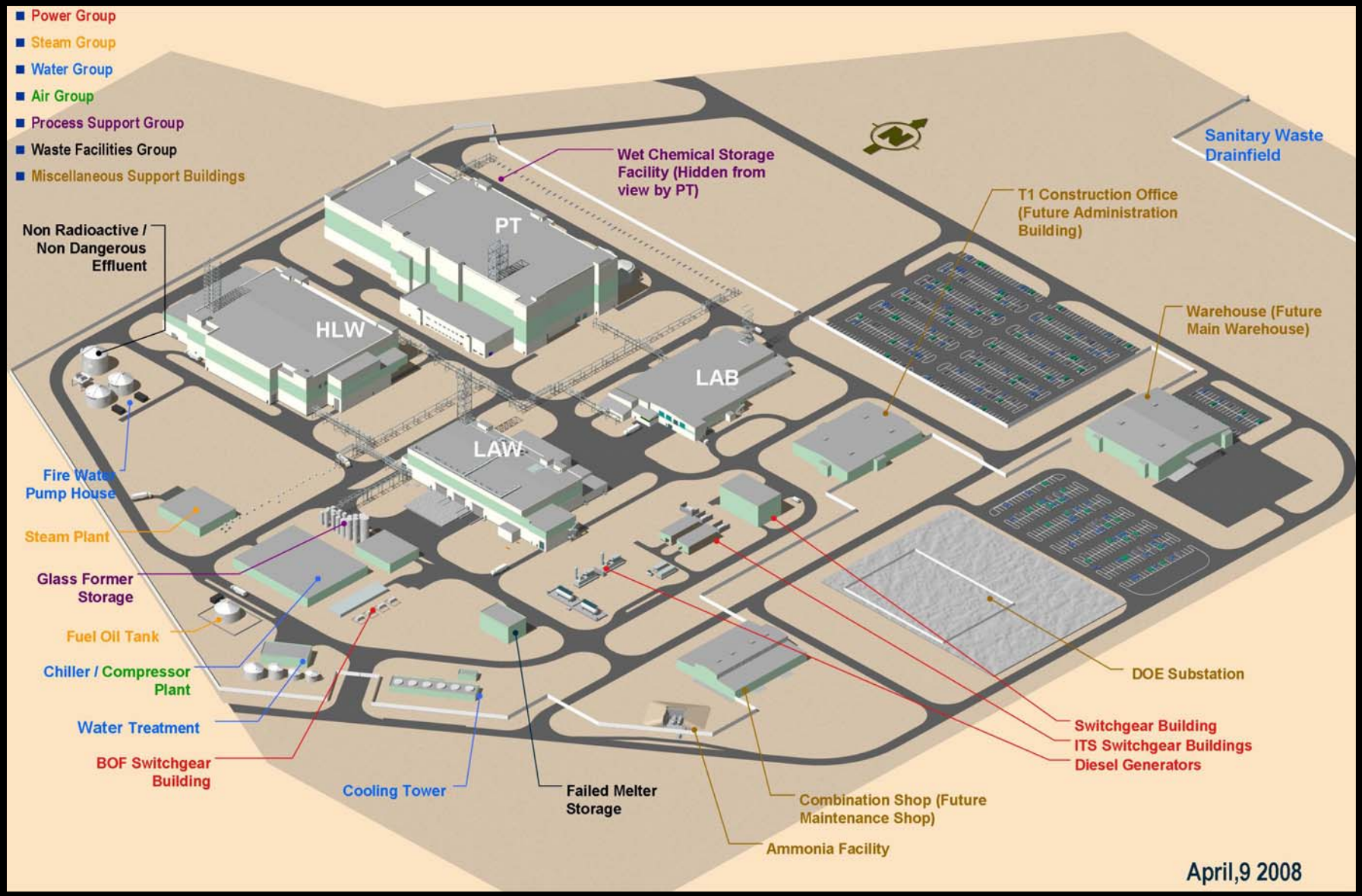
The ORP/RPP Mission



The Waste Treatment Plant (WTP) Mission

- Receive and process 53,000,000 gallons of chemical and radioactive mixed waste currently stored in 177 underground tanks.
- 1,500 chemicals identified in tanks complicates project processes– “witches’ brew” resulting from 5 canyons in Hanford history as research for complex Pu production.
- Complete full WTP construction & start by 2019.
- Early LAW possible before 2019.

Waste Treatment Plant



Unique WTP Design Facility Designs

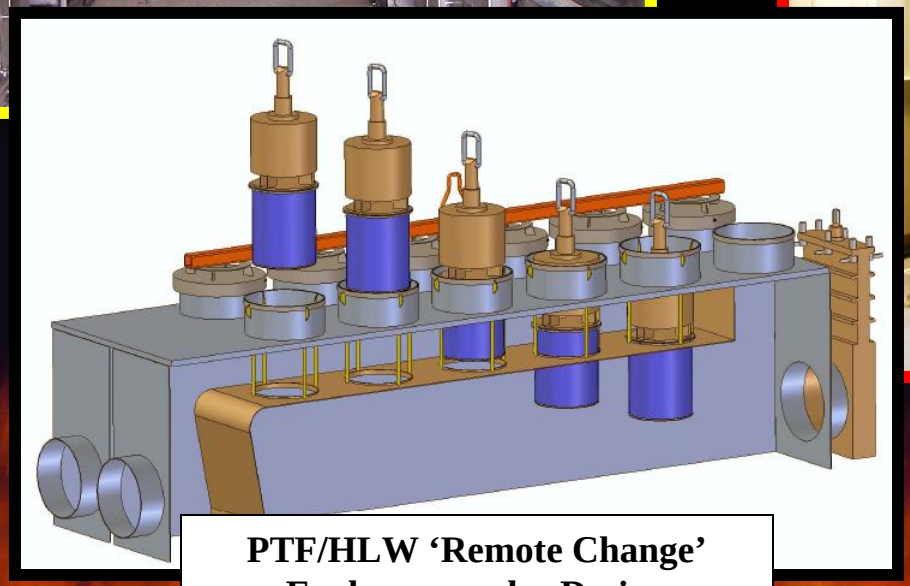
- Worlds Largest Vitrification Plant
- Contains some U.K. Technologies based on Sellafield Vit and Thorp Facilities (e.g. black cells, remote handled radial filters). Specialized remote automated chemical processing systems
- Unique acronyms and terms (bogies –car on a track, melter caves, mechanical handling turntables, glass former silos, bulges/equipment enclosures)
- Complex multilayer elevations with dense equipment and piping commodities.

Sellafield Nuclear Complex

Radial Filter Enclosures

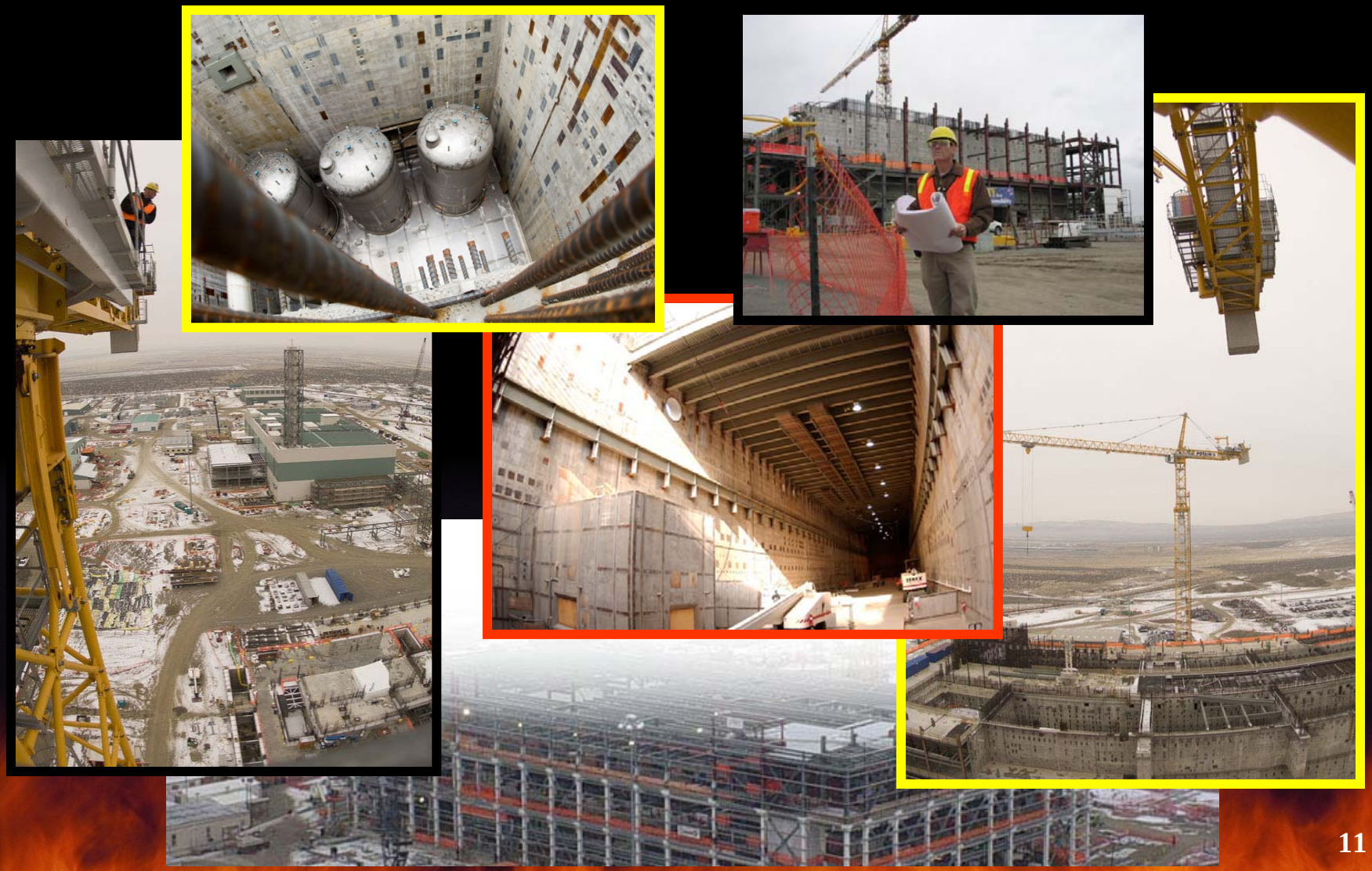
Low-Activity Waste 'Safe Change' Enclosure installation under Construction

Similar 'Safe Change' Enclosure at the Advanced Mixed Waste Project



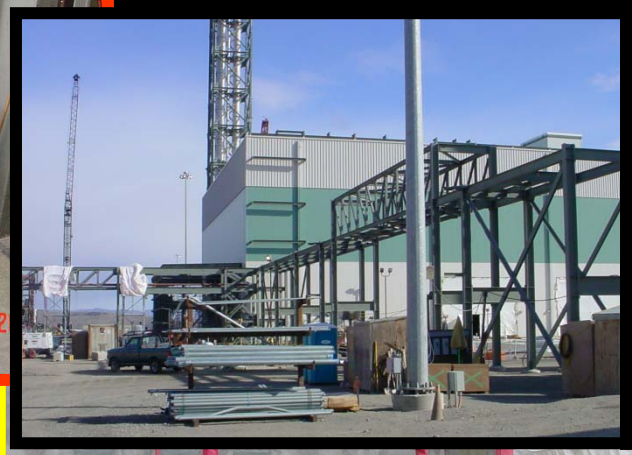
PTF/HLW 'Remote Change' Enclosure under Design

The Scale of the WTP



…complexity,

…unique equipment

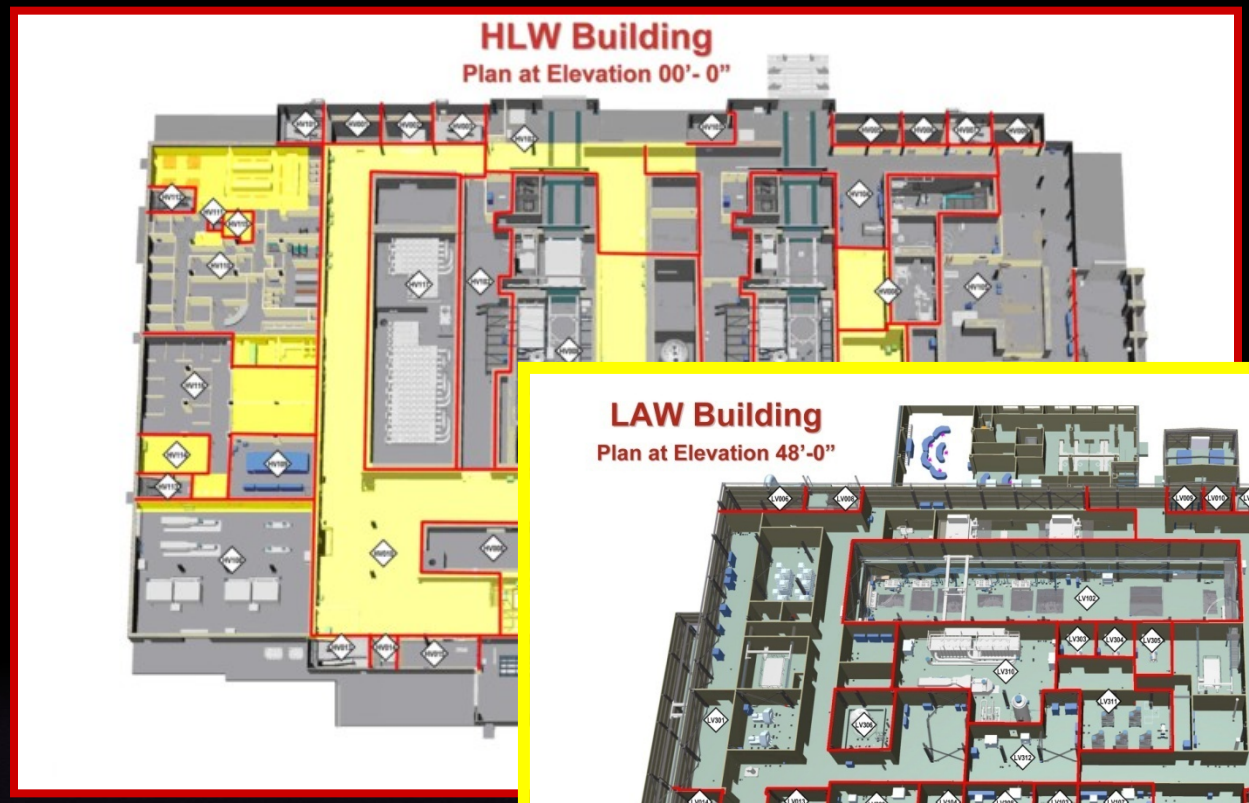


…state of the art analytical laboratory

WTP Site January 2002

WTP Site February 2008

Highly Compartmentalized

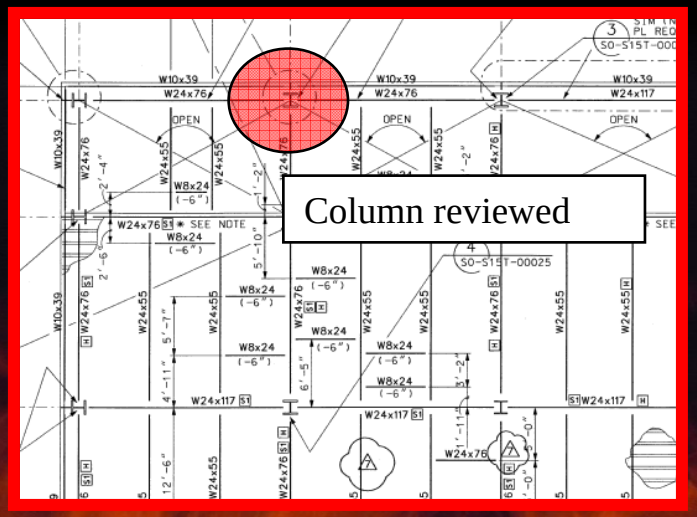


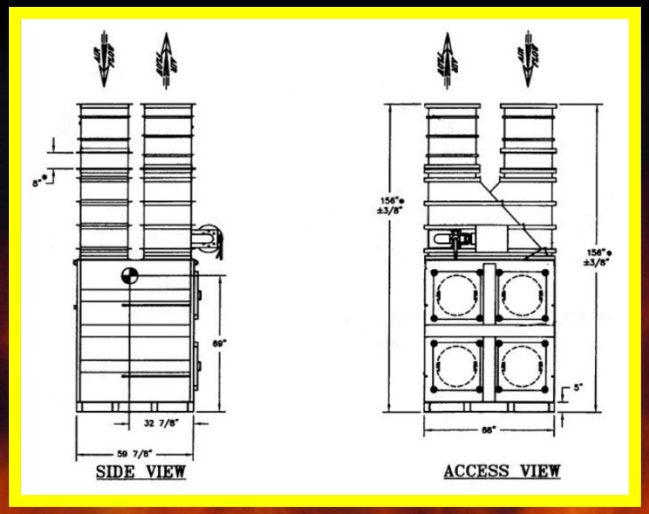
WTP Must Meet Essential DOE Fire Protection Requirements

- Automatic fire suppression and fire alarms/detection
- Adequate water supply
- Fire barriers/areas
- Manual fire department response
- Fire hazard analyses
- Applicable Building Codes, DOE, and NFPA Requirements
- DOE-STD-1066

Examples of two specific current fire protection challenges

- Structural Steel Fire Protection Methodology
- Protection of WTP confinement ventilation HEPA filters from fire





Challenge: Structural Steel Fire Protection

- Current Design Basis: WTP structural members that are not required to support design loads during or after a fire are not protected against fire.
- Designers must develop methodology and calculations accepted to stakeholders (e.g. DOE and DNFSB) showing unprotected structural members with reduced material properties due to a fire would not be relied upon to support the building.

Challenge: Structural Steel Fire Protection

- Approach must be integrated with project and stakeholder Structural and Fire Protection Engineers.
- Getting ‘Agreement’ using performance based methods vs protecting ALL structural steel is difficult.

Challenge: WTP HEPA Fire Protection

- Current design does not contain all prescriptive features found in DOE-STD-1006, Chapter 14 for traditional ‘square’ HEPA filter plenums.
- 1066 Criteria can be applied to other filter arrangements such as Advance Mixed Waste Treatment Project.
- DOE-STD-1006, Chapter 14, Section permits equivalency based on FHA.
- Performance criteria to demonstrate equivalency expectations (e.g. smoke, embers, heat, exposure fires) not explicitly contained in current 1066 standard.

Challenge: WTP HEPA Fire Protection

- ORP current evaluating:
  - smoke, ember, and heat generation calculations submitted to determine basis exists to support the overall conclusions of the FHA.
  - Effectiveness of fire safety controls and design features necessary to achieve an ‘equivalent level’ of protection in performance from prescriptive fire protection requirements of 1066.
  - Accident consequences and controls with respect to collocated and public dose.
- Although not impossible, demonstrating ‘equivalency’ can be more difficult than verbatim compliance.

Needs of these specific challenges:

- To convey a comprehensive documented technical case for any performance based method/equivalency.
- Realization that stakeholders are not as comfortable with performance based fire protection approaches for various reasons.
- Recognition that DOE standards currently not as mature in defining performance based methodology and expectations compared to the NRC (e.g. NUREG 1805 and NFPA 805).
- Consideration of life cycle controls/costs of all key assumptions associated with performance based decisions.

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http://www.hanford.gov/