

Pantex Plant Special Exposure Cohort - Bounding Uranium Intakes

Mark R. Rolfes, M.S.

Health Physicist

**National Institute for Occupational Safety and Health
Division of Compensation Analysis and Support**

**August 2011
Richland, WA**

Pantex Plant Mission

- **Develop and fabricate high explosives**
- **Assemble finished parts into nuclear weapons**
- **Conduct surveillance testing and evaluation**
- **Retrofits and modifications**
- **Dismantlement of retired weapons**

Uranium Exposure Potential

- **Assembly operations involve handling of clean, new depleted uranium components**
 - **Memorandum to Y-12 dated 1959 explicitly pronounced Pantex's "Commitment to allow no detectable removable contamination into the weapon assembly area."**

- **Potential for internal exposure from the handling of new uranium parts is low**
 - **Review of >5,000 Pantex workplace air monitoring results (1960s-1990s), >200,000 contamination swipes (1980s – 2010), and source term information (all years) all support the low exposure potential**

Uranium Exposure Potential_{-cont.}

- **Higher potential for intake during dismantlement**
 - Early Pantex operations focused on assembly
 - Majority of dismantlement work occurred after 1973
- **W28 dismantlement operations from 1984-1989 had the highest potential for uranium internal exposure**
 - Supported by observed contamination levels, documented interviews, and site expert discussions

Reasons Why the W-28 Campaign Bounds Uranium Intakes

- **W28 series weapons were stockpiled up to 30 years which maximized the potential for age related oxidation**
 - **Corrosion of uranium is a function of composition, age, temperature, and humidity**
- **Depleted uranium metal in the W28 was not alloyed or encased (alloying of uranium inhibits corrosion)**
- **W28 had one of the largest uranium surface areas of all weapons, hence more metal was exposed to corrosive environments**
- **Disassembly operations far exceeded those conducted in previous years**

Bounding Uranium Intakes_{-cont.}

- **Approximately 300 uranium urinalyses collected from weapon assembly and disassembly workers at Pantex shortly after the campaign ended**
 - **Samples can be used to bound the maximum chronic intakes that could have occurred over the 6-year period**
- **The 95th percentile uranium intake value of the distribution of measured urine samples bounds potential intakes for all assembly and disassembly operations at Pantex**

Uranium Intake Plausibility

- The uranium intakes proposed by NIOSH are bounding under plausible circumstances
 - For type S material this results in a daily intake of 135 pCi (~30 U dpm/m³)
- *In Vivo* results from the worker population supports that the chronic 95th percentile uranium intakes proposed by NIOSH are bounding
- NIOSH airborne levels are consistent with empirically derived values from similar operations involving uranium

Summary

- **NIOSH has developed a scientific, quantitative methodology to bound potential uranium intakes incurred by Pantex assembly and disassembly workers**