Joslyn Manufacturing and Supply Co.

Ft. Wayne, IN

Special Exposure Cohort
Evaluation Report Addendum

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January 28, 2014

About Joslyn

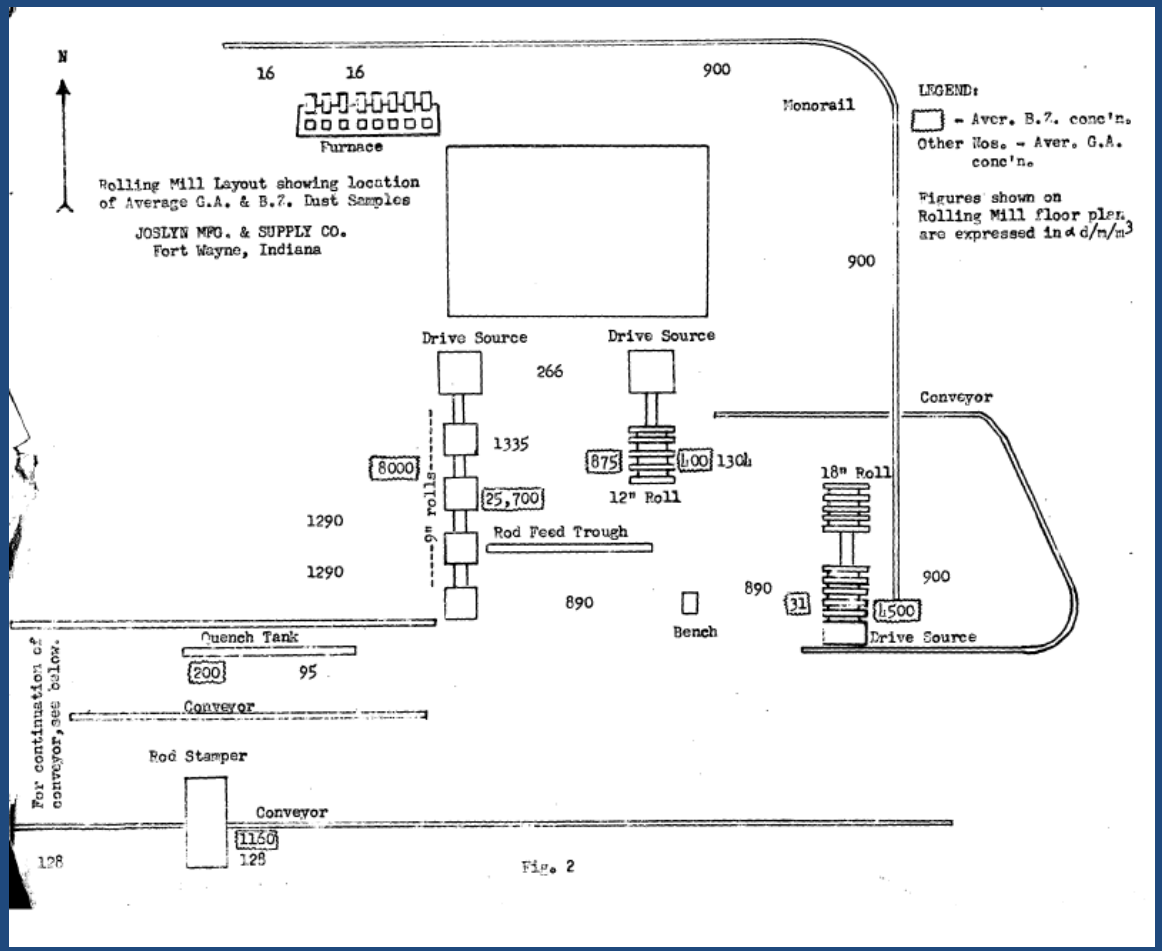
- Atomic Weapons Employer (AWE) from March 1943 to 1952
- Machining and rolling of uranium rods, limited thorium machining before 1948
- Primary commercial uranium rolling facility for the AEC before Simonds Saw and Steel
- Manhattan Engineer District (MED) - hot rolling, quenching, straightening, cooling, grinding, waste burning, and abrasive cutting of natural uranium billets into metal rods

Production

- Pre-1948 work uranium production for Hanford site
- Develop procedures for rolling uranium metal for nuclear reactors
- Rolling operations for testing uranium metal rods at Chalk River reactor, Canada
- Uranium metal for British government

Three rolling mills

18 inch
12 inch
9 inch



Petition review

- Received March 15, 2012
- Qualified May 10, 2012
- Petitioner proposed class
  - All employees who worked in any area of the Joslyn Manufacturing and Supply Company in Fort Wayne, Indiana, from 1944 through 1952
- Class Evaluated
  - All employees who worked in any area of the Joslyn Manufacturing and Supply Company in Fort Wayne, Indiana, from March 1, 1943 through December 31, 1952

Board action review

- December 2012
  - AWE employees for March 1944 - December 1947
  - NIOSH proposes dose reconstruction (DR) from January 1948 using TBD-6000 methods
  - Board tasks SC&A with report on 1948 - 1952
- December 2013
  - SC&A submits report with 11 issues
- January 16, 2014
  - Addendum, issues matrix with work group

NIOSH action review

- Numerous interviews
- Additional data capture
- Reviewed records and basis for TBD-6000 and appropriate use of surrogate data
- Recommended class amended to include January 1, 1948 - July 31, 1948 due to inability to reconstruct internal dose for reasons to be discussed

Exposure sources

- Inhalation and ingestion of natural uranium oxide from uranium metal rods production and shaping
- Hand-operated shop, rods were manually reinserted into the mill the required number of times and then dragged to the next process
- Three co-located rolling mills (18 inch, 12 inch, and 9 inch) used for various operations simultaneously
- Uranium rolling
  - Rollers had water-cooled bearings
  - Produced steam and high levels of contamination

Exposure sources

- Additional machining and preparation steps on uranium metal prepared on site and other facilities
  - Centerless grinding, cutting, heat treating and quenching, and threading
- Billets stored onsite for long periods of time
- Uranium waste collected and burned outside
  - Worker interviews noted burning of waste on site
- Documents reviewed describe off-site explosion of an improperly treated drum of uranium metal

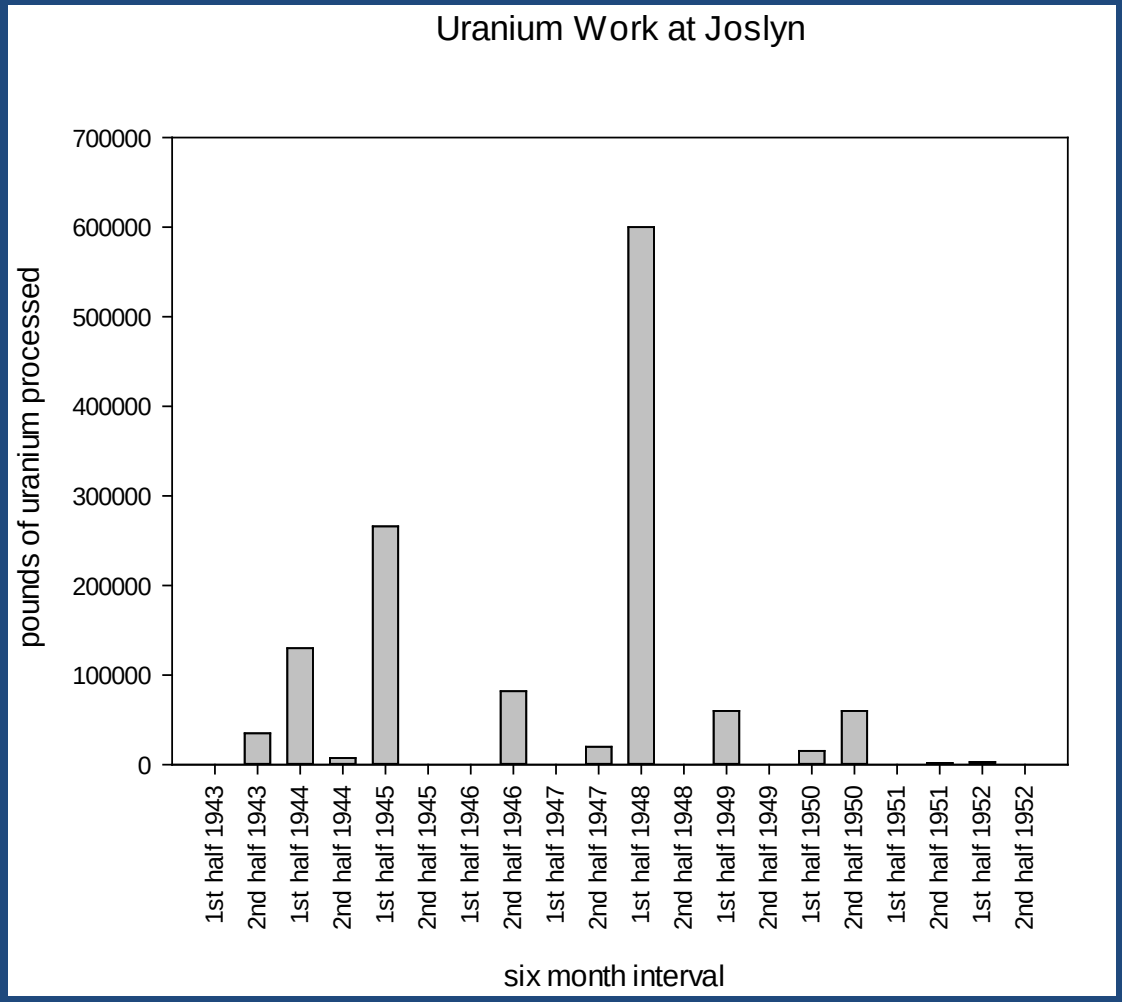
Exposure sources

- For all operations, Joslyn was responsible for packaging, handling, and loading
- MED/AEC kept strict records of metals and sought to regain as much of the material as possible
  - Joslyn responsible for cleanup and accounting for materials
- Documents describe a required medical surveillance program for Joslyn workers including x-rays and blood work

Exposure sources

- Two recorded thorium-related processing periods prior to 1948
  - June 21, 1946: Straightening and centerless grinding of six thorium rods
  - January 21, 1947: Centerless grinding of five extruded thorium rods
- NIOSH has developed an external dosimetry model for these operations based on a TBD-6000 approach

Uranium quantities processed



External Monitoring Programs and Data Availability

- No evidence of routine monitoring program
- Extremely few measurements are available, source term basis needed
- 1949 Health and Safety Laboratory (HASL) survey reported contamination levels and dose rates in several areas

Internal Dose Monitoring Programs and Data Availability

- No routine air monitoring or bioassay program
- Limited air samples taken on three different occasions (December 1943, May 1944, October 1951)
  - Very limited in scope
  - Mostly General Area (GA) samples
  - Early data taken using equipment (electrostatic precipitator) which would not be comparable to HASL equipment
- Substantial study performed January 8, 1952
  - HASL conducted a time weighted average study of various production operations at Joslyn

Class addition rationale

- Previously recognized TBD-6000 approach needed validation for specific practices and methods used at Joslyn facility performed under MED supervision
  - Extensive data collected in 1952 was shown to be bounded by a TBD-6000 approach: How far back can NIOSH justify these measurements represent the conditions and practices at the site?
- Found that practices and standards evolved rapidly from 1943-1948
  - For Joslyn, the same oversight continued through the high production rolling period (until the end of July 1948)
  - Operations after July of 1948 guided by AEC (including contracts and presence of AEC officials)
  - Tie to AEC (and HASL) provides consistency with monitoring procedures, representativeness of sampling

Class addition rationale

- Three closely co-located rolling mills (see earlier diagram)
  - The pre-August 1948 practices include documented rolling of multiple rods simultaneously on the same or adjacent mills
  - The 1952 study was done one station at a time
  - In early 1948 this practice was needed to handle the nearly 600,000 lbs of uranium rods that were processed in 42 operating days (January to July 31, 1948)
  - NIOSH believes data collected in 1952 are directly comparable to this high production phase that required different operational practices

Class addition rationale

- Most of the rolling days (and the only days with substantial rolling efforts) in 1949 and 1950 were in support of the AEC at the Chalk River reactor Canada (alpha phase uranium dimensional stability)
  - Required careful temperature control
  - Represented smaller efforts (approximately 30 tons in both 1949 and 1950)
  - These two efforts represent were specifically done using only the 18 inch rolling mills
  - The 18 inch rolling mill was shown in the 1952 study to have substantially lower air concentration levels that the 9 inch mill.
  - Previous electrostatic precipitation air sampling also showed the 9 inch mill produced much higher air concentrations than the other mills

Class addition rationale

- Suitable DR method does not exists before 1948 for Joslyn workers who were not monitored and potentially exposed to uranium and thorium
- Lack of adequate biological monitoring data,
- Insufficient air monitoring information
- Differences in operational characteristics from other metal working (no appropriate surrogate data exists)

Class addition rationale

- Why everyone?
  - Based on reports by the AEC and facility layout, the process areas were broadly distributed and controls for preventing movement in these areas was not enforced
- Why stop in July 1948?
  - NIOSH proposes that the surrogate data from TBD-6000 coupled with the known operational data and source term information provides support that a realistic dose can be determined

Employees not included in the SEC?

- NIOSH will use internal monitoring data that may become available for an individual claim
- Perform DRs for March 1, 1943 - July 31, 1948
- External 1943 - 1952
- Medical x-ray 1943 – 1952
- Internal August 1 – December 31, 1948

External Dose Post 1943-52

- Standard approach to medical X-ray dose using OTIB-0006
- External dose rate factors for rolling days and contaminated surfaces will be applied
- Billets were stored onsite for an extended amount of time
- For the purposes of the example dose reconstructions external dose determined
  - Rolling day: 10 hour exposure to a long billet at 1 foot per rolling day (7.03 mR/day)
  - Billet storage: 10 hour exposure to a long billet at 1 meter per non-rolling day (1.08 mR/day)

Post July 1948 Internal Dose

- NIOSH proposes to use the data from TBD-6000 and known rolling days to determine internal and external dose beginning with August 1, 1948
- Dose reconstruction approach summarized in a white paper (currently in classification review)
- TBD-6000 tabulated data converted from per calendar day to per rolling day exposures for ingestion and inhalation (assuming 250 work days per year)
- In addition to rolling operator, NIOSH will include uranium machining as a method using TBD-6000 to assess the considerable amount of machining operations conducted during the Joslyn operational period

Health Endangerment

- The evidence reviewed in this evaluation indicates that some workers in the class may have accumulated chronic radiation exposures through intakes of radionuclides and direct exposure to radioactive materials.

- Consequently, NIOSH is specifying that health may have been endangered for those workers covered by this evaluation who were employed for a number of work days aggregating at least 250 work days within the parameters established for this class or in combination with work days within the parameters established for one or more other classes of employees in the SEC.

Summary

Feasibility Findings for Joslyn Petition SEC-200 March 1, 1943 – December 31, 1952		
Source of Exposure	**Reconstruction Feasible**	**Reconstruction NOT Feasible**
Internal		
- Uranium	**8/1/1948 - 12/31/1952**	**3/1/1943- 7/31/1948**
-Thorium	**N/A**	**3/1/1943- 12/31/1947**
External		
- Gamma/Photon	**All years**	
- Beta	**All years**	
- Neutron	**N/A**	
- Occ. Medical X-ray	**All years**	

Proposed Class

"All Atomic Weapons Employees who worked in any buildings/area owned by the Joslyn Manufacturing and Supply Co. in Fort Wayne, Indiana, from March 1, 1943 through July 31, 1948, for a number of work days aggregating at least 250 work days, occurring either solely under this employment or in combination with work days within the parameters established for one or more other classes of employees included in the Special Exposure Cohort."