

## Site Exposure Matrices (SEM)

### Overview

Created SEM in 2005, as a tool that helps claims staff research occupational toxic substance data relating to employees working at facilities covered under Part E of the Energy Employees Occupational Illness Compensation Program Act (EEOICPA). The program released a publically available version in May 2010, in response to stakeholder input. Updates to the public version occur in approximately six-month cycles due to Department of Energy classification reviews. DEEOIC just published the 10<sup>th</sup> version.

### SEM Functionality

SEM is a tool that contains a large data set relating to evidence that a substance was present or used in operations at a facility. It does not provide temporal data on the use of toxic substance data (i.e. the use of toxic substance at different times). It has filtering capabilities that allow for searches based on different variables including health effect, facility, work process, labor category, building/area or incident data. The “probative” strength of search results is dependent on correlation between claim evidence and filtered search parameters. SEM cannot factually prove that an employee had exposure to a toxin or the level, extent or duration of exposure. It can only provide information on the likelihood of *potential* exposure. DEEOIC applies the expertise of certified Industrial Hygienists to refine further the individual exposure profiles for employees.

- **Paragon:** DEEOIC’s contractor for SEM is Paragon Technical Services, Inc. (PTS) PTS staff members have extensive experience working at DOE in jobs such as engineer, chemist, industrial hygienist and operations management. In fact, if you were to add up all the years of DOE experience of each Paragon team member, you would find that they have a combined total of 180 years of experience working at DOE. They have “Q” clearances.
  - Keith Stalnaker – is the PTS Program Manager
    - Worked 32 years in DOE facilities at Portsmouth GDP, Oak Ridge Sites (ORGDP, ORNL, Y-12), Paducah GDP
    - Registered Professional Engineer and Certified Safety Professional
    - Education: Engineering (Ohio State University 1973), MBA (Ohio University 1982), PhD Occupational Safety and Health (University of Tennessee 1998)

- Authored nine peer-reviewed articles that were published in *Professional Safety* and a chapter on Safety and Health Training best practices in the *ASSE Safety Handbook* (2008)
  - Adjunct professor of Safety and Health at Columbia Southern University (2002-2013), and prior chair of graduate safety and health program, and current member of Academic Advisory Board.
- **Data Collection:** Best described as “ongoing”
    - Beginning – in 2005 PTS held 53 worker round table meetings at 37 different DOE facilities (all the major sites) and met with 950 workers requesting input on SEM in terms of toxins, work process, labor categories and suggestions for document searches on these topics
      - **Worker Discussions and recollections** – PTS staff had detailed, meaningful discussion with workers that touched on processes and toxins. These discussions could be quite lively and included instances in which two or more employees who had worked together for years described aspects of their jobs, including substances used, quite differently. These were instances where the workers were “telling it just like they remembered it;” but they remembered it differently. Human recollection can be tricky in that respect, which is why SEM relies on documentation. The worker discussions greatly assisted in the effort to locate that documentation and answer questions brought up in meetings, but ultimately, a paper trail is required.
    - Now
      - ≈ 35,200 documents in the SEM library, each cataloged and accessible. Some more than 1,000 pages, some only a page or two, average size is roughly 300 pages.
      - Gap analysis – going back to some sites to fill in known gaps – SRS, NTS being worked on now – includes coordination with DOE. - PTS researchers are being given direct access to some DOE databases to search for pertinent information. The first search was largely paper- based – but moving to electronic retrieval.

- Constant input to SEM – public input and a Data Acquisition Request (DAR) feedback loop. If a DAR contains information that is not in SEM, the DAR is forwarded to PTS to either identify gap for more information gathering, or sometimes the DAR contains enough information to directly fill gap. Such a change can be accomplished in 3 days, thus facilitating case adjudication in real time.

- **Toxic Substance Information**

- SEM provides data on the various biological or chemical toxins found at a particular facility. The data is populated based on review by Paragon relating to source documentation that relates to the use of toxic substances in DOE operations. The SEM contractor employs many experts in site operations (former employees) and other specialists.
- 118 DOE facility spreadsheets
- 4000 additional spreadsheets associated with uranium mines, mills, ore buying stations and ore transporters
- Largest single spreadsheet is Hanford:  
2010 (v20): 156,615 rows of data (approx. 783,000 cells of data)  
2014 (v50): 183,984 rows of data (approx. 921,000 cells of data)
- Current number of toxins in SEM: 17,347 (in 2005, it was estimated that only 2,000 would be identified)
  - Note: this number can increase or decrease. Currently, PTS has been consolidating trade-name substances into generic categories, so that instead of Windex, SprayWay and Clorox glass cleaners all being listed separately, we have “Glass cleaners,” with all the trade names as aliases. These consolidations are reducing the overall number of toxins, but not substantively changing content. The SEM used by claims staff contains 16,915 toxins.
- SEM is a dynamic database that is updated continually to add or modify data as source material is obtained and analyzed.

- **Health Effect Data**

- Peer reviewed epidemiological data establishing a causal relationship between a toxic material and a diagnosed illness i.e. asbestos causes asbestosis.
- SEM health effect data currently populates from National Library of Medicine Haz-Map.
- Dr. Jay Brown – the links between toxic materials and occupational illness are not on the SEM spreadsheets, rather, those are pulled into the database via links to the National Library of Medicine's (NLM)'s Has-Map. <https://hazmap.nlm.nih.gov/>  
Haz-Map is updated continually because Dr. Jay Brown, its author, reviews health effects for chemicals of interest to DOL and as he reviews public health and other research journals containing the latest findings, updates occur. Dr. Brown's work is then submitted to NLM for review and editing, once they are published on the NLM website, links are input into SEM. Dr. Brown maintains a website (<http://www.haz-map.com>) separate from NLM's website and among other things, provides an up-to-date Bibliography.
- Internal mechanisms exist for review of additional health effect data and would be addressed in the claim process.

# SEM Search/Filtering Parameters –

The screenshot shows a web browser window displaying the 'EEOICP Site Exposure Matrix' website. The URL in the address bar is <http://192.104.4.234/expanded/index.cfm#>. The page content is as follows:

**Compliance Assistance**  
**Regulatory Library**  
**About OWCP**  
**OWCP Programs**

- DFEC
- DEEOIC
- DLHWC
- DCMWC

**Contact OWCP**  
**OWCP Customer Assistance**

*The site specific information in this database reflects available data and may not be complete. The results should be used with a full understanding of the limitations of the current dataset.*

Welcome to the expanded version of the Site Exposure Matrix (SEM). It contains more data and provides more ways to look for information regarding toxic substances at facilities covered under Part E of the EEOICPA. In the expanded SEM, you can more easily identify interrelationships between buildings, work processes and exposure to toxic substances. For additional guidance on how to navigate the new and improved SEM, click on the Help Guide link in the menu above.

The information in this database is a reflection of the information that has been collected to date. DOL continues to enhance SEM as more information is collected and becomes available. Thus, SEM cannot be considered complete or final. If you have additional unclassified information, you are encouraged to submit it to the DOL using the Site-Related Information Submittal Form on this page.

Show DOE sites  Show uranium mines  Show uranium mills  Show Ore-buying stations  Show uranium transport  
Site:    
\*[Click here](#) to locate a site by alias, description and owner/operator, if you cannot find the site you are looking for in the list above.

**SEARCHES OF UNIVERSAL INFORMATION:**  
[Toxic Substances](#) (3059 listed for "Hanford/PNNL")  
[Toxic substance information](#)  
[Toxic substance by alias or property](#)  
[Toxic substance by chemical category](#)  
[Health Effects](#) (from NLM Haz-Map Disease List)  
[Disease or health effect information](#)  
[Find toxic substance by disease or health effect alias](#)  
[Disease or health effect by alias](#)  
[Work Processes with embedded disease links](#) (65 listed matching site-specific work processes for "Hanford/PNNL")  
[Work Process information](#)  
[Work Process by work process text](#)

**SEARCHES SPECIFIC TO THE SELECTED SITE -- "Hanford/PNNL":**  
Site  
*See the SEM profile for "PNNL" for PNNL activities after 2004.*  
[Site history](#)  
[Onsite location by alias](#)  
[Areas](#) (11 listed)  
[Area information](#)  
[Buildings](#) (856 listed)  
[Building information](#)  
[Work Processes](#) (713 listed)  
[Work process information](#)  
[Work process by alias](#)  
[Labor Categories](#) (171 listed)  
[Labor category information](#)  
[Labor category by alias](#)  
[Incidents](#) (72 listed)  
[Incident information](#)  
[Incident text search](#)  
[Incident search by related item \(toxic substance, location, process or job\)](#)

**SEM Home** | [Review status of public input: by site, by disease](#) | [Submit site-related information](#), | [Submit disease-related information](#)  
| [Main Menu](#) | [UNIVERSAL >](#) | [Toxics](#) | [Tox by Alias](#) | [Tox by Category](#) | [Health Effects](#) | [Tox by Health Effect Text](#)

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## Searching SEM

- Correlation between information in case evidence and SEM data
  - The reviewer performing a SEM search constructs a SEM search based on what he or she can reasonably establish about the employee work history. Contradictory data or information that does not align between an employee's work history and SEM searches results in poor outcomes.
  - Employment data supplied by the employer or employee (or a survivor of an employee) that provides information about the when, what and where is critical. Descriptive data is more valuable than vague, unclear information or lists of toxins encountered. Data that does not correlate to the employee in any way is not useful and produces spurious SEM outputs that could actually contradict other more reliable data.
  - The function of the SEM is to identify the toxin(s) to which the employee had the greatest likelihood of exposure AND are associated with an established illness (health effect connection). A good SEM outcome is constructed using different filtering methodologies that specifically connect to the data obtained about the employee. Comparative analysis of different search outcomes can be used to prioritize those exposures that are constants (i.e. toxins that appear for the employee using different search filters)
    - Basic “good” search result:  
Facility + Labor Category + Health Effect + Work Process

## Hanford Welder with COPD who performs...welding –

<b>Labor category:</b> Welder	Submit Labor Category selection and filters <i>(button must be clicked after changing any selection in order to update results.)</i>
<i>Click here to locate a labor category by alias or description, if you cannot find the labor category you are looking for in the list above.</i>	
<b>Secondary filters to apply to lists of related items (from Hanford/PNNL):</b>	
<b>Toxic substance:</b>	
<b>Health effect (per associated toxics):</b> Pulmonary disease, chronic obstructive	
<b>Area:</b>	
<b>Building:</b>	
<b>Process:</b> Welding	

Site: Hanford/PNNL

### Labor Category: Welder

<b>DETAILS</b>	SiteJobAlias: Welder Journeyman
<b>RECORD HISTORY</b>	Facility Data Last Updated: Nov 5, 2015 (Note: Toxic substance/disease relationships may have changed after this date.)
<b>RELATED ITEMS IN SITE EXPOSURE MATRIX</b>	
Secondary filters applied -- Health effect: Pulmonary disease, chronic obstructive Process: Welding	
<b>HAZARDOUS CHEMICALS POTENTIALLY ENCOUNTERED BY LABOR CATEGORY (2 matching criteria)</b>	<input type="checkbox"/> Asbestos CAS: 1332-21-4; 14567-73-8 Aliases: Amosite; 16F; Anthophyllite; Anthophyllite UICC; Anthophyllite asbestos; Chrysotile; Crocidolite; Tremolite; Tremolite asbestos; Tremolitena; Filterbestos; Hysol Epoxi-Patch Kit 615, Part A; Epoxi-Patch Kit 615, Part A Category: Dusts and Fibers <input type="checkbox"/> Welding fumes CAS: CAS Not Found Category: Gases
<b>PROCESSES/ACTIVITIES PERFORMED BY THIS LABOR CATEGORY</b>	<input type="checkbox"/> Welding
<b>AREAS IN WHICH THIS LABOR CATEGORY WAS INVOLVED</b>	<input type="checkbox"/> 100 <input type="checkbox"/> 200 East <input type="checkbox"/> 200 West <input type="checkbox"/> 300
<b>BUILDINGS IN WHICH THIS LABOR CATEGORY WAS INVOLVED</b>	<input type="checkbox"/> 1717-K Name: Maintenance Shops <input type="checkbox"/> 225-BE Name: Maintenance Shop Aliases: Repair Shop <input type="checkbox"/> 2709-E Name: Fire Protection Headquarters <input type="checkbox"/> 272-U Name: Maintenance Shop Aliases: Hot Shop/Cold Shop <input type="checkbox"/> 277-W Name: West Area Shops Building Aliases: Fabrication Shop <input type="checkbox"/> 306 Name: Metallurgical Semi-Works Aliases: 306-E; 306-J; 306-W; Materials Development Laboratory; Materials Storage Building; Metal Fabrication Building; Metal Fabrication Development Building; Metallurgical Pilot Plant; Metals Semi Works; N-Fuels Facility; N-Fuels Pilot Plant; Reactor Fuel Manufacturing Pilot Plant <input type="checkbox"/> 321 Name: Separation Facility Aliases: Cold Semi-Works; Cold Separations Laboratory; Separation Building <input type="checkbox"/> 324 Name: Chemical and Materials Engineering Laboratory Aliases: Chemical Materials Engineering Laboratory; Chemical Processing and Metallurgical Engineering Laboratory; C-MEL; Fuel Recycle Pilot Plant; Solid Storage Engineering Test Facility Chemical and Materials Engineering Laboratory; Waste Technology Engineering Laboratory <input type="checkbox"/> 325 Name: Radiochemistry Laboratory Aliases: 325-A; Applied Chemistry Laboratory; Radiochemical Processing Laboratory; Radiochemistry Building <input type="checkbox"/> 328 Name: Engineering Services and Safety Shop Aliases: 328-A Engineering Management and Technical Shops Annex; Engineering Management and Technical Shops; Mechanical Development Building <input type="checkbox"/> 333 Name: Fuel Cladding Facility Aliases: Coextrusion Facility; Fuels Manufacturing Building <input type="checkbox"/> 350 Name: Plant Operations and Maintenance Facility
<b>INCIDENTS INVOLVING THIS LABOR CATEGORY</b>	none listed

- **Generic Exposure Data**

Construction, All Sites. This is in the “Site” drop-down menu. There are 24 construction-based labor categories in “construction, all sites.” These are profiles that were completed for workers in these job categories regardless of location. They are not based upon DOE-specific documents and are intended to capture the full range of potential exposures that workers in these labor categories would have encountered regardless of where they worked – whether working construction at a DOE facility, or building a shopping center, a school, hospital, etc. These profiles are recommended for use for construction sub-contractors at the sites, as they were more likely to perform standard construction tasks not unique to DOE.

Generic Labor Categories. For some labor categories, such as HVAC maintenance, DOE hired skilled workers who came to the site with expected skill-of-the-craft abilities. Prior to approx. 1990, such workers often did not have detailed procedures for their work. They were hired with the expectation that they had the knowledge and expertise to perform the task without detailed procedures. These positions did not require special operating guidance internal to DOE and therefore DOE did not delineate how those jobs were to be performed. The SEM team thus created “generic profiles” for these types of jobs. The caveat here is that if DOE did develop site-specific guidance for one of these jobs that information supersedes whatever is in the generic profile.

## **Advice & Assistance**

DEEOIC is looking forward to your advice and assistance. To that end, we have created a list of some things with which we were hoping the committee could assist.

- New scientific studies relating to both exposure and causation are published daily. We seek guidance on efforts to keep the program current with these studies and to utilize them effectively in programmatic guidance on health effects. There are multiple challenges in evaluating such studies, including dealing with instances in which a study is shown to be mistaken in its determination. However, in the internet age, such studies are easily quoted by those who like what it says, regardless of its relative lack of scientific standing.

We want the committee to provide DEEOIC policy guidance on linkages between toxins and occupational disease. Some of these already have DEEOIC policy guidance pertaining to them, but such guidance is always subject to being updated.

Below is a listing of diagnosis for which DEEOIC is aware of arguments of linkages between the diagnosis and various toxins. Some of these already have DEEOIC policy guidance pertaining to them. We seek review of these in which the review provides an overview of the literature and a discussion thereof. Central to any analysis of the items noted below would be delineation of which specific diagnosis (by ICD-9 and ICD-10 codes) is covered by the discussion, what diagnostic criteria should serve as forming the basis for determining such a diagnosis, and how to consider a medical diagnosis dating back to the 1940's. Additionally, we want to know what toxins are "at least as likely as not to cause, contribute or aggravate" such a diagnosis. Beyond that, does the evidence support any causative presumptions and/or any exposure presumptions.

- Parkinson's Disease/Parkinsonism/Manganism
  - Prostate cancer
  - Hearing loss from organic solvent exposure (noise is NOT a toxic substance under EEOICPA)
  - Neuropathy
  - Non-Hodgkin's Lymphoma and trichloroethylene or benzene
  - Hyper/Hypo Thyroidism, Goiter/Nodules
  - Breast Cancer
  - Immune system disorders – lupus, and others
  - Colorectal Cancer
  - Melanoma/Other Skin Cancers
  - Kidney Cancer TCE, Benzene, Cadmium, asbestos
  - Bladder Cancer
  - Diabetes
  - Glioblastoma/ meningioma
  - Heart Disease
- In addition to disease/toxic links, there are multiple other factors that influence human health outcomes. To what degree can/should these be considered in DEEOIC determinations:
    1. Diabetes
      - Neuropathy and other consequences of Diabetes
    2. Consideration of smoking history in pulmonary disease claims

3. Diagnosis largely associated with geriatrics. When might these have an occupational component?
  - Heart disease
  - Essential tremor or Parkinsonism?
  - Dementia
- Moving forward, how does the committee recommend DEEOIC evaluate health studies and epidemiological data to determine threshold for establishment of viable health effects? In other words – what are the criteria to apply when reviewing studies for credibility and applicability to DEEOIC?
- Modifications or additions to SEM data presentation to better convey information for use in creating employee toxic substance exposure profile
  1. Temporal data on presence/use of toxic substances at particular facilities
  2. Categorization of information
  3. Improved data descriptions by facility i.e. labor category, work process, site/building
  4. General presentation of information in the database
  5. Generic toxic substance profiles
- Prioritization of data collection efforts by SEM contractor in populating the database with additional toxic substance information.