

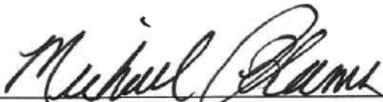
SALT WASTE PROCESSING FACILITY

INDUSTRIAL HYGIENE PROGRAM PLAN

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SUMMARY OF CHANGES

Revision No.	Date	Description of Change
0	07/17/08	Initial issuance to comply with OSHA regulations and to protect worker health and safety.
1	10/02/09	Revise per DMR 2176, revise and re-evaluate content in light of current regulations and contract requirements.
2	06/06/2012	Revised per DMR 2176 update to current regulations and contract requirements.
3	12/18/2013	Revised per DMR 2704 Remove Section 6.3 Assignment of Risk Assessment Codes and update References and Titles.
4	05/02/2016	Revised per DMR 3318, Modify to support transition to testing.
5	03/28/2018	Revise per DMR 4434, update PL-SH-4300 to include references to the specific implementing procedures. This revision addresses CR-2017-343.
6	12/10/2018	Revise per DMR 4823, add Appendix A, Respirable Crystalline Silica Program.
7	11/07/2019	Revise per DMR 5544, General revision and total rewrite of the procedure. No change bars used.

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ACRONYMS AND ABBREVIATIONS

µg	Microgram
ACGIH	American Conference of Governmental Industrial Hygienists
ASHRAE	American Society of Heating, Refrigerating, and Air Conditioning Engineers
CFR	Code of Federal Regulations
CIH	Certified Industrial Hygienist
CPA	Central Processing Area
DOE	U.S. Department of Energy
EPCDC	Engineering, Procurement, and Construction Document Control
ESH	Environmental, Safety and Health
HEPA	High-Efficiency Particulate Air
HNO ₃	Nitric Acid
IH	Industrial Hygiene
JHA	Job Hazard Analysis
m ³	Cubic Meter
NaOH	Sodium Hydroxide
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
OTM	OSHA Technical Manual
PEL	Permissible Exposure Limit
PPE	Personal Protective Equipment
QA	Quality Assurance
SDS	Safety Data Sheet
SEG	Similar Exposure Groups
SWPF	Salt Waste Processing Facility
TLV	Threshold Limit Value
TSR	Technical Safety Requirements
TWA	Time-Weighted Average
WSHP	Worker Safety and Health Program

1.0 INTRODUCTION

A brief summary of the Salt Waste Processing Facility (SWPF) Project is provided to describe the context of the SWPF Industrial Hygiene (IH) Program in support of SWPF operations and phases of the SWPF Project. The SWPF Project is a Design, Build, and Operate Capitol Line Item project managed and subsequently operated by Parsons Corporation.

The IH Program provided input into the design phase and actively participated in the construction phase of the SWPF. The focus was placed on the identification and control of newly promulgated silica hazards associated with silica containing construction materials and associated activities.

As the SWPF transitions through testing and commissioning into operations, the IH Program is focused on working to protect workers by coordinating with work planners on review of procedures for potential hazards and hazardous activities and coordinating with other safety-related professionals (e.g., Occupational Safety, Radiological Protection) to support the SWPF Worker Safety and Health Program (WSHP).

1.1 SWPF Site Description

The SWPF is located within the boundaries of Savannah River Site, which is approximately 310 square miles in size and is 22 miles south of Aiken, South Carolina. The SWPF plot is designated as J-Area with an area of approximately 11 acres.

1.2 SWPF Facilities Description

Building 221-J, The SWPF Central Processing Area (CPA), has a reinforced concrete core of process cells that house equipment to treat radioactive liquid waste. The reinforced concrete core of the CPA is surrounded by process support areas. The CPA has three elevations. The first elevation contains the process pumps and tanks, Control Room, and support facilities. The second elevation contains the Caustic-side Solvent Extraction separation equipment and High-Efficiency Particulate Air (HEPA) filters. The third elevation contains the SWPF Analytical Laboratory, Hot Cells, and process exhaust HEPA filters.

Ancillary facilities that support the SWPF include the Administration Building (704-J), Next Generation Solvent (221-6J), Compressor Building (221-4J), and Warehouse (763-S). Various additional equipment pads include chiller packages, transformers, and standby diesel generator. Office trailers for support personnel are located north of the process building. Connex boxes (i.e., shipping containers) are located within the SWPF area.

1.3 SWPF Process Description

Nuclear material production operations at the Savannah River Site resulted in the generation of radioactive liquid waste stored in underground waste storage Tank Farms (i.e., F-Area and H-Area). The waste has been reduced using evaporators, resulting in the precipitation of salt solids. This waste stream is processed by the SWPF and divided into two outgoing waste streams, one of high radiological activity sent to the Defense Waste Processing Facility, and the other with a low radiological activity sent to the Saltstone Facility in Z-Area.

The primary hazards of concern at the SWPF are radiological and chemical hazards. Throughout the design, construction, and operation of the SWPF, the philosophy has been that controlling the radiological hazard of the waste stream will control the chemical hazard of the waste stream. The worker does not come into contact with the waste stream during normal operations. The waste stream is flushed from process piping and equipment prior to workers entering given areas and prior to performing maintenance on the process piping and equipment. Prior to entering process areas, the Radiological Protection Program surveys the area to confirm work can be safely performed and workers can enter the process areas.

The waste stream contains radiological material and hazardous chemicals, and is extremely corrosive. During initial startup of operations, the IH Program will verify the effectiveness of the flushing process to confirm work can be safely performed. This is performed via pH monitoring and air monitoring. Reflective of the “follow the radiological hazard” philosophy, the IH Program adopts the philosophy that the monitoring of mercury/mercury compounds is a surrogate for the toxic air properties of the waste stream. Real time measuring equipment provides detection of mercury/mercury compounds in parts per trillion. When necessary, the IH Program provides real time measurements of the mercury/mercury compounds; the presence of mercury/mercury compounds may indicate the presence of other hazardous materials associated with the waste stream. Real-time measurements of mercury/mercury compounds are conducted initially to establish a baseline. Once a baseline is established, real-time mercury/mercury compound measurements are conducted as deemed necessary by the IH Program.

In addition to toxic properties, the waste stream is also extremely corrosive, as are the process chemicals (i.e., 50% Sodium Hydroxide [NaOH] and 20% Nitric Acid [HNO₃]). The corrosive waste stream and process chemicals present a “contact” hazard versus airborne hazard, unless the corrosive materials are forcibly aerosolized through sprays or spills from height; therefore, simple pH checks are used to verify flushing of pipes and equipment has eliminated the chemical hazard.

Other hazards of concern include hazardous process chemicals associated with treatment of the waste stream, noise impacts associated with mechanical equipment (e.g., process pumps, exhaust fans), and other process related hazards (e.g., confined space, ergonomic) for which the IH Program is responsible for identifying, analyzing, and controlling to ensure workers’ health and safety is protected.

1.4 SWPF Nuclear Facility Hazard Category

The SWPF is a Hazard Category 2 Nuclear Facility, based on the criteria specified in the U.S. Department of Energy (DOE)-STD-1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*¹. The IH Program is a named Safety Management Program in the SWPF Documented Safety Analysis (see S-SAR-J-00002, *SWPF Documented Safety Analysis*²) and Technical Safety Requirements (TSR) (see S-TSR-J-00001, *SWPF Technical Safety Requirements*³).

2.0 IH PROGRAM PLAN PURPOSE

This plan provides an overview of the IH support activities at the SWPF and identifies the roles and responsibilities in support of SWPF operations. The IH Plan documents the elements, functions, and operations of the SWPF IH Program. Responsibilities of the SWPF IH Program and the structure of the program are described.

This plan addresses the implementation of the IH Program in accordance with 10 Code of Federal Regulations (CFR) 851, *Worker Safety and Health Program*⁴ requirements. This plan reflects high-level document with appropriate reference to implementing plans and procedures.

Appendix B provides the guidance for silica exposure control at SWPF.

2.1 SWPF Worker Safety & Health Policy

As the operating contractor, Parsons established a safety-conscious work environment and has a safety goal of Zero Lost Workday Cases. Safety objectives and measurable goals for the objectives are established in an Integrated Safety Management System Declaration of Readiness, which was developed jointly with DOE, and is revised annually to ensure that objectives stay current with the SWPF.

Parsons has established the Worker Safety and Health Program as required by 10 CFR 851⁴. Parsons established and maintains the IH Program as an integral part of the WSHP. The IH Program supports normal and abnormal operations at the SWPF. This plan implements aspects of the WSHP.

2.2 SWPF Management Support

SWPF Management is committed to the IH Program and implementing plans and procedures. SWPF Management commitment specifically includes providing the necessary support and funding to carry out the requirements of the IH Program and management involvement in expediting the resolution of outstanding issues and deficiencies.

The funding for the IH Program includes allocations for adequate staffing, facilities, resources and training. This plan affirms and implements the commitment of SWPF Management to provide a comprehensive IH Program in accordance with 10 CFR 851⁴.

3.0 IH PROGRAM SCOPE

The scope of the IH Program is to anticipate, recognize, evaluate, monitor, and control health hazards with the potential to impact SWPF employees, visitors/subcontractors at the SWPF. These efforts are implemented with the cooperative efforts of Occupational Safety, Radiological Protection, and Occupational Medicine, and coordination with design and planning personnel.

The This plan applies to facilities and property associated with the entire J-Area including the CPA, Next Generation Solvent Facility, Administration Building, and other support facilities. The IH Program scope includes both normal and abnormal operations.

This plan applies worker safety and health protection to personnel associated with the SWPF including management, operators, maintenance, laboratory, support personnel, subcontractors, and visitors.

The IH Program is managed in accordance with 10 CFR 851⁴ and the SWPF Contract (DE-AC09-02SR22210, *Design, Construction, and Commissioning of a Salt Waste Processing Facility [SWPF]*⁵) provisions.

4.0 IH PROGRAM MANAGEMENT

The IH Program organization and management is rooted in the SWPF organizational structure and operational needs of the SWPF. There are five organizations established to manage the SWPF: Engineering, Plant Operations, Program Development and Integration, Business Operations, and Quality Assurance (QA).

- Engineering: Provides technical support for the design, maintenance, and operation of the SWPF, equipment, and associated programs.
- Plant Operations: Performs the production, work control, and maintenance activities, which include Testing and Commissioning.
- Program Development and Integration: Provides support services that include Environmental, Safety, and Health (ESH), Document Control, and procedure maintenance.
- Business Operations: Performs Project Controls, Procurement, and Information Technology.
- QA: Oversees the quality controls on maintenance, equipment, and materials.

A detailed description of the SWPF organizational structure is provided in V-IM-J-00001, *SWPF Organization, Roles, and Responsibilities Manual*⁶. The five organizations work together in supporting the WSHP.

The IH Program is within the Program Development and Integration Organization, which provides support services that include ESH, Document Control, and Procedure Maintenance. The IH Program is managed by the SWPF ESH Organization. The ESH Manager is responsible for supporting the coordination of the interactions between the Safety Program, IH Program, Environmental Program, and Radiological Protection Program, and design and planning personnel.

The ESH Manager provides staff positions for the IH Program.

- Certified Industrial Hygienist(s) (CIH) and
- Industrial Hygiene Technician/Support Personnel.

The ESH Manager may provide additional IH support to the IH Program from other SWPF organizations such as Occupational Safety, Radiological Protection, and Nuclear Safety.

The CIH oversees the technical aspects of the IH Program and performs duties as a CIH. The IH Program personnel are responsible for implementing the technical aspects of the program including the performance of exposure assessments, assignment of personal protective equipment (PPE), and measurements/monitoring of hazardous environments. Qualifications of the various positions related to the IH Program are in accordance with PL-TR-1807, *SWPF Safety/Industrial Hygiene Training Program Description*⁷.

The ESH Manager ensures that the ESH Programs coordinate activities. The IH Program coordinates with Occupational Safety and Radiological Protection and design and planning personnel on many technical aspects including participating in assigning PPE, performing Job Hazard Analyses (JHA), supporting confined space entries, and performing exposure assessments. The IH Program coordinates with Occupational Medicine for personnel in the medical monitoring programs.

Both Occupational Safety and Radiological Protection personnel may also support the measurement of hazardous environments with appropriate IH equipment. The IH Program interfaces with Fire Protection, Nuclear Safety, and other organizations. The IH Program interfaces with the SWPF Chemical Coordinator for the evaluation and control of hazardous chemicals.

5.0 IH PROGRAM OVERVIEW

The SWPF IH Program is focused on preserving the health of the workforce through the anticipation, recognition, evaluation, monitoring, and control of potential health hazards. S-CIP-J-00003, *SWPF 10 CFR 851 Worker Safety and Health Program*⁸, is the worker safety and health program document for achieving compliance with the requirements of 10 CFR 851⁴, of which the IH Program is an integral part.

Figure 19-illustrates the programmatic flow down of Appendix A.6 in 10 CFR 851⁴ into the IH Program implementing procedures. The WSHP Plan is the overarching document that describes the Parsons Corporation commitment to worker safety and health. PM-OP-8501, *SWPF Operations Safety Manual*⁹, comprises the set of administrative procedures to implement the elements of the WSHP Plan. The IH Program Plan provides the connection between the WSHP Plan and the implementing plans and procedures.

The IH Program is responsible for assessing worker safety and health for the following hazards:

- Bloodborne Pathogens,
- Chemicals,
- Ergonomics,
- Lasers,
- Noise, and
- Thermal – Heat/Cold Stress.

The IH Program has a shared role with SWPF Occupational Safety for assessing worker safety and health for confined spaces and a shared role with SWPF Occupational Safety and SWPF Radiological Protection for the identification and application of required PPE. The IH Program works with the Occupational Medicine Provider to manage the medical surveillance programs that include respirator fitting, audiometric testing, and other necessary medical surveillance for the SWPF.

6.0 IH PROGRAM RESPONSIBILITIES

As defined in SWPF TSR 5.8.2.4 of S-TSR-J-00001³, the IH Program serves to maintain employee exposures to chemical, physical, and biological hazards within safe levels following the IH procedures governing the IH regulations. The IH Program implements a comprehensive IH program following Appendix A of 10 CFR 851⁴ that includes at least the following six elements:

1. Initial or baseline surveys and periodic resurveys and /or exposure monitoring as appropriate of work areas or operations to identify and evaluate potential worker health risks (App a.6.a of 10 CFR 851⁴);
 2. Coordination with planning and design personnel to anticipate and control health hazards that proposed facilities and operations would introduce (App A.6.b of 10 CFR 851⁴);
 3. Coordination with cognizant occupational medical, environmental, health physics, and work planning professionals (Appendix A.6.c of 10 CFR 851⁴);
 4. Policies and procedures to mitigate the risk from identified and potential occupational carcinogens (Appendix A.6.d of 10 CFR 851⁴);
 5. Professionally and technically qualified industrial hygienists to manage and implement the IH program [Appendix A.6.e of 10 CFR 851⁴]; and
 6. Use of respiratory protection equipment tested under the DOE Respirator Acceptance Program for Supplied-air Suits per DOE-Technical Standard-1167-2003 when National Institute for Occupational Safety and Health-approved respiratory protection does not exist for DOE tasks that require such equipment (Appendix A.6.f of 10 CFR 851⁴).
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The IH Program implements the Industrial Hygiene Program (see SWPF TSR 5.8.2.4 of S-TSR-J-00001³) and Appendix A.6 of 10 CFR 851⁴ requirements through a comprehensive set of plans and procedures.

7.0 IH PROGRAM AREAS

The IH Program is responsible for assessing worker safety and health for specific hazards or hazardous environments encountered with normal and abnormal operations at the SWPF. For normal operations, occupational noise exposures in the process areas and chemical/process stream exposures are primary hazards; whereas for abnormal operations, chemical/process stream hazards are the primary hazard.

7.1 Bloodborne Pathogens

Bloodborne pathogens are pathogenic microorganisms that are present in human blood and that can cause disease in humans. Bloodborne pathogens are not expected as part of normal operations. Bloodborne pathogens are anticipated to be present during upset/emergency conditions, especially for emergence response personnel.

PP-SH-4446, *Bloodborne Pathogens Exposure Prevention and Control*¹⁰, describes the procedure that the SWPF utilizes for limiting/preventing occupational exposure to potentially infectious bodily fluids in accordance with 10 CFR 851⁴ which invokes Section 1030 of 29 CFR 1910, *Occupational Safety and Health Standards*¹¹.

7.2 Chemicals

Use of hazardous chemicals is part of standard operations at the SWPF in the Cold Chemicals Area and the SWPF Analytical Laboratory. Hazardous chemical usage in the SWPF Analytical Laboratory is in accordance with PL-LB-8100, *SWPF Analytical Laboratory Chemical Hygiene Plan*¹². Chemicals associated with the Cold Chemicals Area include 20% HNO₃, 50% NaOH, and Caustic-side Solvent Extraction solvent. Bulk Cold Chemicals Area chemicals generally do not provide a toxicity hazard but present a chemical physical hazard (e.g., corrosive). The primary route of exposure to these bulk chemicals is via contact, unless aerosolized, which would present an airborne hazard.

Direct exposure to the SWPF process stream that contains hazardous chemicals is not expected during normal operations because of a combination of engineering and administrative controls. Direct exposure to the SWPF process stream during an abnormal operation could present potential of personnel exposure to the constituents of the process stream, which includes toxic hazards and the physical hazards. Of primary concern, the constituents of the process stream with toxic properties include methyl mercury and dimethyl mercury. The process stream also contains arsenic, barium, bromide, cadmium, lead, lithium, and mercury/mercury compounds, radionuclides ammonium, cesium, plutonium, and uranium. Building ventilation systems and administrative controls for system flushes are in place to mitigate exposure to the process streams. The administrative controls for system flushes prevent maintenance personnel exposure when

performing work on piping and equipment. With the process operations under normal operations, workers are not routinely exposed to the process wastestream hazards.

In the SWPF Analytical Laboratory, personnel work with the process wastewater and analytical (hazardous) chemicals to evaluate the effectiveness of the SWPF treatment process. Laboratory activities are primarily conducted in Gloveboxes and Radiohoods using small quantities of hazardous chemicals.

PP-SH-4442, *Respiratory Protection*¹⁰, identifies the requirements for personnel respiratory protection to prevent airborne chemical exposure. PP-SH-4442¹⁰ implements the respiratory protection program in accordance with 10 CFR 851⁴, which invokes Section 134 of 29 CFR 1910¹¹ and 29 Code of Federal Regulations (CFR) *Occupational Safety and Health Administration (OSHA) and the American National Standards Institute/American Society of Safety Engineers ANSI/ASSE Z88.2 - 2015, American National Standard Practices for Respiratory Protection*¹³.

PP-SH-4443, *Air Monitoring*¹⁰, establishes methodologies for air monitoring activities at the SWPF in accordance with 10 CFR 851⁴ and 29 CFR 1910¹¹. Air monitoring is performed to ensure accurate assessment of air contaminant hazards at SWPF.

PP-SH-4462, *Carcinogen Control Procedure*¹⁰, establishes the minimum requirements for the control of confirmed, suspected, and/or regulated carcinogens as defined herein and handling chemicals or products that pose a potential carcinogenic hazard at the Salt Waste Processing Facility (SWPF).

7.3 Ergonomics

Workplace ergonomic hazards at the SWPF vary with job function. SWPF Analytical Laboratory personnel functions include repetitive motion within a Glovebox/Radiohood environment. There are maintenance tasks requiring lifting of large mechanical equipment (e.g., fans, pumps, filter housings, etc.) and administrative functions which have the traditional office-related ergonomic issues.

PP-SH-4441, *Ergonomics*¹⁰, establishes guidelines for reducing employee exposure to workplace ergonomic hazards at the SWPF that can cause or aggravate work-related musculoskeletal disorders. PP-SH-4441¹⁰ provides a comprehensive SWPF ergonomics program in accordance with 10 CFR 851⁴ requirements, which incorporates the standards invoked by American Conference of Governmental Industrial Hygienists (ACGIH) *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices* (2016 Edition)¹⁴.

7.4 Lasers

Currently, there are not “regulated” Class 3 or Class 4 laser systems at the SWPF. PP-SH-4447, *Laser Safety*¹⁰ establishes the SWPF policies and guidelines for the safe and proper use of lasers and laser systems in accordance with 10 CFR 851⁴.

7.5 Noise

Occupational noise is encountered in a majority of locations throughout the SWPF process areas internal and external to the building. Where there is mechanical equipment (e.g., ventilation fans, process pumps, etc.) at the SWPF, high-noise is a concern. Activities such as the operation of the standby diesel generator, operation of the instrument air compressors, and pressure relief of gas/air systems are a high-noise concern.

PP-SH-4440, *Occupational Noise Exposure Prevention and Control/Hearing Conservation*¹⁰, provides guidelines and requirements intended to reduce or eliminate the risk of occupational noise-induced hearing loss at the SWPF. PP-SH-4440¹⁰ defines requirements for identifying high-noise areas, monitoring affected personnel, and effectively mitigating noise exposure risks. PP-SH-4440¹⁰ establishes a comprehensive SWPF noise control and hearing conservation program in accordance with Section 95 of 29 CFR 1910¹¹, 10 CFR 851⁴, and ACGIH *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices* (2016 Edition)¹⁴.

7.6 Thermal – Heat/Cold Stress

The Heat/Cold Stress goal is to maintain a core body temperature between maximum and minimum temperatures to avoid injury to workers. At the SWPF, the primary heat/cold stress hazards reflect exposure to weather external to the SWPF building(s). Workers required to wear PPE may be exposed to elevated heat stress conditions from the clothing ensemble. Examples may include radiological protection personnel, maintenance personnel, or emergency response personnel that may be required to don chemical/radiological PPE clothing inside or outside SWPF buildings.

PP-SH-4444, *Heat Stress/Cold Stress Prevention*¹⁰ provides methods for minimizing the risk of heat or cold stress-related disorders at SWPF. PP-SH-4444¹⁰ implements requirements of 10 CFR 851⁴, which invokes the thermal stress threshold limit values (TLV) specified in the ACGIH, *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices* (2016 Edition)¹⁴.

7.7 Confined Space

Implementing and maintaining an effective confined space entry procedure can prevent deaths, injuries, and illnesses requirements to protect employees and subcontractors from the hazards of entry into confined spaces at the SWPF. There are both permitted and non-permitted confined spaces within the SWPF. Confined spaces include the process cells, process tanks, and other defined areas.

The IH Program interfaces with Occupational Safety to address the hazards associated with confined spaces. The IH Program maintains a list of the confined spaces that delineates if the spaces are permitted or non-permitted. The IH Program oversees identification and potential mitigation of atmospheric confined space hazards when measurements are necessary to test for

concentrations of toxic materials, physical agents, combustible atmospheres, and oxygen-deficient atmospheres. Whereas the Occupational Safety establishes monitoring schedules and conducts atmospheric testing during entry activities and determines PPE use.

PP-SH-4445, *Confined Space*¹⁰, is in accordance with 10 CFR 851⁴, which invokes the OSHA Standard 29 CFR 1910.146, *Permit-required confined spaces*¹⁵.

7.8 Personal Protective Equipment

PP-SH-4414, *Personal Protective Equipment*¹⁰, provides guidance and requirements for the selection and use of PPE at the SWPF. PP-SH-4414¹⁰ describes the various types of PPE available and the corresponding activities that may require PPE at the SWPF.

The IH Program works with Occupational Safety to select regulatory-compliant PPE for SWPF non-radiological hazards based upon specific locations, work activities, and known or anticipated conditions. Both this plan and Occupational Safety coordinate with the Radiation Protection Program Manager for selection of PPE when radiological, industrial hygiene, and industrial safety hazards are present. This plan and Occupational Safety perform assessments to ensure PPE use is implemented fully and correctly. Occupational Medicine coordinates with both the IH Program and Occupational Safety to ensure personnel are fit-for-duty and trained for respirator fit.

PP-SH-4414¹⁰ is in accordance with 10 CFR 851⁴, which invokes Subpart I of 29 CFR 1910¹¹.

7.9 Occupational Medicine & Fitness for Duty

PP-SH-4451, *Occupational Medicine and Fitness for Duty*¹⁰, is based on the occupational medicine requirements set forth in 10 CFR 851⁴ and S-CIP-J-00003⁸. PP-SH-4451¹⁰ provides guidelines for Occupational Medicine Provider-conducted employee medical evaluations, including the disposition of medical evaluation findings, to ensure SWPF personnel are fit to perform assigned duties.

7.10 Miscellaneous Hazards

The SWPF IH Program has a commitment to assess worker safety and health hazards at the SWPF. To ensure a holistic approach, there is a need for flexibility in the identification and analysis of various IH program areas. This flexibility allows the SWPF IH Program to quickly respond to and address employee concerns, non-routine hazards, new hazards/potential changes in workplace conditions not otherwise addressed in the existing IH Program documentation (e.g. asbestos, beryllium, nanomaterials). This flexibility also allows the SWPF IH Program to complete IH-related sampling/assessments in support of other SWPF Programs (e.g., mold, legionella, light). Based on the magnitude of hazards identified and potential resampling intervals, additional IH Program documentation may be developed as deemed necessary.

The IH Program follows published OSHA standards, ACGIH TLVs, ACGIH guidance/other national consensus standards, to holistically assess worker safety and health hazards. In addition to the primary IH hazards at the SWPF, other areas for IH Program contributions, interface, and

collaborations may be identified. Any interim sampling/exposure assessments are conducted in accordance with the Exposure Assessment Strategy in DP-SH-4301, *Performance of Industrial Hygiene Exposure Assessment*¹⁰.

8.0 OCCUPATIONAL EXPOSURE ASSESSMENTS

The IH Program implements a process that examines the potential/actual exposure of workers to hazardous physical or chemical agents at SWPF. This process is implemented by performing and documenting Exposure Assessments in accordance with DP-SH-4301, *Performance of Industrial Hygiene Exposure Assessment*¹⁰.

The IH Program defines Similar Exposure Groups (SEGs) as a way to generalize potential exposures based on a work group doing the same or similar tasks. Standard Operating Procedures with corresponding JHAs are used to control and perform work. For SWPF Operations, workers are assigned work based on training and qualifications in differing areas of the SWPF. Similar work is performed over work shifts by assigned workers. SEGs are assigned by the hazard profile stemming from the given work document(s) and corresponding JHA. Examples of SEGs include analytical laboratory personnel, maintenance personnel, and field operators. Appendix A provides a listing of the current SEGs used to perform Exposure Assessments. SEGs may be adjusted as necessary per the IH Program.

9.0 IH EQUIPMENT

The IH Program verifies that IH equipment resources are maintained following the manufacturer recommendations for use, maintenance, and calibration. The IH Program manages IH equipment through a maintained inventory. The inventory of equipment includes the following information as appropriate:

- Manufacturer,
- Unit name/model,
- Serial number,
- Initial calibration date,
- Next calibration due date, and
- Storage location.

The inventory of equipment includes other pertinent details necessary for proper use, maintenance, and calibration. IH sampling equipment calibrations will be per manufacturer's instructions and or OSHA requirements and must be based on a method traceable to a recognized authority, such as the National Institute of Standards and Technology. Documentation of calibrations are maintained to support sampling data. Calibrations are completed on a frequency as specified by the manufacturer.

10.0 HEALTH HAZARD INVENTORY

The IH Program maintains a comprehensive and effective program to recognize occupational health hazards prior to creating negative impacts on worker health. Various methods are used for recognition and determining the magnitude of health hazards. Chemical, physical, biological, and other potential hazards are identified and prioritized for further evaluation. The entirety of the records generated as a result of implementing health hazard inventory methods are the health hazard inventory for the SWPF.

10.1 Work Control Authorization

The IH Program coordinates with the Work Control Team to incorporate controls to eliminate or minimize the exposure potential to workers. These controls are incorporated into the Work Order Package. The IH Program has input for hazard controls into the Work Plan, Pre-Job Brief, Plan of the Day, and the JHA through the coordination and interaction with design and planning personnel.

10.2 JHA

The JHA process is one of the primary mechanisms for identifying new hazards and mitigating measures prior to implementation of the work. PP-SH-4407, *Job Hazards Analysis*¹⁰, provides the process to systematically identify, analyze, control, and communicate hazards at SWPF.

The IH Program participation in the JHA process is required when chemical, biological, or other physical hazards warrant involvement. The IH Program involvement includes participation in the JHA process (e.g., walkthroughs, meetings, control assignment, etc.). The IH Program ensures that industrial health hazards associated with tasks under review are identified and controlled.

When health hazards could present exposure with adverse health effects, the IH Program identifies appropriate controls, (i.e., PPE and training requirements) in the JHA. Following the standard control hierarchy, appropriate controls may include elimination or substitution and engineering/administrative controls.

10.3 Walk-through Surveys

The health hazard recognition effort is multi-faceted and includes IH "walk-through" surveys. The IH Program requires "walk-through" surveys or assistance obtained from other ESH organizations such as Occupational Safety and Radiological Protection. The walk-through surveys identify new hazards, ensure mitigating measures are effective, and identify where/when to perform routine or special monitoring as needed. When new hazards are identified, actions are taken to assess and mitigate worker exposures.

10.4 IH Workplace Monitoring

This plan establishes requirements for performance of workplace monitoring following nationally recognized methods. IH workplace monitoring includes measurements for noise, chemicals, oxygen deficient atmospheres, ergonomic hazards, and thermal stress hazards.

Results of workplace monitoring is documented and retained in accordance with PP-DC-3002, *Records Management*¹⁰.

10.5 Safety Data Sheet Review

A Safety Data Sheet (SDS) is provided to SWPF Vendor Data for chemicals being brought to the site for use by SWPF personnel and subcontractors in performance of the scope of work. Procurement requirements include IH Program review of each SDS prior to ordering of new chemicals. SDSs associated with chemicals that arrive at the site warehouse are provided to SWPF Vendor Data. SDSs that are received by SWPF Vendor Data are scanned and forwarded to ESH Manager for review. The IH Program reviews SDSs before uploading to the SDS to the SDS Database.

10.6 Employee Reporting

Employees are an effective source for health hazard identification and workplace surveillance. Condition Reports, surveillances, verbal reports, and e-mails are available to report signs or symptoms of employee health hazard exposure to the ESH Program, whether the IH Program or Safety Program.

The IH Program also participates in employee/management committees to canvas the workforce for concerns and participates in committees to investigate workplace safety and health conditions.

10.7 Follow-up to Medical Surveillance

Interactive communication with the SWPF Occupational Medicine Provider is an invaluable source for health hazard recognition. Workers diagnosed with a possible work-related illness or condition (e.g., hearing loss, elevated blood, or urine levels of heavy metals, etc.); the SWPF Occupational Medicine Provider reports the nature of the problem to the ESH Manager.

The first diagnostic case often represents a sentinel event and immediate health hazard evaluation with appropriate implementation of controls may prevent additional adverse effects within the SEG. The exchange of information with the SWPF Occupational Medicine Provider may include noise, heat stress, chemical exposures, heavy metals, or ergonomic stressors.

10.8 Records Review

The IH Program periodically accesses standard injury and illness records, such as the OSHA Form 300, *Log of Work-Related Injuries and Illnesses*, reports, worker compensation reports, or site-specific forms used to track employee actual or potential exposures to health hazards. Records review provide necessary information to identify illness trends or hazards not otherwise clearly observable through general workplace surveillance.

11.0 SWPF OCCUPATIONAL HEALTH CRITERION

SWPF applies the various standards and regulatory requirements in keeping with priorities established by DOE through 10 CFR 851⁴ and cited regulatory requirements and standards including OSHA, and ACGIH.

11.1 Federal and State OSHA Standards

The IH standards invoked by either 29 CFR 1910¹¹, or 29 CFR 1926, *Safety and Health Regulations for Construction*¹⁶, are applied as SWPF health standards.

IH standards include Permissible Exposure Limits for time-weighted average (TWA) concentrations, ceiling concentrations, and acceptable maximum peak values above ceiling concentrations, action levels, or emergency temporary standards. However, in accordance with 10 CFR 851⁴, ACGIH threshold limit values are used when more protective than Permissible Exposure Limits.

OSHA standards contain other requirements such as quarterly monitoring, controls, records, notification, or other actions, which apply to SWPF workplaces.

IH requirements found in 10 CFR 851⁴ take precedence when found to conflict with OSHA standards.

11.2 Alternate Standards

In those rare instances where neither a DOE nor OSHA standard exists, the IH Program considers use of alternate standards, such as those developed by:

- National Institute for Occupational Safety and Health (NIOSH);
- U.S. Environmental Protection Agency;
- U.S. Department of Transportation;
- Chemical manufacturers;
- American Society of Heating, Refrigerating, and Air Conditioning Engineers (ASHRAE);
- American National Standards Institute; and
- Construction Standards.

The IH Program may elect to use the alternate standards as necessary.

11.3 No Existing Standards

In the absence of existing standards, and in situations where standards should exist to ensure worker and public health, SWPF may establish local standards. For chemical exposures, the IH Program may use the NIOSH or ACGIH process for TLV development as a model for local standard development.

12.0 IH SAMPLING STRATEGIES

The appropriate sampling and analytical techniques are used for the criteria for a given exposure level. For OSHA criteria, the sampling and analytical methods are “at least as good as” the OSHA recommended/mandated methods.

The *OSHA Technical Manual (OTM)*¹⁷, NIOSH Publication 94-113, *NIOSH Manual of Analytical Methods [NMAM]*¹⁸, or the *Chemical Sampling Information (CSI)*¹⁹, references are consulted to determine appropriate sampling and analytical techniques. In the absence of OSHA, DOE, or NIOSH established methods, the IH Program evaluates the effectiveness of other recommended sampling and analytical methods, including those developed by analytical laboratories, manufacturers, associations, or other professional organizations.

The IH Program develops the rationale for IH sampling strategies used. The strategy used allows for collection of appropriate qualitative and quantitative data, employee and personal observations, measurements of related information, such as ventilation flow rates, and other information necessary for determining whether employees may be experiencing exposures to levels of chemical, biological, or physical agents that have potential to cause harm. IH sampling strategies address the potential for contamination of the sampling media/equipment. The sampling strategy must address:

- Concepts of workplace and process variation over time and environmental changes;
- Changes in materials, processes, and facilities;
- Worker population variability, based on work practices and personal preferences;
- Changes in engineering control effectiveness;
- Statistical variation in sampling and analytical procedures; and
- Other variations noted by the IH Program.

The strategy employed dictates the times, locations, and types of samples that are needed to correctly assess the full range of exposures that are occurring from day to day.

Sampling strategies reflect a one-time sample using direct reading instrumentation, short-term sample using direct reading instrumentation, or an 8-, 10-, 12-, or 24-hour TWA sample, using a collection media with laboratory analysis. The IH Program normally uses short-term samples that are extrapolated to compare to the relevant TWA.

When conducted by the IH Program, calculations or modeling to determine the maximum exposure potential based on product usage are sometimes used in lieu of actual data collection. The need for supporting sample collection, such as bulk and wipe samples, are addressed as necessary. When deemed necessary, sampling results are statistically analyzed to determine data significance.

13.0 HAZARD CONTROL STRATEGIES

The IH Program, where possible, eliminates health hazards through process and SWPF design review changes and substitution of materials presenting lower toxicity to workers. Where hazards cannot be eliminated, engineering controls are implemented to reduce the level of hazard to the lowest feasible extent. If hazards cannot be reduced through engineering controls, the implementation of administrative controls or, as a last resort, the use of PPE is implemented to mitigate the hazard. The IH Program recommends appropriate controls for health hazards following the standard control hierarchy; elimination, substitution, engineering, and administrative controls including PPE.

13.1 Elimination/Substitution

The SWPF process chemistry to treat the wastestream is established and validated. The IH Program works with design and planning staff and the chemical coordinator and operations to evaluate procured chemicals for potential elimination or substitution.

13.2 Engineering Controls

When elimination or substitution does not completely reduce a health hazard to acceptable levels, the use of engineering controls is preferred and included in the design for the SWPF process and facilities. The primary engineering controls include engineered isolation from process vessels and active ventilation zones and Gloveboxes and Radiohoods. The IH Program coordinates with design and planning personnel with the application of engineered controls.

13.3 Administrative Controls

When engineering controls cannot completely reduce a health hazard to acceptable levels, the use of administrative controls are the next level in the hierarchy of controls. Administrative controls are primarily a means of limiting worker contact with the hazard through time or location (e.g., limiting access to labyrinth areas until the process piping and equipment are flushed of hazardous materials). Administrative controls are established through procedures at the SWPF. The IH Program works with supervisors and workers to develop and validate the ongoing effectiveness of administrative controls.

NOTE: Certain OSHA standards prohibit only the use of administrative controls to maintain worker contaminant exposures below the Permissible Exposure Limit (PEL). The IH Program consult substance-specific OSHA standards prior to recommending administrative controls when appropriate.

13.4 Personal Protective Equipment

The use of PPE such as respirators, gloves, and other dermal coverings to protect workers from health hazards must be used when engineered/administrative controls do not provide adequate protection or mitigation of the hazards.

While PPE is not the preferred level of control, engineered/administrative controls may not provide the level of protection necessary. Active ventilation is present under normal operations. The use of PPE is sometimes a defense-in-depth control and nearly always considered in conjunction with engineering/administrative controls.

The IH Program considers aspects of PPE use prior to recommending as a control measure. The IH Program or Safety Manager evaluates criteria used to select site PPE, ensuring that adequate protection is provided, and review relevant site documents that provide guidance for PPE selection.

14.0 ENGINEERING AND PROCESS DESIGN REVIEWS

Many occupational health hazards can be eliminated during the design, planning/procurement stages. Early involvement allows the IH Program to prepare for and carry out appropriate exposure assessments on new health hazards.

14.1 Design Review

New and modified SWPF designs are reviewed for adequacy of engineering controls for occupational health hazards. Engineering design criteria, such as ventilation flow rates or capture hood designs, should be verified as meeting minimum recommended IH design standards. Examples of IH design standards to consider include 10 CFR 851⁴, ACGIH publications, NIOSH publications, and ASHRAE recommendations. Choosing the appropriate design standards for health hazard control requires professional judgment and input by the IH Program.

14.2 Planning

New or modified plans for work processes/materials, workflow, work practices, administrative controls, or other process changes with the potential to affect worker exposures to health hazards require IH Program review and input. The IH Program review considers the potential for worker exposure to material, raw materials, by-products/decomposition or applicable breakdown products. The IH Program has ready access to planning documents, criteria documents, project plans, test plans, reports, and procedures.

IH Program participation with in-process reviews and SWPF planning meetings is determined on a case-by-case basis through a cooperative effort of the IH Program and design/planning personnel.

14.3 Procurement

Procurement activities provides the opportunity to anticipate possible occupational health hazards and eliminate or control those hazards prior to entry into the workplace. In particular, activities associated with selection of contractors, materials of use, specifications for PPE or other work clothing are areas in which the IH Program review may be needed to eliminate, reduce, or control the extent of hazards being introduced. The IH Program is involved with the purchasing process for chemicals.

15.0 TRAINING AND QUALIFICATIONS

PL-TR-1807⁷ describes the content, structure, and administration of the SWPF Safety/Industrial Hygiene Training Program. PL-TR-1807⁷ applies to the development, implementation, and administration of training for Safety/Industrial Hygiene personnel.

15.1 Qualifications

The IH Program is managed by a CIH by the American Board of IH. The SWPF CIH adheres to the *American Board of IH Code of Ethics*²⁰. Personnel assigned to IH duties are expected to perform to the same level of data collection and reporting for the IH Program. The SWPF IH Program uses appropriately qualified personnel for performing IH activities. The IH personnel verify a trainee meets the entry-level requirements prior to enrolling a trainee in the Safety/Industrial Hygiene Training Program.

15.2 Training

Initial training requirements summarized in Appendix A in PL-TR-1807⁷. Initial Safety/Industrial Hygiene Qualification Curriculum, are dependent upon the specific Safety/Industrial Hygiene job position. Initial training consists of a combination of instructional methods (classroom, laboratory, on-the-job training, etc.) necessary to provide the trainee with the knowledge and skills to safely perform tasks identified on the Task-To-Training Matrix for each position qualification. Continuing training consists of a combination of instructional methods (classroom, on-the-job training, etc.) necessary to maintain and enhance the employee's qualifications and prepare the employee for re-qualification.

16.0 REPORTING AND RECORDKEEPING

16.1 Reporting

Hazard evaluation or Exposure Assessment results are reported in accordance with Section 20 and Section 26 of 10 CFR 851⁴, and other requirement found in OSHA 29 CFR 1910¹¹ substance-specific standards. The following reporting requirements listed in the sections below are addressed.

16.1.1 Employee Reporting

The IH Program notifies, in writing, when an employee is overexposed to a hazardous material. Affected employees are notified of their right of access to exposure records and the mechanism for exercising that right.

When the hazard evaluation involves a physical or chemical hazard covered by a specific OSHA standard, additional reporting requirements are also met (e.g., reporting within a specified time period or inclusion of specific information relative to planned hazard controls).

The IH Program delineates the requirements of a complete and accurate employee exposure record with the online record fields and corresponding requirements.

16.1.2 SWPF Occupational Medicine Provider

The SWPF Occupational Medicine Provider is notified of hazard evaluation results that may require changes in medical surveillance procedures.

16.2 Recordkeeping

The mechanisms for IH data management are established to achieve compliance with recordkeeping requirements of regulations as found in Section 26 of 10 CFR 851⁴, Section 1020 of 29 CFR 1910¹¹ Section 1960 of 29 CFR 1910¹¹ and Chapter 1 of 40 CFR, *Protection of Environment*²¹.

The following information is collected with a hazard evaluation/exposure assessment:

- Demographic information, such as employee name and employee ID number;
- Health hazard evaluation date;
- Health hazard control methods in use, including recommendations for improvements;
- Equipment calibration;
- Sampling methods employed; and
- Laboratory analytical results.

Original IH data packages are secured in the IH Program office and subsequently sent to Engineering, Procurement, and Construction Document Control (EPCDC) following authentication. The IH Program employs a Peer Review Process to ensure accuracy of sampling records and documents submitted to EPCDC for record retention.

Environmental workplace monitoring reports or exposure assessment reports including personal, area, grab, wipe, or other form of sampling are submitted to EPCDC or other site archival system for record retention. Related collection and analytical methodologies, calculations, and other background data relevant to interpretation of the results obtained are stored with the appropriate records.

The IH Program reviews proposed chemicals prior to purchasing/use at the SWPF. SDSs are reviewed for adequacy and accuracy before being sent to EPCDC or other site archival system. For chemicals no longer in use or in storage at SWPF, SDSs and chemical inventory records are retained for a specified period, as long as some record of the identity (chemical name, if known) of the substance or agent, where used, and when used is retained.

16.3 Records Management

PP-DC-3002¹⁰, establishes the controls for identifying, generating, authenticating, maintaining, and specifying final disposition of records. PP-DC-3002¹⁰ provides the requirements for personnel who identify, generate, authenticate, maintain/specify final disposition of lifetime and non-permanent records. IH records are maintained as lifetime records to be turned over to future operating contractors. IH Program records are usually maintained online.

17.0 QA

V-QP-J-00001, *SWPF Quality Assurance Plan*²², establishes and implements a Quality Assurance Plan specific to the SWPF. This Quality Assurance Plan (V-QP-J-00001²²) establishes the QA program requirements for the Quality Management System and ensures risks and environmental impacts are minimized, and safety, reliability, and performance are maximized which is accomplished through the application of management systems using a graded approach commensurate with the risks.

17.1 IH Data, Recordkeeping, and Records

The IH personnel establish the QA requirements for the IH Program to include the collection of IH data, reporting of IH data, and corresponding recordkeeping. Quality records include equipment maintenance/calibration logs, real time sampling results, exposure assessments, and corresponding reports.

The IH Program performs a Peer Review Process for record quality control reviews with subsequent approvals (i.e., electronic/hard copy) to ensure validation and verification of exposure assessments prior to issuance. Further quality reviews are performed during the annual assessment.

17.2 Laboratories

The IH Program uses laboratories that are accredited by the American Industrial Hygiene Association or equivalent standard. Appropriate QA requirements delineated by analytical technique/data collection standards are applied when necessary.

17.3 Management Review

In accordance with V-QP-J-00001²², the ESH Manager ensures that documented quality checks of the recordkeeping and reporting program for DOE/OSHA reports are performed to verify that information reported and recorded is thorough, accurate, and consistent.

18.0 PROGRAM ASSESSMENTS

18.1 Self-Assessments

The IH Program conducts an annual self-assessment of the IH Program. Results of the annual self-assessment targets areas for improvement and identifies potential IH Program issues that may need additional resources. The annual assessment may include one or more of the following aspects at the discretion of the IH Program verify:

- SWPF documents containing IH duties, tasks, or responsibilities receive a review by qualified IH personnel at some point in the previous 12-month period against regulations and standards, and to ensure accurately reflects current site IH processes, procedures, and conditions;
- IH Program activities have been accomplished in accordance with the requirements, to include the walk-through survey inspections of each SWPF process or location;
- JHAs have the appropriate IH reviews;
- IH documentation, including sampling and analysis results, is filed and maintained appropriately;
- IH equipment has received required calibration and maintenance;
- IH sampling and analysis methods were accomplished in accordance with OSHA, DOE/NIOSH criteria;
- Programs supporting are operating in accordance with specified IH requirements in this document or other program documents; and
- IH Program provides exposure control and worker protection compliant with the most recent ACGIH TLVs or OSHA PELs/the impact upon the program to comply with changes in new imposed TLV and PEL changes.

The annual self-assessment of the IH Program is documented through an assessment report provided to the ESH Manager.

18.2 External Assessments

DOE IH reviews of the IH Program/SWPF areas that include IH functions are conducted periodically. The IH Program supports external reviews and assessments as needed. The IH Program may review data, findings, conclusions, program documents, or other facets of this Plan as requested by the DOE Field Office or Headquarters.

19.0 PLANS AND PROCEDURES

Requirements, processes, means and methods identified in this plan are implemented through SWPF procedures contained in the *Salt Waste Processing Facility Project Procedures Manual*¹⁰.

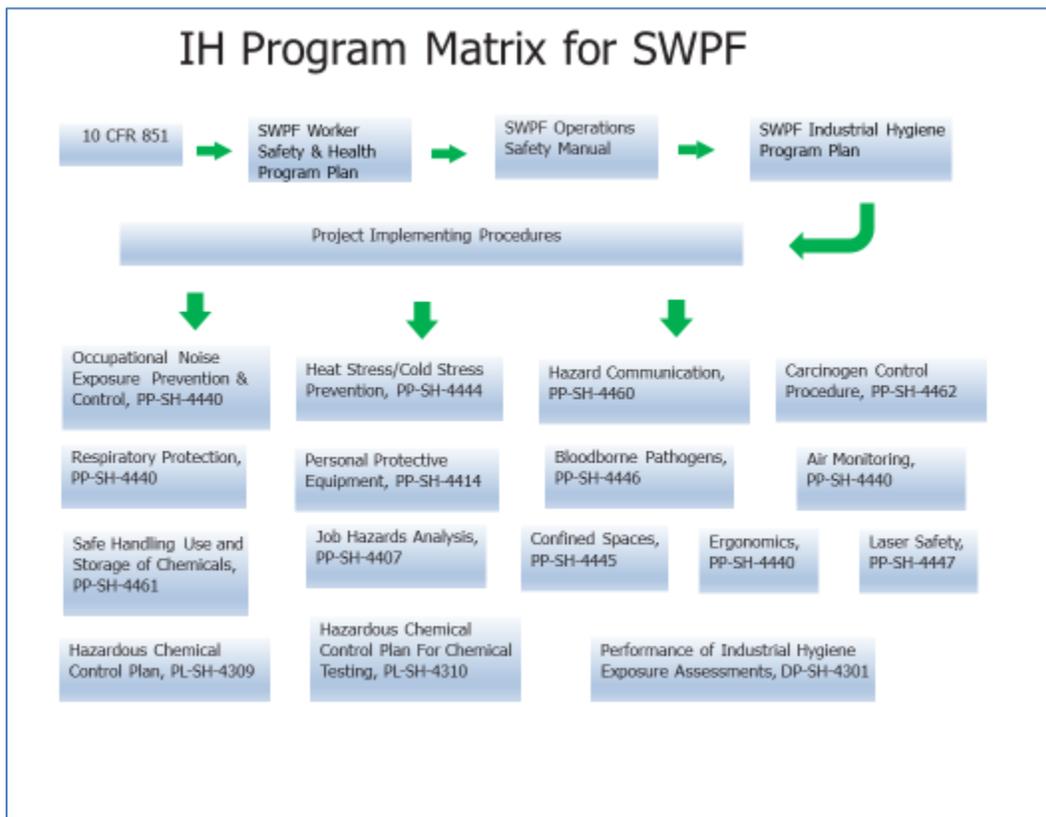
As part of the SWPF WSHP and SWPF ESH Program, the IH Program maintains plans and procedures to implement the IH Program requirements:

- PP-SH-4440¹⁰;
- PP-SH-4441¹⁰;
- PP-SH-4442¹⁰;
- PP-SH-4443¹⁰;
- PP-SH-4444¹⁰;
- PP-SH-4447¹⁰;
- PP-SH-4462¹⁰,
- PP-SH-4446¹⁰; and
- DP-SH-4301¹⁰.

Supporting plans and procedures in cooperation with other SWPF ESH organizations that are used to implement the IH Plan include the following:

- PL-SH-4309, *SWPF Hazardous Chemical Control Plan*²³;
 - PL-SH-4310, *SWPF Hazardous Chemical Control Plan for Chemical Testing*²⁴;
 - PP-SH-4407¹⁰;
 - PP-SH-4412, *Environmental, Safety, and Health Reporting*¹⁰;
 - PP-SH-4414¹⁰;
 - PP-SH-4460, *Hazard Communication*¹⁰; and
 - PP-SH-4461, *Safe Handling, Use and Storage of Chemicals*¹⁰.
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Figure 19-1. IH Program Documentation



Appendix A. Similar Exposure Groups (SEGs)

Similar Exposure Group	Description	Potential Exposure
Construction Workers	Welding/grinding metal, drilling, painting, insulating, erecting scaffolding and general housekeeping.	Noise, Heat/Cold, Radiation, Silica, Chemicals and Ergonomics.
Field Operators	Daily operating SWPF rounds, valve lineups and establishing Lock Out /Tag Outs.	Noise, Heat/Cold, Radiation, Chemicals and Ergonomics.
Laboratory Chemist/Technician	Performing laboratory analysis including radioactive materials and chemical handling.	Noise, Radiation, Chemicals, and Ergonomics.
Maintenance	Routine maintenance, troubleshooting, line breaks, valve and pump maintenance.	Noise, Heat/Cold, Radiation, Chemicals, and Ergonomics.
Radiation Protection	Radiological surveys and oversight of radiological work.	Noise, Heat/Cold, Radiation, and Ergonomics.
Support Personnel	Inspections and oversight of work.	Noise, Radiation and Ergonomics.

Appendix B, Respirable Crystalline Silica Program

PURPOSE

This appendix is the Respirable Crystalline Silica Program for SWPF. The design and implementation of this program is to protect workers from exposures to Respirable Crystalline Silica and thus minimizing the potential for occupational illness related to silica exposures.

SCOPE

This program for SWPF applies to workers, vendors, or visitors to the SWPF that could have the potential for exposure from airborne silica. Exposure control for silica is accomplished by the following actions:

- Identify work process and activities which create the potential for airborne silica;
- Restrict work practices that create dust where there is a practical alternate method available to control dust; and
- Implement methods into work process and activities to minimize and control airborne silica.

SILICA EXPOSURE HAZARDS

Silica is more than just dust. Quartz or silica is found naturally in almost all rock, sand, and soil. Silica is found in concrete products and brick.

Exposure to silica can have detrimental health effects. Silica particles can scar the lungs causing “fibrosis”. This reduces the lung’s ability to extract oxygen from the air. Extreme scarring of the lungs can prevent the individual from getting enough oxygen. A lung disease “Silicosis is caused by breathing air containing silica particles.

Common construction work activities can present a silica exposure hazard. These activities include but are not limited to; abrasive blasting, rock drilling, concreted and masonry construction, earthwork, rock crushing, masonry or concrete demolition and road construction, and repair.

The following is a listing of construction work activities that could be performed at SWPF, which could promote airborne silica:

- Handheld or stand mounted drills for drilling penetrations into concrete;
 - Jackhammers and handheld powered chipping tools to demolish or modify concrete;
 - Heavy equipment and utility vehicles for grading and excavating; and
 - Housekeeping associated with the preceding activities.
-

EXPOSURE CONTROL METHODS

Whenever work activities are identified which are to be performed with the knowledge of the presence of silica, the silica exposure controls required by Table 1 in Section 1153 of 29 CFR 1926¹⁶ will be imposed. This table has identified pre-defined tasks with specific controls capable of reducing the exposure to silica. Monitoring is performed pending sufficient data to validate effectiveness of silica exposure controls to maintain exposures to less than 25 microgram (μg) per cubic meter (m^3) measured as a TWA. The control methods from Table 1 in Section 1153 of 29 CFR 1926¹⁶ may be incorporated into job specific JHAs directly or via reference.

If those controls specified in Table 1 in Section 1153 of 29 CFR 1926¹⁶ are not implemented, or a task is performed which is not listed in Table 1 in Section 1153 of 29 CFR 1926¹⁶, then alternate exposure control methods must be used. Whenever alternate control methods are used, performance or objective data is collected to document that the controls are adequate to minimize personnel exposures to silica. These methods include:

- Exposure assessments will be conducted for each worker expected to be exposed at or above the action level of $12.5 \mu\text{g}/\text{m}^3$ measured as a TWA.
- Each worker's exposure will be assessed as an TWA using air monitoring data or objective data to accurately characterize the worker's exposures to respirable crystalline silica
- Dust suppression techniques will be used to minimize silica exposures
- Respiratory protection will be used whenever dust control and safe work methods cannot limit silica exposures below the TLV/PEL
- Respiratory protection will be used whenever there is insufficient data to assure controls in use limit silica exposures below the TLV/PEL.

Note: Whenever work activities are performed which could generate respirable crystalline silica the work activity is evaluated to determine the worker's potential exposure and if monitoring is required. The objective of monitoring is to document controls are adequate to protect the worker from exposure above $25 \mu\text{g}/\text{m}^3$ measured as a TWA. This TWA complies with TLV limits specified in ACGIH *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices* (2016 Edition)¹⁴.

Table A.1. Specified Exposure Control Methods when Working with Materials Containing Crystalline Silica

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours / shift	> 4 hours / shift
<p>(i) Stationary masonry saws</p> 	<p>Use saw equipped with integrated water delivery system that continuously feeds water to the blade.</p> <p>Operate and maintain tool in accordance with manufacturer’s instructions to minimize dust emissions.</p>	None	None
<p>(ii) Handheld power saws (blade diameter)</p> 	<p>Use saw equipped with integrated water delivery system that continuously feeds water to the blade.</p> <p>Operate and maintain tool in accordance with manufacturer’s instructions to minimize dust emissions.</p> <ol style="list-style-type: none"> 1) When used outdoors. 2) When used indoors or in an enclosed area. 	<ol style="list-style-type: none"> 1) None 2) APF 10 	<ol style="list-style-type: none"> 1) APF 10 2) APF 10

Table A.1. Specified Exposure Control Methods when Working with Materials Containing Crystalline Silica (cont.)

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours / shift	> 4 hours / shift
<p>(iii) Handheld power saws for cutting fiber-cement board (with blade diameter of 8 inches or less)</p> 	<p>For tasks performed <u>outdoors only</u>:</p> <ul style="list-style-type: none"> • Use saw equipped with commercially available dust collection system. • Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. • Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency. 	None	None
<p>(iv) Walk-behind saws</p> 	<p>Use saw equipped with integrated water delivery system that continuously feeds water to the blade.</p> <p>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</p> <ol style="list-style-type: none"> 1) When used outdoors. 2) When used indoors or in an enclosed area. 	<ol style="list-style-type: none"> 1) None 2) APF 10 	<ol style="list-style-type: none"> 1) None 2) APF 10

Table A.1. Specified Exposure Control Methods when Working with Materials Containing Crystalline Silica (cont.)

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours / shift	> 4 hours / shift
<p>(v) Drivable saws</p> 	<p>For tasks performed <u>outdoors only</u>:</p> <ul style="list-style-type: none"> • Use saw equipped with integrated water delivery system that continuously feeds water to the blade. • Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. 	None	None
<p>(vi) Rig-mounted core saws or drills</p> 	<p>Use tool equipped with integrated water delivery system that supplies water to cutting surface.</p> <p>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</p>	None	None

Table A.1. Specified Exposure Control Methods when Working with Materials Containing Crystalline Silica (cont.)

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours / shift	> 4 hours / shift
<p>(vii) Handheld and stand-mounted drills (including impact and rotary hammer drills)</p> 	<p>Use drill equipped with commercially available shroud or cowling with dust collection system.</p> <p>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</p> <p>Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism.</p> <p>Use a HEPA-filtered vacuum when cleaning holes.</p>	None	None
<p>(viii) Dowel drilling rigs for concrete</p> 	<p>For tasks performed <u>outdoors only</u>:</p> <ul style="list-style-type: none"> • Use shroud around drill bit with a dust collection system. Dust collector must have a filter with 99% or greater efficiency and a filter-cleaning mechanism. • Use a HEPA-filtered vacuum when cleaning holes. 	APF 10	APF 10

Table A.1. Specified Exposure Control Methods when Working with Materials Containing Crystalline Silica (cont.)

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours / shift	> 4 hours / shift
	<p>Use tool with water delivery system that supplies a continuous stream or spray of water at the point of impact.</p> <p>1) When used outdoors. 2) When used indoors or in an enclosed area.</p> <p style="text-align: center;">OR</p> <p>Use tool equipped with commercially available shroud and dust collection system.</p> <p>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</p> <p>Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism.</p> <p>3) When used outdoors. 4) When used indoors or in an enclosed area.</p>	<p>1) None 2) APF 10</p> <p>3) None 4) APF 10</p>	<p>1) APF 10 2) APF 10</p> <p>3) APF 10 4) APF 10</p>
<p>(xi) Handheld grinders for mortar removal (i.e., tuckpointing)</p> 	<p>Use grinder equipped with commercially available shroud and dust collection system.</p> <p>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</p> <p>Dust collector must provide 25 cubic feet per minute or greater of airflow per inch of wheel diameter and have a filter with 99% or greater efficiency and a cyclonic pre- separator or filter-cleaning mechanism.</p>	<p>APF 10</p>	<p>APF 25</p>

Table A.1. Specified Exposure Control Methods when Working with Materials Containing Crystalline Silica (cont.)

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours / shift	> 4 hours / shift
<p>(xiii) Walk-behind milling machines and floor grinders</p> 	<p>Use machine equipped with integrated water delivery system that continuously feeds water to the cutting surface.</p> <p>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</p> <p style="text-align: center;">OR</p> <p>Use machine equipped with dust collection system recommended by the manufacturer.</p> <p>Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.</p> <p>Dust collector must provide the air flow recommended by the manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism.</p> <p>When used indoors or in an enclosed area, use a HEPA-filtered vacuum to remove loose dust in between passes.</p>	None	None

Table A.1. Specified Exposure Control Methods when Working with Materials Containing Crystalline Silica (cont.)

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours / shift	> 4 hours / shift
<p>(xiv) Small drivable milling machines (less than half- lane)</p> 	<p>Use a machine equipped with supplemental water sprays designed to suppress dust. Water must be combined with a surfactant. Operate and maintain machine to minimize dust emissions.</p>	None	None
<p>(xv) Large drivable milling machines (half-lane and larger)</p> 	<p>For cuts of depth on asphalt only:</p> <ul style="list-style-type: none"> • Use machine equipped with exhaust ventilation on drum enclosure and supplemental water sprays designed to suppress dust. • Operate and maintain machine to minimize dust emissions. <p>For cuts of four inches in depth or less on substrate:</p> <ul style="list-style-type: none"> • Use machine equipped with exhaust ventilation on drum enclosure and supplemental water sprays designed to suppress dust. • Operate and maintain machine to minimize dust emissions. <p style="text-align: center;">OR</p> <p>Use a machine equipped with supplemental water spray designed to suppress dust. Water must be combined with a surfactant. Operate and maintain machine to minimize dust emissions.</p>	None	None

Table A.1. Specified Exposure Control Methods when Working with Materials Containing Crystalline Silica (cont.)

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours / shift	> 4 hours / shift
<p>(xvi) Crushing machines</p> 	<p>Use equipment designed to deliver water spray or mist for dust suppression at crusher and other points where dust is generated (e.g., hoppers, conveyers, sieves/sizing or vibrating components, and discharge points).</p> <p>Operate and maintain machine in accordance with manufacturer’s instructions to minimize dust emissions.</p> <p>Use a ventilated booth that provides fresh, climate-controlled air to the operator, or a remote control station.</p>	None	None
<p>(xvii) Heavy equipment and utility vehicles used to abrade or fracture silica-containing materials (e.g., hoe-ramming, rock ripping) or used during demolition activities involving silica-containing materials**</p> 	<p>Operate equipment from within an enclosed cab.</p> <p>When employees outside of the cab are engaged in the task, apply water/dust suppressants as necessary to minimize dust emissions.</p>	None	None

Table A.1. Specified Exposure Control Methods when Working with Materials Containing Crystalline Silica (cont.)

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours / shift	> 4 hours / shift
<p>(xviii) Heavy equipment and utility vehicles for tasks such as grading and excavating but not including: demolishing, abrading, or fracturing silica-containing materials</p> 	<p>1) Apply water/dust suppressants as necessary to minimize dust emissions.</p> <p style="text-align: center;">OR</p> <p>2) When the equipment operator is the only employee engaged in the task, operate equipment from within an enclosed cab.</p>	<p>1) None</p> <p>2) None</p>	<p>1) None</p> <p>2) None</p>

COMPETENT PERSON

IH personnel will serve as the Competent Person for implementation of this Respirable Crystalline Silica Exposure Control Program.

HOUSEKEEPING

Do not dry sweep or brush to clean if the activity could contribute to worker exposure to respirable crystalline silica unless, HEPA filtered vacuuming, wet sweeping, wet mopping or other methods that minimize potential exposure are not practical.

TRAINING

Training is provided for employees who could be exposed to respirable crystalline silica at or above the Action Level of $12.5 \mu\text{g}/\text{m}^3$ as a TWA. This training will provide information of the health effects of silica including cancer, lung effects and immune system deficiencies.

MEDICAL SUVEILLANCE REQUIREMENTS

A medical surveillance is made available to employees who are exposed above the PEL for 30 days of more per year. The medical surveillance is performed by a physician or licensed health care provider. This surveillance will include:

- A baseline medical examination covering medical and work history, with emphasis on past, present and anticipated exposure to silica, dusts or other agents affecting the respiratory system;
- A physical examination with emphasis of the respiratory system;
- A chest X-ray;
- A pulmonary function test to include forced vital capacity and forced expiratory volume in one second and the forced expiratory volume in one second / forced vital capacity ratio;
- Testing for latent tuberculosis; and
- Other tests determined to be appropriate by the physician or licensed health care provider.

RECORDKEEPING

Process objective or performance data collected to document the exposure assessments of workers along with training and medical surveillance documents in accordance with PP-DC-3002¹⁰.

REFERENCES

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- ¹ DOE-STD-1027-92, *Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports*. U.S. Department of Energy, Washington D.C.
 - ² S-SAR-J-00002, *SWPF Documented Safety Analysis*. Parsons, Aiken, South Carolina.
 - ³ S-TSR-J-00001, *SWPF Technical Safety Requirements*. Parsons, Aiken, South Carolina.
 - ⁴ 10 CFR 851, *Worker Safety and Health Program*.
 - ⁵ DE-AC09-02SR22210, *Design, Construction, and Commissioning of a Salt Waste Processing Facility (SWPF)*. U. S. Department of Energy. 2002.
 - ⁶ V-IM-J-00001, *SWPF Organization, Roles, and Responsibilities Manual*. Parsons, Aiken, South Carolina.
 - ⁷ PL-TR-1807, *SWPF Safety/Industrial Hygiene Training Program Description*. Parsons, Aiken, South Carolina.
 - ⁸ S-CIP-J-00003, *SWPF 10 CFR 851 Worker Safety and Health Program*. Parsons, Aiken, South Carolina.
 - ⁹ PM-OP-8501, *SWPF Operations Safety Manual*. Parsons, Aiken, South Carolina.
 - ¹⁰ *Salt Waste Processing Facility Project Procedures Manual*. Parsons, Aiken, South Carolina.
 - ¹¹ 29 CFR 1910, *Occupational Safety and Health Standards*.
 - ¹² PL-LB-8100, *SWPF Analytical Laboratory Chemical Hygiene Plan*. Parsons, Aiken, South Carolina.
 - ¹³ 29 Code of Federal Regulations (CFR) *Occupational Safety and Health Administration (OSHA) and the American National Standards Institute/American Society of Safety Engineers ANSI/ASSE Z88.2 - 2015, American National Standard Practices for Respiratory Protection*
 - ¹⁴ American Conference of Governmental Industrial Hygienists (ACGIH) *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices* (2016 Edition). American Conference of Governmental Industrial Hygienists. Cincinnati, Ohio.
 - ¹⁵ OSHA Standard 29 CFR 1910.146, *Permit-required confined spaces*
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- ¹⁶ 29 CFR 1926, *Safety and Health Regulations for Construction*.
- ¹⁷ TED 01-00-015, *OSHA Technical Manual (OTM)*, U.S. Department of Labor: Occupational Safety & Health Administration, Washington, D.C.
- ¹⁸ NIOSH Publication 94-113, *NIOSH Manual of Analytical Methods (NMAM)*, 4th Edition. U.S. Department of Health and Human Services, Washington, D.C. August 1994.
- ¹⁹ *Chemical Sampling Information (CSI)*. U.S. Department of Labor: Occupational Safety & Health Administration, Washington, D.C.
- ²⁰ *American Board of Industrial Hygiene Code of Ethics*. American Board of Industrial Hygiene. Effective May 25, 2007.
- ²¹ 40 CFR, *Protection of Environment*.
- ²² V-QP-J-00001, *SWPF Quality Assurance Plan*. Parsons, Aiken, South Carolina.
- ²³ PL-SH-4309, *SWPF Hazardous Chemical Control Plan*. Parsons, Aiken, South Carolina.
- ²⁴ PL-SH-4310, *SWPF Hazardous Chemical Control Plan for Chemical Testing*. Parsons, Aiken, South Carolina.
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