# CONTENTS



# LIST OF TABLES

# 1.0 INTRODUCTION

## 1.1 Purpose

**1.1.1** This Safe Work Instruction outlines specific steps to be taken during planned and unplanned $H_2S$ releases. It will also provide information on exposure limits, respiratory protection, atmospheric gas testing, and reporting.

**1.1.2** Policies and practices cannot cover every possible situation that may occur; therefore, best judgment must be used as situations warrant. Always keep personal safety in the forefront of all decision making when responding.

## 1.2 Scope

**1.2.1** This Safe Work Instruction is used by the SLC Refinery to define methods in responding to $H_2S$ releases and minimum standard requirements. This Safe Work Instruction applies to all SLC Refinery personnel, contractors, and visitors.

**1.2.2** Hydrogen sulfide ($H_2S$) is present throughout the Salt Lake City Refining Division and is assumed to be present in all areas inside battery limits.

## 1.3 Corporate References

The following sections describe references used to generate this Safe Work Instruction.

### 1.3.1 Marathon Standards, Policies and Procedures

- Corporate: HLT-2001 Industrial Hygiene Program
- Corporate: HLT-2002 Hydrogen Sulfide Exposure Control Program
- Corporate: HLT-2005 Respiratory Protection Program
- Corporate: SAF-4010 Personal Protective Equipment
- Corporate: SAF-4014 Hazard Communication Program
- Refining: RSP-1701 $H_2S$ Exposure Control Program
- Refining: RSP-1701-000-FORM01 APR Task Analysis and Review Form
- Local: HS-SWI-001 Safe Work Permit
- Local: HS-SWI-064 Line Opening
- Local: HS-SWI-011 Control of Hazardous Energy
- Local: HS-SWI-012 Leak Identification, Assessment, and Response
- Local: Emergency Response Plan
- Local: Hazard Communication Program
- Local: Respiratory Protection Program
- Local: Personal Protective Equipment

### 1.3.2 Government Regulations

- 29 CFR 1910 OSHA $H_2S$ Exposure Limits
- Federal: OSHA 29 CFR 1910.1000 Table Z-2
- DHHS (NIOSH) 83-127 Comprehensive Safety Recommendations for Land-Based Oil and Gas well drilling
- NIOSH: Pocket Guide to Chemical Hazards

## 2.0 DEFINITIONS

The following terms and definitions are used in this document.

**Table 1 Terms and Definitions**

| Term | Definition |
|---|---|
| APR | Air-Purifying Respirator |
| Breathing zone | Hemisphere forward of the shoulders within a radius of approximately 6 to 9 inches |
| Ceiling Concentration | The OSHA Ceiling Concentration for $H_2S$ has been established at 20 ppm. The allowable time period for $H_2S$ above the ceiling but below the maximum peak is 10 minutes once, only if no other measurable exposure occurs |
| ERT | Emergency Response Team |
| Exposure | State or condition of being unprotected and open to damage or danger. |
| $H_2S$ | Hydrogen Sulfide |
| $H_2S$ Stream | For the purpose of this document, a hydrogen sulfide stream is defined as any gas, vapor or liquid that can release 10 ppm or more of $H_2S$ into the breathing zone or into an area that may become the breathing zone of employees. |
| Hydrogen Sulfide | $H_2S$ is a colorless, very poisonous, flammable gas with the characteristic foul odor of expired eggs perceptible at concentrations as low as 0.00045 parts per million. |
| Immediately Dangerous to Life or Health (IDLH) | The NIOSH Immediately Dangerous to Life or Health (IDLH) concentration for $H_2S$ is 100 ppm. IDLH is an atmospheric concentration of $H_2S$ that poses an immediate threat to life or would cause irreversible or delayed adverse health effects or would interfere with an individual's ability to escape from a dangerous atmosphere. |
| Maximum Peak | OSHA Maximum Peak above the Ceiling is 50 ppm. The maximum peak concentration must not be exceeded more than once during an 8-hour shift. |
| Odor Threshold | The odor detection threshold is the lowest concentration of a certain odor compound that is perceivable by the human sense of smell. |
| Occupational Exposure Limit (OEL) | OEL is a company-identified limit on the amount or concentration of a chemical to which workers may be exposed for a predefined time limit. The OEL for $H_2S$ is 10 ppm for an 8-hour TWA. |

**Table 1 Terms and Definitions**

| Term | Definition |
|---|---|
| Personal Alarm Monitor (PAM) | Gas detectors for personal use, small enough to be clipped onto exterior clothing. Personal alarms alert personnel to presence of the toxic gas they were designed to detect in the local atmosphere. They provide continuous, direct reading gas detection with visual and audible alarms, and are designed to be worn when working in locations where toxic gases might be released. The terms personal $H_2S$ monitor and personal $H_2S$ alarm are used interchangeably. |
| SCBA | Self-Contained Breathing Apparatus (aka Fresh Air). An atmosphere-supplying respirator for which the source of breathing air is designed to be carried by the user. |
| Short-Term Exposure Limit (STEL) | The 15-minute MPC OEL Short-Term Permissible Exposure Limit (STEL) for $H_2S$ has been established at 15 ppm. A 15-minute TWA exposure that should not be exceeded at any time during a day, even if the 8-hour TWA is within the OEL-TWA. |
| Time Weighted Average (TWA) | The 8-hour MPC OEL Time Weighted Average (TWA) for $H_2S$ has been established at 10 ppm. The OEL-TWA concentration is for a “conventional 8-hour workday and a 40-hour workweek, to which it is believed that nearly all workers may be repeatedly exposed, day after day, for a working lifetime without adverse effect”. |

# 3.0 ROLES AND RESPONSIBILITIES

## 3.1 Safety Department

Health and Safety is responsible for:

- Maintaining this instruction with a program review at least every three (3) years
- Providing training material to support the training responsibilities of Operations and the Training Department
- Providing consultation for work where $H_2S$ is expected to be present
- Routinely (at least weekly) reviewing data logged personal $H_2S$ monitor data and notify individuals and their supervisors of any unreported alarms
- Provide reports to management on any compliance issues related to calibration and bump testing of personal monitors

## 3.2 Shift Supervisors

Shift supervisors are responsible for ensuring that $H_2S$ events are managed according to this Safe Work Instruction and existing policies.

## 3.3 Owning Department Supervision

Supervision is responsible for the following:

- Providing appropriate training and resources to comply with this instruction and to investigate $H_2S$ alarms as near misses; and
- Reporting and investigating $H_2S$ incidents based upon the classification of the incident.

## 3.4 Owning Department Personnel

Owning Department is responsible for:

- Following the requirements of this practice
- Determining which process streams contain $H_2S$ and a general understanding of $H_2S$ concentrations
- Maintaining and being prepared to use gas testing equipment and PPE to respond to $H_2S$ events
- Ensuring that all PPE and safety equipment (e.g., gas testers, supplied-air respirators, etc.) are replaced if found to be unfit for use
- Investigating and controlling $H_2S$ exposures as defined in this policy

## 3.5 Servicing Group

Servicing Group is responsible for:

- Following the guidelines of this practice
- Ensuring that all PPE and safety equipment (e.g., gas testers, supplied-air respirators, etc.) are replaced if found to be unfit for use

## 3.6 Contractors

Contractors are responsible for:

- Knowing and following the response protocols defined in this practice

- Providing each individual, who will enter process units or areas, with a personal monitor with data logging capabilities
- Responding to $H_2S$ alarms at 10 ppm as defined in this practice
- Reporting all alarm events to their MPC responsible party who will input an incident report and investigate

## 4.0 PRACTICES

The following section details the response process to $H_2S$ releases and events including when to activate the emergency response protocol and minimum standard requirements.

### 4.1 $H_2S$ Personal Alarm Monitors (PAMs)

**4.1.1** Personal data-logging hydrogen sulfide monitors will be worn in all areas where "Essential PPE" is required. Personal $H_2S$ monitors have been provided to each employee whose work duties require spending time on process units or in processing areas. Other shop areas may require a personal hydrogen sulfide monitor depending upon the task.

**4.1.2** **DO NOT USE Personal $H_2S$ monitors for unit gas testing. Atmospheric testers are available for this purpose.**

**4.1.3** All contractors, vendors, and visitors are to provide their own personal alarm monitor which will be maintained according to the manufacturer's requirements.

**4.1.4** Personal $H_2S$ monitors will be worn as follows:

a. Worn in the breathing zone (within 10 inches of the mouth)

b. Placed on the outermost layer of clothing

c. Placed so that it is likely to be seen and/or heard if the device alarms

### 4.2 Personal Alarm Monitor Settings

Personal $H_2S$ monitors will have alarms set so that the low alarm sounds at 10 ppm and the high alarm sounds at 50 ppm.

### 4.3 Planned $H_2S$ Release during Standard Operations

If a planned operational activity, such as draining a tank, is expected to release $H_2S$, then complete the following steps:

a. Prior to commencing the operational activity, barricade the area with red tape and tags to prevent entry.

b. Complete a walkthrough to verify that no unauthorized personnel are within the affected area, including any overhead work where a ladder exists leading into the barricaded area.

c. Communicate using the radio to potentially affected personnel (including contractors) the forthcoming event.

d. Employees are to visually verify that the event is progressing according to the plan and to verify with an atmospheric tester (not the personal $H_2S$ monitor) that conditions have not exceeded 10 ppm $H_2S$.

## 4.4 Required Response for Personal Monitor Alarms

The following sections only apply to personal alarm monitors worn in the breathing zone. IDLH atmospheres, measured by atmospheric testers, inside containment (piping, etc.) does not constitute an IDLH concentration in the breathing zone and does not prevent employees or contractors from safely breaking containment using the proper PPE.

### 4.4.1 10 to 49 ppm

A. Evacuate the area crosswind until clear of the sources and then upwind.

B. Notify the Operator, who will initiate an assessment of potential sources and risks according to HS-SWI-012 Leak Identification, Assessment, and Response.

C. Upon completion of the assessment, the Operator will notify the shift supervisor of the results of the assessment.

D. Ensure that other units and facilities that may be affected are alerted to the release (i.e., shops, offices etc.)

E. Undertake any actions that can be safely done to control the source of the $H_2S$.

F. Entry into the area will only be conducted by qualified, properly trained personnel wearing supplied air, with a backup person and an atmospheric tester, until the area is rendered safe.

G. If any exposed personnel experience symptoms of $H_2S$ exposure, they are to report to the clinic.

H. Dock the monitor by the end of shift, so that the instrument readings can be captured.

I. The shift foreman will submit an incident report as soon as it is safe to do so. This event will be managed and investigated based upon the classification of the incident. Include sufficient detail in the incident report to support an efficient start to an investigation.

### 4.4.2 50 ppm and above

A. In addition to the steps identified in 4.4.1 the following are required for personal alarms greater than 50 ppm.

B. Any personal alarms without respiratory protection at 50+ ppm require that the individual no longer has any potential exposure to $H_2S$ for the remainder of the shift.

C. This can be achieved by removing the individual from service; requiring supplied air for any $H_2S$ potential exposures; etc.

## 4.5 Required Response for Fixed Station Area Alarms

### 4.5.1 10+ ppm

A. The Board Operator is to immediately notify the Operator and all others in the affected area to evacuate the immediate area.

B. The Board Operator is to take any actions necessary to mitigate the source of the $H_2S$ release.

C. The Operator will put on a supplied-air respirator and begin investigating the source of the $H_2S$ by using an atmospheric tester with a backup outside the effect area.

D. The Operator will notify the Board Operator and shift supervisor the results of the investigation.

E. For concentrations above 10 ppm, the shift supervisor will submit an incident report as soon as it is safe to do so. Include sufficient detail to support an efficient start to an investigation.

F. The shift supervisor shall evaluate the need to notify the ERT.

## 4.6 Engineering/Work Practice Controls

**4.6.1** The refinery will evaluate the feasibility of engineering and work practice control measures to maintain exposure within the exposure limits; and where exposures cannot be maintained below the limits, use controls to reduce exposures to the lowest feasible level.

**4.6.2** Industrial Hygiene/Safety Department will be involved during the hazard assessment of the design process to ensure all $H_2S$ control measures are adequately implemented. Industrial Hygiene/Safety Department must also be notified when new $H_2S$ control equipment is installed or modified.

# 5.0 TRAINING

## 5.1 Initial Training

**5.1.1** All personnel will receive awareness training about the hazards of $H_2S$, use and limitation of personal gas monitors, response to alarms and required safe work practices.

**5.1.2** All contractors entering process areas are required to train their employees on $H_2S$ safety including all requirements specified in this document.

## 5.2 Refresher Training

**5.2.1** All personnel will receive periodic refresher training about the hazards of $H_2S$, use and limitation of personal gas monitors, response to alarms and required safe work practices.

**5.2.2** Personnel working in or near process areas where $H_2S$ is routinely present will have refresher training on a yearly basis.

# 6.0 PERSONAL PROTECTIVE EQUIPMENT (PPE) REQUIREMENTS

## 6.1 PPE for Airborne Concentrations Above 10 ppm

**6.1.1** Use of respiratory protection (supplied-air only) is required when $H_2S$ concentrations exceed 10 ppm (see 6.1.3 and 6.2 for exceptions). All responses to $H_2S$ releases by operations and/or emergency response personnel will be performed using supplied air.

**6.1.2** Additionally, supplied-air responses to concentrations greater than 100 ppm, require a spotter to maintain visual contact with the individual assessing the $H_2S$ source.

a. The spotter may be required to use supplied air unless the spotter can remain in an area of less than 10 ppm.

b. The spotter's role is to notify the Emergency Response Team and is forbidden from providing rescue.

**6.1.3** All other requirements of the Respiratory Protection Program must be followed (e.g. use of a bottle watch, etc.).

**6.1.4** Air-purifying respirators (APRs) will not provide adequate protection against high concentrations of $H_2S$ and are only approved for specific tasks (see section 6.2 for details).

**6.1.5** APRs may be worn to prevent $H_2S$ exposure in situations where breathing air is not normally required but $H_2S$ is identified as a potential hazard.

a. If a $H_2S$ alarm occurs, treat the alarm as a normal $H_2S$ exposure. Evacuate the area and contact the operator/shift foreman. The incident shall be entered into the Incident Tracking Database noting the employee was wearing an APR.

### 6.2 Procedure to Downgrade from Supplied Air to Air Purifying Respirators

**6.2.1** Air purifying respirators (APRs) for $H_2S$ are permitted for the specific task of known $H_2S$ concentration if approved through the EXAM process and formally signed-off by the Refinery and Corporate OEH.

A. Refer to Appendix A for the APR approval form.

**6.2.2** The list of approved APR tasks will be maintained by the HES department.

## 7.0 REVIEW AND REVISION HISTORY

### 7.1 Procedure Review

The Safe Work Instruction will be reviewed every 3 years.

### 7.2 History of Revisions

Table 2 provides the revision history for this Safe Work Instruction.

**Table 2 Revision History**

| Revision | Date | Change Author | Reason for Change |
|---|---|---|---|
| 1.0 | XXXXXXXXX | | Document Creation |
| 2.0 | 3/30/2016 | | Updated to the new SWI format |
| 3.0 | 5/17/20175/17/20175/17/2017 | Judd Moffitt/Keith Groth | Rewrite and removed $SO_2$ |
| 4.0 | 10/8/2019 | Judd Moffitt | Updated to match MPC requirements |
| 5.0 | 10/20/2020 | Judd Moffitt | Addition of APR downgrade process, removal of spotter requirement <100 ppm, renamed to SWI from SSP |

## 8.0 APPENDIX A – H2S Air Purifying Respirator (APR) Task Analysis and Approval Form

**SECTION 1 – General Information**

Date _____ Refinery Location _____

**SECTION 2 – Task Information**

Describe task to be performed while wearing APR and include general work steps and products involved (include Job Safety Analysis if available):

_____

_____

_____

**SECTION 3 – Air Purifying Respirator**

Manufacturer _____

Cartridge Type _____ (e.g. Acid Gas, OV, etc.)

Cartridge replacement frequency _____

**SECTION 4 – Description of Required Work Practices**

_____

_____

_____

**SECTION 5 – Summary of Statistical Data and Results**

_____

_____

_____

_____

_____

_____

| | *Requirement* | *Local Assessment* | *Requirement Met?* |
|---|---|---|---|
| Number of Samples | | | |
| Range of peak values | | | |
| % Exceedance | | | |
| UTL 95/95 | | | |

**SECTION 6 – Personal Alarm Monitor (PAM) to be worn during task**

Manufacturer _____ Model _____

Alarm set points: Low Alarm _____ ppm High Alarm _____ ppm

**SECTION 7—Additional Requirements to Supplement APR:**

**APPROVALS:**

**Component Industrial Hygienist: _____ Date:**

**OEH Manager: _____ Date:**

**Component ES&S Manager: _____ Date:**