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Doc Custodian: Safety Supervisor		Refinery Safe Work Procedure
Approved By: Eric Kaysen		
Date Approved: 2/23/2021		Next Review Date: 5/31/2026 Effective Date: 5/27/2021

## TABLE OF CONTENTS

<b>1.0</b>	Purpose .....	2
<b>2.0</b>	Scope .....	2
<b>3.0</b>	Procedure.....	2
3.1	General Requirements.....	2
3.1.1	Exposure Limits .....	2
3.1.2	Action Level (AL) .....	2
3.2	Regulated Areas .....	2
3.3	Methods of Reducing Personnel Exposure .....	3
3.3.1	Engineering and Work Practices Controls .....	3
3.3.2	Respiratory Protection .....	3
3.4	Benzene Hazard Communication .....	4
3.4.1	Labels .....	4
3.4.2	Employee Training .....	4
3.5	Exposure Monitoring .....	4
3.5.1	Personal exposure monitoring will be coordinated by HESS personnel. ....	4
3.5.2	Initial Monitoring .....	4
3.5.3	Periodic Monitoring .....	4
3.5.4	Employee Notification .....	4
3.5.5	Observation of Monitoring .....	5
3.5.6	Atmospheric Testing .....	5
3.6	Medical Surveillance.....	5
3.6.1	Initial and Periodic Medical Evaluations .....	5
3.6.2	Medical Evaluations as a Result of Emergency Exposures .....	5
3.6.3	Medical Records .....	6
3.7	Contractors .....	6
<b>4.0</b>	Definitions .....	6
<b>5.0</b>	References .....	6
<b>6.0</b>	Attachments .....	6
<b>7.0</b>	Revision History .....	6
	Attachment A: Benzene Release Response Requirements .....	7
	Attachment B: Benzene Gas Testing .....	8

Blanchard Refining Company LLC	Galveston Bay Refinery	
Title: SM-4 Benzene Exposure Reduction	Doc Number: RSW-000057-GB	Rev No: 2

## 1.0 Purpose

The purpose of this procedure is to minimize occupational exposure to benzene and meet the requirements of the OSHA Benzene Standard 29 CFR 1910.1028.

## 2.0 Scope

This procedure applies to any activity where exposures to benzene can occur. This is defined as any unknown product release, all excavation work, process streams containing concentrations greater to or equal to 0.1% benzene, or any detection of VOC exceeding 0.5 ppm.

## 3.0 Procedure

### 3.1 General Requirements

#### 3.1.1 Exposure Limits

Permissible Exposure Limit (PEL) – 1.0 ppm (parts per million) averaged over 8 hours

Short-Term Exposure Limit (STEL) – 5.0 ppm averaged over 15 minutes

3.1.2 Action Level (AL) - The exposure level at which various parts of the benzene standard are required to be implemented, for example, medical surveillance and training. The AL is 0.5 ppm averaged over 8 hours.

### 3.2 Regulated Areas

3.2.1 Regulated areas will be established whenever airborne concentrations of benzene exceed or can be reasonably expected to exceed 0.5 ppm.

3.2.1.1 Areas to be regulated during routine operations include:

3.2.1.1.1 The Galveston Bay Refinery has no Permanent Regulated Areas.

3.2.1.2 Areas/Activities that can be reasonably expected to be a Benzene Regulated Area:

3.2.1.2.1 During venting, draining, blinding or opening process equipment and piping containing or having contained greater than 10% benzene.

3.2.1.2.2 During unplanned releases or spills greater than 5 gallons of liquids which contain 0.1% or more of benzene (i.e., gasoline, crude oil, crude ethylbenzene, mixed xylenes).

3.2.2 To limit access to authorized personnel, the regulated area must be clearly marked with the appropriate warning signs. Where feasible, the area should also be barricaded. Warning signs must read as follows:

**DANGER**  
**BENZENE**  
**CANCER HAZARD**  
**FLAMMABLE - NO SMOKING**  
**AUTHORIZED PERSONNEL ONLY**  
**RESPIRATOR REQUIRED**

Blanchard Refining Company LLC	Galveston Bay Refinery	
Title: SM-4 Benzene Exposure Reduction	Doc Number: RSW-000057-GB	Rev No: 2

Signs and barricade tape are available in the warehouse.

- 3.2.3 Once established, an area will remain regulated until monitoring indicates the concentration of benzene in the air is less than 0.5 ppm.
- 3.2.4 Only personnel trained in the hazards of benzene will enter a benzene regulated area.
- 3.2.5 All personnel entering a regulated area will wear all appropriate respiratory protection and protective clothing.

### 3.3 Methods of Reducing Personnel Exposure

#### 3.3.1 Engineering and Work Practices Controls

Where feasible, benzene exposures will be controlled through engineering controls and work practices. Respirators should be used to control exposures that are intermittent or caused by emergency conditions and while awaiting engineering controls to be implemented. Engineering controls include, but are not limited to, closed-loop sample points, sample cooler, hard piping for draining, and laboratory fume hoods. Work practice controls include closed draining, hot nitrogen purging, and pre-cleaning of process equipment.

#### 3.3.2 Respiratory Protection

3.3.2.1 Respiratory Protection will be worn as outlined below;

<b>Benzene Concentration</b>	<b>Respirator*</b>	<b>Cartridge</b>
Unknown (i.e., no air sampling information and/or emergency response for a release)	Supplied Air	Not applicable
Less than 0.5 ppm	None required	Not applicable
Greater than or equal to 0.5 ppm, but less than 10 ppm	Half-Mask Air Purifying	Organic vapor (Black) or organic vapor/acid gas (Yellow) cartridges
Greater than or equal to 10 ppm, but less than 50 ppm	Full Face Air Purifying or Supplied Air	Organic vapor (Black) or organic vapor/acid gas (Yellow) cartridges
Equal to or above 50 ppm	Supplied Air	Not Applicable

\* Individuals shall be fit tested on the specific manufacturer, model, and size respirator being utilized.

3.3.2.2 Activities which may result in air concentrations of benzene between 0.5 ppm and 10 ppm include, but are not limited to, operations and maintenance work on process equipment, containing or having contained 10% or more of benzene, or cleanup of small spills (5 gallons or less) of liquids containing benzene.

3.3.2.3 Activities which may result in air concentrations of greater than 10 ppm may include work in some confined spaces or spills greater than 5 gallons that contain benzene. NOTE: Some spills less than 5 gallons may result in air concentrations greater than 10 ppm depending on the material involved (i.e.

Blanchard Refining Company LLC	Galveston Bay Refinery	
Title: SM-4 Benzene Exposure Reduction	Doc Number: RSW-000057-GB	Rev No: 2

high benzene concentrations) and environmental conditions (i.e. hot day, spill in direct sunlight, etc.)

### 3.4 Benzene Hazard Communication

#### 3.4.1 Labels

- 3.4.1.1 In addition to the labels required for the Hazard Communication Program, containers containing benzene greater than 0.1% must be labeled as follows:

**DANGER**  
**CONTAINS BENZENE**  
**CANCER HAZARD**

- 3.4.1.2 Note: As long as the SDS has the above wording and the vessel refers to that particular SDS on the container list, the SDS can serve as the label for a benzene containing vessel. However, portable containers (i.e. drums, cans, sample containers) still require the above wording.

#### 3.4.2 Employee Training

- 3.4.2.1 All MPC employees working in areas with potential benzene exposures must be properly trained to work with benzene.
- 3.4.2.2 Training will be conducted upon initial employment and repeated at a frequency determined by the HESS Department and the Training Department. Employees may refer to the Safety Training Matrix for the frequency they are to complete training.
- 3.4.2.3 Training will include the specific hazards of benzene, the contents of the benzene standard, medical surveillance program and the appropriate protective measurements to control benzene exposures.
- 3.4.2.4 Training records will be maintained by the Training Department.

### 3.5 Exposure Monitoring

- 3.5.1 Personal exposure monitoring will be coordinated by HESS personnel.

#### 3.5.2 Initial Monitoring

Initial personal monitoring will be performed to determine representative exposures for each job function in which exposures to benzene may exceed the OSHA action limit or short-term exposure limit.

#### 3.5.3 Periodic Monitoring

- 3.5.3.1 For job functions in which initial monitoring indicates benzene exposure above the action level, a periodic monitoring program will be established.
- 3.5.3.2 Periodic Monitoring will be completed depending on exposure levels.
- 3.5.3.3 Periodic monitoring will be conducted semi-annually when engineering controls or work practices do not reduce benzene exposure below the PEL or STEL.
- 3.5.3.4 Periodic monitoring will be conducted annually when engineering controls or work practices do not reduce benzene exposures below the action level.

#### 3.5.4 Employee Notification

- 3.5.4.1 Each employee monitored will be notified in writing of his/her personal monitoring result within 15 days of the receipt of analytical results.

Blanchard Refining Company LLC	Galveston Bay Refinery	
Title: SM-4 Benzene Exposure Reduction	Doc Number: RSW-000057-GB	Rev No: 2

3.5.4.2 In the event of overexposure, the individual will be notified of any corrective action through his/her supervisor.

### 3.5.5 Observation of Monitoring

The monitoring process may be observed by all employees whom the monitoring affects.

### 3.5.6 Atmospheric Testing

There are several different ways to test the atmosphere for benzene. The most prevalent ways are the use of an UltraRAE 3000, benzene specific Drager tube, bag sample and gas chromatograph (GC) analysis. There are other ways such as the use of a portable GC (i.e., Snapshot, Voyager) and a combination of a photoionization detector (PID) and a portable GC. The atmospheric testing will be conducted for confined spaces that contained benzene or other areas that a benzene regulated area may be required.

3.5.6.1 See Attachment B: Benzene Gas Testing for procedures on testing for benzene and VOCs.

3.5.6.2 In certain scenarios, due to distance, previous air sampling results, or stream composition, the Health or Safety Department can waive the requirement for the half-face respirator or benzene testing while testing (e.g. confined space attendant that is positioned outside of the hot zone).

## 3.6 Medical Surveillance

### 3.6.1 Initial and Periodic Medical Evaluations

3.6.1.1 Employees working in process areas who have potential exposure to benzene receive pre-employment and periodic medical evaluations as determined by the site physician.

3.6.1.2 If initial or periodic medical evaluations indicate an abnormal condition (i.e., abnormal blood condition), further evaluations will be given, and referrals made as determined by the site physician.

3.6.1.3 Medical evaluations will be done periodically for individuals that have been identified as having benzene exposures above 10 ppm for 30 or more days per year prior to December 10, 1987.

### 3.6.2 Medical Evaluations as a Result of Emergency Exposures

3.6.2.1 In the event of exposure above the STEL of 5.0 ppm without the use of proper respiratory protection, to an unforeseen release of benzene-containing vapor or liquid, the employee shall provide a urine specimen to the Medical Department. The specimen must be collected no sooner than 6 hours and no later than 8 hours following the exposure. If a urine sample is not collected within this time frame, the exposed employee must enter a blood monitoring program administered by the site Medical Department.

**3.6.2.1.1 For any exposures on night shift and weekends contact SOC and on call Safety person.**

3.6.2.2 If the urine specimen indicates an abnormal condition (i.e., high phenol in urine), further evaluation will be performed, and referrals made as determined by the site physician.

3.6.2.2.1 Procedure for submitting a urine sample off hours.

3.6.2.2.2 Personnel will contact the EMT's for the coordination of the urine collection.

3.6.2.2.3 The EMT's will then ensure that the samples are properly

Blanchard Refining Company LLC	Galveston Bay Refinery	
Title: SM-4 Benzene Exposure Reduction	Doc Number: RSW-000057-GB	Rev No: 2

handled, and the appropriate paperwork is completed.

### 3.6.3 Medical Records

3.6.3.1 Medical records associated with benzene medical surveillance will be maintained by the Medical Department.

3.6.3.2 An employee's medical records must be made available for review and copying to the employee, or to anyone with written consent of the employee.

## 3.7 Contractors

All contractors required to work in a benzene regulated areas must meet the requirements of the OSHA benzene standard

## 4.0 Definitions

None

## 5.0 References

5.1 OSHA Benzene Standard 29 CFR 1910.1028

5.2 [MPC HLT-2013 Benzene Exposure Control Program](#)

## 6.0 Attachments

6.1 Attachment A: Benzene Release Response Requirements

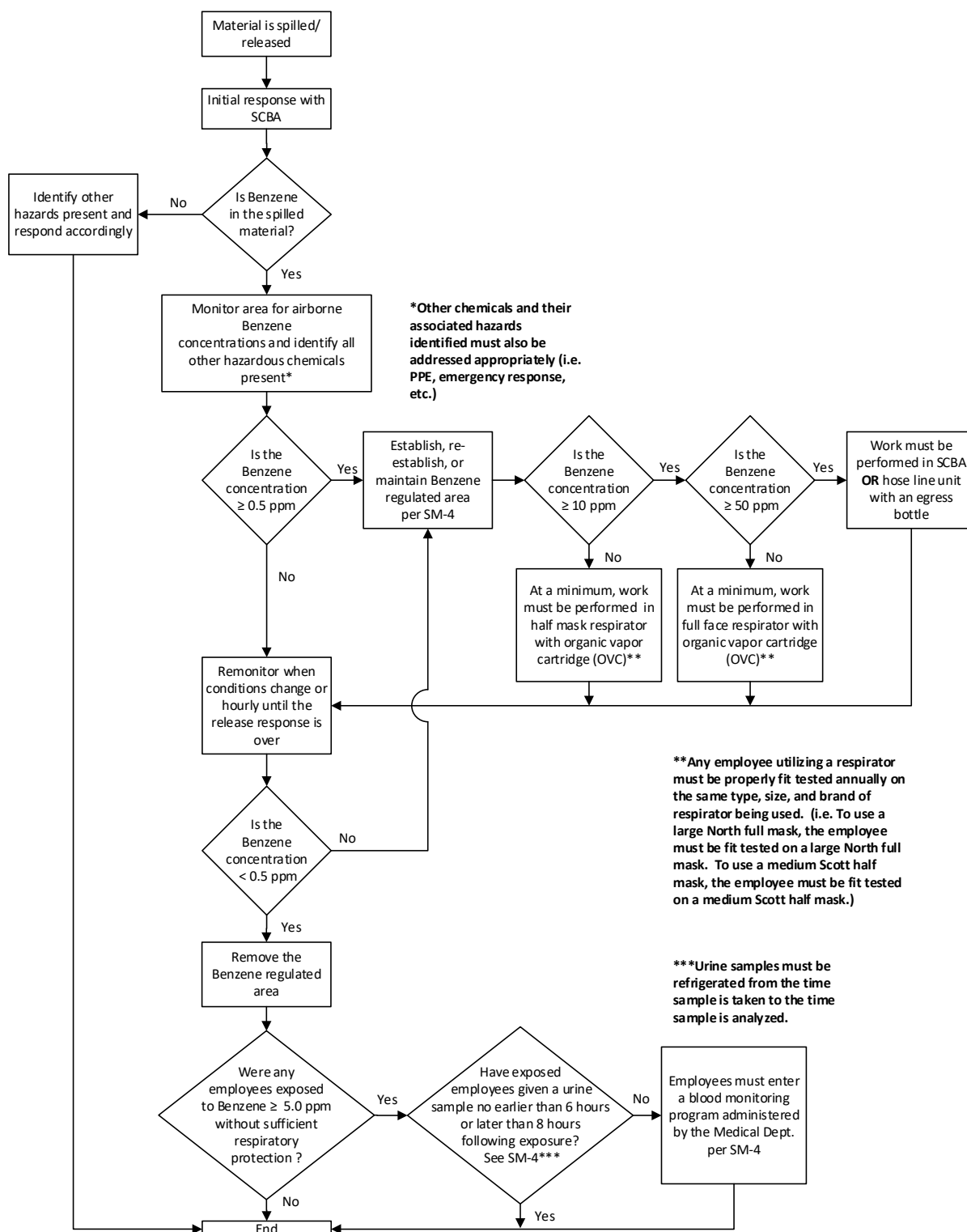
6.2 Attachment B: Benzene Gast Testing Procedure

## 7.0 Revision History

Revision Number	Description of Change	Written by	Approved by	Revision Date	Effective Date
0	Original issue. New integrated site procedure replaces GBR-HESS-PR-21 and RSW-0036-TC under MOC 69267.	E. S. Streacker	V. J. Meeks	1/15/2020	1/27/2020
1	Clarified respiratory protection and monitoring requirements for benzene and VOCs under 78846.	S. Lambert	E. R. Kaysen	9/24/2020	11/16/2020
2	Updated to address medical staff reduction under MOC 85443.	S. Lambert	E. R. Kaysen	2/23/2021	5/27/2021

Blanchard Refining Company LLC	Galveston Bay Refinery	
Title: SM-4 Benzene Exposure Reduction	Doc Number: RSW-000057-GB	Rev No: 2

## Attachment A: Benzene Release Response Requirements



Blanchard Refining Company LLC	Galveston Bay Refinery	
Title: SM-4 Benzene Exposure Reduction	Doc Number: RSW-000057-GB	Rev No: 2

## **Attachment B: Benzene Gas Testing**

### Using the UltraRAE 3000 or Draeger Benzene Detector Tubes

Your purpose in benzene gas testing is to document the exact benzene concentration measured to the nearest 0.1 ppm. While the 8-hr TWA exposure limit remains 1 ppm, certain regulatory requirements begin at 0.5 ppm. To perform a gas test correctly, follow the steps below.

- 1) If trained to operate an UltraRAE, obtain an UltraRAE 3000 w/benzene pre-filter tube and conduct a test at a representative sample point as described below. You can obtain an UltraRAE 3000 from Safety Repair. The value displayed after the one-minute test will display to one-tenth of a ppm.
  - Ensure that the UltraRAE 3000 is calibrated prior to each use.
  - Ensure that the benzene pre-filter tube is not past its expiration date.
- 2) If an UltraRAE is not available, obtain a Draeger benzene detector tube 0.5/c w/ Draeger pump (or other approved by IH). The warehouse stocks both the Rae Systems benzene pre-filter tube and the Draeger 0.5C tubes. The Draeger 0.5/c tube consists of two tubes connected with rubber tubing. Follow the instruction included with the tubes. The expiration date printed on the outside of the tube box must not be exceeded. Test the pump seals before sampling by first using an unopened tube.
- 3) If the system being tested may possibly release pressurized benzene-containing liquid or gas, the tester must wear an SCBA or other supplied-air respiratory protection.
- 4) Find an appropriate point to sample the air for benzene. You should try to sample air at the most concentrated benzene source representative of the benzene source that will impact the job. Normally, never sample inside of a process source (bleeder, sample point, cracked flange, or drain on a pump or pipeline). The sample probe or tube shall be placed about 1" (one inch) outside of the source.

For example: you might open a high-point vent and sample the vapors emitted. In sampling this way, we make the assumption that the benzene level measured will always be much greater than what the employee will be exposed to when opening the equipment or performing the work. If the gas test can only be done when workers have started the job, the person taking the gas test and the workers must wear supplied air until results are obtained. If you think you cannot sample where the benzene level should be greatest, you may have to assume the job will pose a benzene hazard and follow this Rule and Standing Instruction. If you have any questions, contact Industrial Hygiene or your supervisor.

- 5) If using an UltraRAE 3000: Take the sample and read the benzene concentration.
  - a) Test outside the space for VOCs to determine if greater than 0.5 ppm. If VOCs are >0.5 ppm, then test for benzene. This will determine initial testing PPE (follow section 3.3.2.1. for respiratory protection based on measurements)
  - b) If benzene is expected (unknown concentrations in emergency situations, process streams >0.1%, excavations) or if VOCs are >100 ppm, test for benzene in a half-face APR with organic vapor cartridges when sampling in your breathing zone.



Blanchard Refining Company LLC	Galveston Bay Refinery	
Title: SM-4 Benzene Exposure Reduction	Doc Number: RSW-000057-GB	Rev No: 2

- i) Use a benzene pre-filter tube. Crack open the tube using the tube-breaker located on the pre-filter tube box and attach to inlet. The tubes have arrows printed on them to show the direction of air flow.
    - ii) Follow the UltraRAE 3000 display prompts to collect the sample. The value displayed after the one-minute test will display to one-tenth of a ppm.
    - iii) Any color change observed on the pre-filter tube media indicates non-benzene VOCs filtered by the tube. If the entire length of the tube changes colors, over-saturation may have occurred. Consider re-testing. If you have any questions, contact Industrial Hygiene or your supervisor.
  - c) When testing confined space or excavation lower hose until you reach the working space for the permit. Results of the sampling will follow section 3.3.2.1. for respiratory protection.
    - i) While actively digging during an excavation, gas testing can either be performed inside or outside of the space. If gas testing inside of the space with a hose is a hazard due to positioning or hose interference, it is acceptable to monitor the breathing zone outside of space.
  - d) For continuous monitoring, thereafter, monitor without a tube for VOCs.
- 6) If using a Draeger benzene detector tube: Take the sample and read the discoloration.
- a) Use the pre-tube (w/green and brown layers) with the Draeger benzene detector tube. The tubes have arrows printed on them to show the direction of air flow. If benzene is present in the air sample, it will discolor the second tube (the tube with the lines and corresponding numbers on it).
  - b) Start taking the sample. Each stroke takes about 1 minute for the sampling pull of the Draeger pump to equilibrate with atmospheric pressure. The colored pre-tube (first tube) may discolor, but that does not mean benzene is present.
  - c) After ten pumps, any beige/brownish color on the second tube indicates HALF the benzene level. For example, if the discoloration ends at 2 ppm, the actual benzene level is 4 ppm. (tube scale reads 0.5 - 10 because it is set for 20 pumps). After ten pumps, no beige/brownish color change indicates a benzene concentration below 1 ppm.
  - d) If you want to see if the concentration is lower than 1 ppm, take twenty pump strokes. The benzene level is read directly from the tube (0.5 - 10 ppm).
- 7) If you have any questions or concerns, contact your Supervisor, Safety Repair, or Industrial Hygiene.