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1.0 INTRODUCTION

1.1. Purpose

The purpose of this procedure is to outline the Tesoro Mandan Refinery’s Respiratory Protection Program and to provide guidance on the proper selection and use of respiratory protection equipment.

1.2. Scope

This procedure describes the respiratory protection program for Mandan Refinery. It is intended for use by both Supervisors and workers. Should any additional information be needed regarding the best respiratory protective device for a particular problem, the availability of approved respirators, or items not specifically covered in this procedure, contact your Supervisor or the Health & Safety Department.

This policy shall apply to all personnel who are required to wear a respirator (including contractors) to perform assigned duties. Contractor supplied respiratory equipment must meet or exceed the same specifications in this standard.

2.0 REFERENCES

The following sections describe references used to generate this procedure.

1.1 Tesoro Standards

- TSHS-009 Essential PPE Requirement
- TSHS-010 Hazard Assessments and Additional PPE

1.2 Government Regulations

- 29 CFR OSHA 1910.134 Respiratory Protection
- 29 CFR OSHA 1910.1000 (Subpart Z – Toxic & Hazardous Substances) Air Contaminants

2.0 DEFINITIONS

The following additional definitions are applicable to this procedure.

Table 1 – Definitions

Term	Description
Air-purifying Respirator (APR)	A respirator with an air-purifying filter, cartridge, or canister that removes specific air contaminants as ambient air passes through the air-purifying element.
Assigned Protection Factor (APF)	The level of respiratory protection that a respirator or class of respirators is designated by OSHA to provide to employees when properly worn. The actual protection factor measured by quantitative fit testing is called a fit factor and is expected to be higher than the assigned protection factor.
Canister or Cartridge	Container with a filter, sorbent, or catalyst, or combination of these items, which removes specific contaminants from the air passed through the container.
Demand-Respirator	An atmosphere-supplying respirator that admits breathing air to the facepiece only when a negative pressure is created inside the facepiece by inhalation.

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Exhalation valve	A device that allows exhaled air to leave a respirator and prevents outside air from entering through the valve.	
Facepiece	That portion of a respirator that covers the wearer's nose and mouth in a half-mask facepiece; or nose, mouth and eyes in a full facepiece. It is designed to make a gas tight or dust tight fit with the face and includes the headbands, exhalation valve(s), and connections for air-purifying device or respirable gas source or both.	
Fit Factor	A quantitative estimate of the fit of a particular respirator to a specific individual. Typically estimates the ratio of the concentration of a substance in ambient air to its concentration inside the respirator when worn.	
Fit-Test	The use of a protocol to qualitatively or quantitatively evaluate the fit of a respirator on an individual. (See also Qualitative fit test QLFT and Quantitative fit test QNFT.)	
Full-Face	Respirator face piece covering the full face, used with air-purifying filters or chemical cartridges	
Grade D Breathing Air	Compressed or supplied air that meets specifications detailed in G-7.1 of the Compressed Gas Association's publication entitled "Commodity Specification for Air", which include:	
	Oxygen	19.5-23.5%
	Carbon Monoxide	No more than 10 ppm
	Carbon Dioxide	No more than 1000 ppm
	Oil (Condensed Hydrocarbons)	No more than 5 mg/m ³
	Odor	No noticeable odor
Half-Mask	Respirator face piece covering nose and mouth and extending over the chin, used with air-purifying filters or chemical cartridges	
Head harness (headbands)	A device for holding the facepiece securely in place on the wearer's head.	
HEPA High efficiency particulate filter	A filter that is at least 99.97% efficient in removing mono-dispersed particles of 0.3 micrometers in diameter. The equivalent NIOSH 42 CFR Part 84 particulate filters are the N100, R100, and P100 filters	
IDLH	Immediately Dangerous to Life and Health	
Inhalation valve	A device that allows respirable air to enter the facepiece and prevents exhaled air from leaving the facepiece through the intake opening.	
Open-circuit SCBA	An open-circuit SCBA exhausts the exhaled air to the atmosphere instead of recirculating it.	
Oxygen deficiency	An atmosphere with oxygen content below 19.5% by volume.	
Positive pressure respirator	A respirator in which the pressure inside the respiratory inlet covering exceeds the ambient air pressure outside the respirator.	
Powered air-purifying respirator (PAPR)	An air-purifying respirator that uses a blower to force the ambient air through air-purifying elements to the inlet covering.	
PEL	Permissible Exposure Limit	
Pressure Demand-Respirator	A respirator in which the pressure inside the respiratory inlet covering exceeds the ambient air pressure outside the respirator.	
QLFT Qualitative Fit Test	A pass/fail fit test to assess the adequacy of respirator fit that relies on the individual's subjective response to the test agent.	
QNFT Quantitative Fit Test	An assessment of the adequacy of respirator fit by numerically measuring the amount of leakage into the respirator.	
Self contained breathing apparatus (SCBA)	Positive pressure, air-supplying respirator with the breathing air source supplied from a compressed gas cylinder carried by the user.	

	5-minute Escape bottles are not considered SCBA and are never to be used as a stand alone system. Escape bottles are only allowed when used in conjunction with a supplied air set up or when switching from an air-purifying mode to a supplied air mode for escape purposes.
Supplied-Air Respirator (SAR) or Airline Respirator	Positive pressure, air-supplying respirator that provides breathing air to the respirator wearer through an airline (hose) from by breathing air cylinders, from a breathing air compressor, or from an attached breathing air cylinder. Up to 300 feet of air-line is permissible.

3.0 ROLES & RESPONSIBILITIES

3.1 Respiratory Program Administrator

The Respiratory Program Administrator is responsible for overseeing the respiratory protection program and conducting the required evaluations of program effectiveness, thereby ensuring that all the requirements of the program are fully implemented, as necessary. The Safety Supervisor is the designated Respiratory Program Administrator for Mandan Refinery. Duties of the Respiratory Program Administrator include:

- Identifying work areas, processes or tasks that require workers to wear respirators, and evaluating hazards.
- Selection of respiratory options.
- Monitoring respirator use to ensure that respirators are used in accordance with their certifications.
- Arranging for and/or conducting training.
- Ensuring proper storage and maintenance of respiratory protection equipment.
- Arranging for and/or conducting quantitative fit testing.
- Maintaining records required by the program.
- Evaluating the program.
- Updating the written program, as necessary, to reflect workplace changes that affect respirator use.

3.2 Superintendents & Supervisors

Superintendents and Supervisors are responsible for ensuring that this Respiratory Protection Program is implemented in their particular areas. In addition to being knowledgeable about the program requirements for their own protection, Superintendents and Supervisors must also ensure that the program is understood and followed by all employees under their supervision. Duties of the Superintendent and Supervisor include:

- Ensuring that employees under their supervision (i.e. including new hires) have received appropriate training, fit testing and annual medical evaluation.
- Ensuring the availability of appropriate respirators and accessories.
- Being aware of tasks requiring the use of respiratory protection.
- Enforcing the proper use of respiratory protection when necessary.
- Ensuring that respirators are properly cleaned, maintained, and stored according the Respiratory Protection Program.
- Ensuring that respirators fit well and do not cause discomfort.
- Monitoring work areas and operations continually to identify respiratory hazards.

- Coordinating with the Respiratory Program Administrator on how to address respiratory hazards or other concerns regarding the program.

3.3 Employees

Each employee has the responsibility to wear their respirator when and where required, and in the manner in which they were trained. Employees must also:

- Care for and maintain their respirators as instructed and store them in a clean and sanitary location.
- Inform their Supervisor if the respirator no longer fits well.
- Inform their Supervisor or the Respiratory Program Administrator of any respiratory hazards that they feel is not adequately addressed in the workplace, and of any other concerns that they have regarding the program.
- Notify their Supervisor or the Respiratory Program Administrator of any other problems associated with using their respirator.
- Maintaining facial hair that does not interfere with the face-to-face piece seal or interfere with valve function per this procedure.
- Performing a positive/and negative user seal check before each use.

4.0 RESPIRATORY PROTECTION REQUIREMENTS

Supplied air shall be used until the airborne hazards have been identified. Once identified, respiratory protection shall be set based on the permissible exposure limit (PEL) of the particular airborne hazard.

Respirators will be used for operations where engineering controls, such as ventilation or closed systems, do not reduce atmospheric contamination to acceptable levels. Entry into atmospheres containing less than 19.5% oxygen or that are immediately hazardous to life or health, is not allowed without a safety permit requiring the appropriate respiratory protection and stand-by personnel.

Appendix III contains Respiratory Equipment Operating Instructions covering the selection and use of respirators. Appendix I contains tables on the selection of respirators.

If a work activity requires personnel to utilize a fall restraint device and supplied air for respiratory protection simultaneously, then the Health & Safety Department must be notified and a hazard assessment performed. Hazard mitigation and engineering controls should provide personnel the opportunity to safely evacuate the area, if needed.

5.0 RESPIRATORY SELECTION

5.1 Respirator Selection

Respirator selection must be determined from chemical data, exposure duration, environmental or working conditions and route of exposure. Additional consultation from the Health & Safety Department may be necessary to help determine adequate protection. RSSI 01-05 PPE will help provide guidance on PPE selection. A respirator guidance chart can be found in Appendix II.

In the event that the respirator guidance chart does not list the chemical or hazard involved, the Health & Safety Department will evaluate and provide guidance on respirator selection.

Air purifying respirators will never be used when oxygen content is below 19.5 %. It is NEVER acceptable to guess or assume what the concentration levels are when selecting respirators. Regardless of respirator selection, work will not be authorized when working in atmospheres containing more than 10% LEL. All work involving LEL must be continuously monitored.

Work is not allowed to take place in IDLH atmosphere. Additional requirements or approvals may be required by the PTW Work Classification Table, RSSI 01-10.

If atmospheric readings for any substance exceeds the IDLH, confined space entry will not be permitted. The only exception is for Inert Entries. See RSSI 01-32 section for Inert Entries.

6.0 MEDICAL EVALUATION

Personnel assigned to tasks where respirators are utilized must be physically able to perform the work while using the respirator. Accordingly, Mandan Refinery has the responsibility of ensuring that employees are medically fit and able to tolerate the physical and psychological stress imposed by use of respirators. Employees will not be allowed to wear respirators until a physician or other licensed health care professional has determined that they are medically able to do so. Employees assigned to tasks requiring the use of respirators will be required to complete the "Respirator Medical Evaluation Questionnaire". This questionnaire stays on file with the plant Nurse. Contractors are required to maintain compliance with the OSHA Respirator Standard.

Records of medical evaluations must be retained and made available for inspection (per 29CFR 1910.1020).

The initial and annual fit testing will include the following:

- An opportunity to handle the respirator, have it fitted properly for comfort, test its facepiece-to-face seal, wear it in normal air for a familiarity period to determine comfort, and finally to wear in a test atmosphere.
- Individual respirator fit testing. Normally this will be "quantitative" test performed during the annual fit test.
- Each fit test record must contain the employee identification number; type of fit test; date last tested; test results; and the make, model, and size of respirator tested.
- The fit test shall not be conducted if there is any hair growth between the skin and the facepiece sealing surface, such as stubble beard growth, beard, mustache or sideburns which cross the respirator sealing surface.

An additional fit test shall be conducted whenever a change is noted in the employees physical condition which could affect respirator fit such as facial scarring, dental changes, cosmetic surgery, or obvious changes in body weight.

Fit testing records will be kept by Health Services.

7.0 CLEANING & SANITIZATION OF RESPIRATORS

Respirators shall be cleaned and sanitized after each use by the user. Procedures recommended for cleaning and disinfecting respirators shall meet the manufacturer's requirements:

- Remove any filters or cartridges from the mask; and for the SCBA, remove the breathing tube.
- Clean the respirator with antiseptic toiles.
- Air dry in a clean area.
- Clean other respirator parts as recommended by the manufacturer.
- Inspect valves, head straps, head harnesses, and other parts. Repair, or report for repair, any parts found to be defective.
- Place respirator in plastic bag or container for storage.

8.0 RESPIRATOR MAINTENANCE

All respirators shall be inspected before and after each use by the person using the respirator. Any deficiencies found shall be reported to your Supervisor or the Health & Safety Department and the user shall obtain a new respirator for use.

Cartridge changing is the responsibility of the user.

Respirators used for emergency response will be tracked and inspected routinely by the Emergency Response Group.

9.0 RESPIRATOR STORAGE

Respirators shall be stored to protect against damage, contamination, dust, sunlight, heat, extreme cold, excessive moisture, or damaging chemicals. Respirators shall be stored to prevent deformation of the facepiece or exhalation valves. Respirators for emergency use should be stored in compartments built for that purpose, be quickly accessible at all times, and be clearly marked. Respirators should not be stored in such places as lockers, or tool boxes unless they are in carrying cases or cartons.

10.0 FACIAL HAIR

Employees who are required to wear tight-fitting respirators must keep facial hair (Ex: stubble, mustache, sideburns, low hairline, and bangs) trimmed in such a manner to assure no hair passes between the face and the sealing surface of the face piece of the respirator, or interferes with the function of a respirator's valves.

See Appendix II of this guidance document for examples of acceptable and unacceptable facial hair.

Any personnel, (other than short-term delivery personnel, or as approved by the EH&S Manager), performing work on an operations unit, must follow this facial hair policy.

11.0 PRESCRIPTION EYEWEAR

Workers assigned to tasks requiring the use of respirators will not be permitted to wear spectacles, which have temple bars, or straps, which pass between the sealing surface of a respirator and the wearer's face. Employees requiring corrective lenses may obtain special spectacle kits for prescription lenses from Health Services.

12.0 SUPPLIED AIR RESPIRATOR TYPES

12.1 Atmosphere Supplying Respirators

12.1.1 Self-Contained Breathing Apparatus (SCBA)

The distinguishing feature of all types of SCBA is that the wearer need not be connected to a stationary air supply, such as a compressor or rack of air cylinders. Instead, the wearer carries the air supply. This is an "open circuit" SCBA in that exhaled air is exhausted to the atmosphere instead of being recirculated.

12.1.2 Air-Line Respirators

There are two types of air-line respirators available at the Mandan Refinery:

Pressure-Demand Air-Line Respirator
Continuous Flow Air-Line Respirator

12.1.2.1 Pressure-Demand Air-line Respirators

Before a person is permitted to wear an air-line respirator in a hazardous atmosphere, his immediate supervisor must assure:

1. Air-line hose from a cylinder air supply shall be protected from damage, including cutting, kinking, crushing, or burning. In some cases, an armored hose shall be used. Hose couplings shall be protected against disconnecting. Trailing air-line hose shall be arranged to minimize tripping and to permit ready escape.
2. The breathing air cylinders for the air-line respirator shall meet the minimum specifications for Type I, Grade D gaseous air (see section 15.0 *Breathing Air Quality*). The air supply in the cylinder shall be adequate for completion of the work and escape. Breathing air only must be used with air-line respirators, never oxygen.
3. The wearer shall be properly trained in the use of the air-line respirator and in the operation of the associated equipment, i.e. cylinder rack and/or cart.
4. The wearer shall be well informed of the existing or potential hazards requiring the use of the respirator.

12.1.2.2 Continuous Flow Air-line Respirators

Continuous flow air-line respirators maintain an air flow at all times, rather than on demand. In place of a pressure demand regulator, an air flow control valve controls the flow of air to the mask. The three types available in the refinery are: (1) the full welding hood approved for welding in hazardous atmospheres such as toxic fumes and

dusts; (2) the abrasive sand-blasting hood for protection against dusts produced from abrasive blasting operations; and (3) the Alkylation PVC acid hoods to be used solely for purging the facepiece in order to help prevent fogging.

Continuous flow air-line respirators are not to be used in atmospheres immediately dangerous to life and health (IDLH). Also, a flow of at least six CFM of air must be maintained to the hood or helmet at all times. This can be accomplished by setting the manifold pressure on the air supplying system to 30 psi.

12.1.3 AIR-LINE RESPIRATORY SYSTEMS

The refinery has two systems which deliver air to air-line respirators:

1. Portable Air-Line Cylinder Rack
2. Portable Air-Line Breathing Air Cart

Prior to use, the fresh air bottle valve shall be opened and closed quickly to clean contaminants from valve before hooking up with the regulator. Once the regulator has been installed, pressure, then de-pressure the system to assure the regulator gauges zero properly.

12.1.3.1 Portable Air-line Cylinder Rack

One of the primary means for supplying air to an air-line respirator is by a rack of cylinder bottles. The cylinder rack holds eight 250 scf breathing air cylinders and should only be used when all cylinders are in place. These cylinder bottles shall have at least 500 psi of air in them prior to use. The air-line units are not equipped with low pressure alarm devices and the cylinder pressure at the portable air-line cylinder rack must be monitored at all times, a person must remain at the rack and in contact with the end user at all times. The cylinder bottles are arranged in banks of four, each bank having separate but identical piping arrangements. (Refer to key operating instructions posted on cylinder rack.)

Before a person is permitted to operate and use the Portable Air-line Cylinder Rack, he must be aware of the following items associated with this device:

- (1) Only approved and tagged breathing air cylinder bottles are to be used.
- (2) A maximum of 300' of air-line hose can be used per individual.
- (3) The operating pressure of the air-line hose shall be maintained at 70 psi for pressure-demand air-line respirators and no greater than 30 psi for the continuous flow air-line respirators.
- (4) When the cylinder pressure drops below 200 psi on one bank of cylinders, the other cylinder bank should be opened and the spent bank closed.

For additional operating instructions pertinent to this device, refer to the instructions located between the gauge valves on the Portable Air-line Cylinder Rack.

12.1.3.2 Portable Air-line Breathing Air Cart

The Portable Air-line Breathing Air Cart is the second means for supplying air to air-line respirators. This cart is designed to provide a portable breathing air supply at the job site. The unit consists of two 250 scf breathing air cylinders, a regulator, and a pair of hand crank reels with 100 feet of 1/4" airline. Presently, the refinery has breathing air-line carts; at the Alkylation Unit, DDU Unit, Combination Unit, and at the Sulfur Recovery Unit. However, the breathing air cart at the Alkylation unit is considered a "Purge System" only. It is to be used solely for purging the PVC acid hood facepieces.

Before a person is permitted to operate the portable breathing air cart, they must be aware of the same key operating points as outlined above for the *Portable Air-line Cylinder Rack*. For additional information regarding the Alkylation Unit Air Purge System, refer to Standing Instruction AOI -A-8.

12.1.3.3 Alkylation Unit Hard Pipe Purge Air System

The hard pipe system is supplied by two banks of six cylinders, housed in the heated building near the acid unloading area. This system is regulated to 200 psi in the building, then re-regulated to 30 psi at the hose reel stations. Each station is manually blocked to prevent leakage. Each air station has the capability to supply 3 air hoses.

12.1.3.4 CCR and Power Station Shelter-in-Place Breathing Air Systems

The CCR and Power Station Control Room are equipped with a hard piped breathing air system consisting of four 250 scf breathing air bottles with three hose reel and Hip-Air units at the Power Station and an additional six hose reel and Hip-Air units at CCR.

The operating pressure of these units shall be maintained at 70 psi for the pressure demand air-line respirators.

The bank of cylinders is checked, by operations, monthly. These systems are designed as an emergency system; therefore, the cylinders must never reach a pressure less than 1500 psi.

13.0 BREATHING AIR SYSTEMS

The refinery utilizes a primary and secondary means for filling SCBA air breathing cylinder bottles. The primary means is via the refinery's breathing air compressor. The second alternative is purchased air via a local supplier. Both methods for filling SCBA's or air bottles must meet the requirements for Grade D breathing air. All breathing air bottles brought on site by

vendors will have a document certifying that the breathing air meets or exceeds the specifications under 29 CFR 1910.134 and CGA G-7.1 for Grade D breathing air.

Bauer Unicus III High Pressure Breathing Air Compressor

The Bauer breathing air compressor meets all of the requirements under 29 CFR 1910.134 and CGA G-7.1 for Grade D breathing air and is equipped with the necessary safety and standby devices. The Fire Chief is responsible to insure that the breathing air compressor is re-certified and air purity meets CGA Specification G-7.1 for Grade D breathing air. Refer to section 15.0 Breathing Air Quality RSSI for Grade D breathing air specifications. If the air purity cannot be met, the compressor must be immediately taken out of service.

14.0 BREATHING AIR QUALITY

Grade D Air Quality

<u>Component</u>	<u>Concentration</u>
Carbon Monoxide (max.)	10 ppm
Carbon Dioxide (max.)	1000 ppm
Oxygen	19.5-23.5%
Oil Mist (Condensed Hydrocarbons - max.)	5 mg/m ³
Odor	Free from pronounced odor
Moisture content in cylinder < dewpoint of -50°F at 1 ATM	

Pure oxygen is hazardous and must never be used with atmosphere supplied respirators.

15.0 RECORDKEEPING

The following records are required and must be available upon request to affected employees or their designees and to OSHA:

- A written copy of the current respirator program (RSSI – 01-33)
- Medical evaluations required by this standard.
- Current fit testing records
- Monthly inspection records of emergency respirators.
- Training records
- Breathing air quality certification
- Breathing air compressor testing and certification

16.0 EVALUATION

A regular inspection and evaluation to determine the continued effectiveness of this respirator program will be conducted by the Respirator Program Coordinator or their designee. Evaluation will include:

- (1) Assessment of workplace conditions to ensure that the respirator is still adequate for the contaminant and concentrations encountered. Review of procedures and materials will be done to update emergency procedures.
- (2) Evaluation of actual respirator usage:

- a) Visual inspection of employees on the job to see that respirators are worn where required and worn properly.
- b) Examination of respirators in use and in storage to check for proper maintenance.
- c) Interview with wearers to ascertain any discomfort, resistance to breathing, interference with vision or communication, restriction of movement, interference with job performance, and any lack of confidence in the respirator.
- d) Appropriate respirators are used for the hazard.

Any problems found will be recorded, analyzed, and solution sought. Standard respirator operating procedures will be modified accordingly.

17.0 TRAINING

Employees will be trained in the need, use, sanitary care, and limitations of respiratory equipment they use.

Initial and annual training requirements include the following:

- Reasons for wearing respirators
 - The respirator's capabilities and limitations
 - Proper selection
 - Proper use
 - Proper maintenance, including sanitizing procedure
 - Hands-on training
 - How to use the respirator effectively in emergency situations
 - Medical signs and symptoms that may limit or prevent the effective use of respirators, such as shortness of breath or dizziness
 - Fitting and testing
 - Conditions that prevent a good face seal (i.e. beard, sideburns, glasses, missing dentures)
-

18.0 APPENDIX I – RESPIRATOR GUIDE

Concentration "Up to Values" Shown Below

	PEL	IDLH	Half Mask	Full Face	3M		MS
					Cartridge	Color Code	
Acid	5	50		250	60923		GME-P100
Acid HF	0.5	30					
Ammonia	25	300	250	1250	60924		GME-P100
Asbestos**	0.1		1	5	P-100		P-100
Carbon Monoxide	25	1200					
Carbon Tetrachloride					60923		GME-P100
Catalyst Dust					P-100		P-100
Caustic		50			60923		GME-P100
Dimethyl Sulfide					60923		GME-P100
Dioxins					60923		GME-P100
Hydrocarbon	100	1000	300	800	60923		GME-P100
Hydrocarbon w/Benzene	0.5	500	5	25	60923		GME-P100
Hydrogen Sulfide	10	100					
Lead							
Mercaptan					60923		GME-P100
Mercury	0.01	2	0.1	0.5	6009S		Mersorb
Oxygen	19.5-23.5	<19.5					
Particulates*	10		100	500	P-100		P-100
Silica***	50		1	5	P-100		P-100
Sulfur Dioxide (SO2)	0.5	100	5	25	60923		GME-P100
Welding Fumes - Carbon Steel (1)			0	0	P-100		P-100
Welding Fumes - Hex Chrome***(1)	5		50	250	or Supplied Air		or Supplied Air

 Black indicates that Air Purifying Respirators are not allowed

– Dust masks are only allowed to be used in shops and areas approved by the Safety Department.

*Indicates units of mg/m³

**Indicates units of f/cm

***Indicates units of ug/m³

(1) Air purifying respirator is approved for outside welding, for areas with poor ventilation & in confined spaces supplied air is required

- Emergency Responders responding to a leak or release use Supplied Air when exposure concentrations are unknown
- Always use the chemical with the lowest PEL when evaluating mixtures
- Never work in areas when LEL is above 10%, respirators don't protect against explosion hazards
- No half mask respirators when acid or caustic is present - splash hazard to eyes.

19.0 APPENDIX II FACIAL HAIR



The shaded portions are your respirator seal areas. Facial hair is Not Permitted on these portions of the face.

Unacceptable



Extended Side Burns



Fu Manchu Moustache



Wide Moustache



Full Beard



Goatee & Narrow Moustache



Goatee & Wide Moustache

Acceptable



Clean Shaven



Narrow Moustache

APPENDIX III – RESPIRATORY EQUIPMENT OPERATING INSTRUCTIONS

20.1 General

All Mandan Refinery employees and contractors must understand how to use each piece of respiratory equipment and know its limitations before they will be allowed to use the respirator in the plant. If additional instructions are needed, contact your Supervisor or the Health & Safety Department.

Inspect each piece of respiratory equipment before each use. Be sure that all connections and fittings on air-supplied equipment are secure and not leaking.

Don, adjust, and test respiratory equipment in fresh air.

Certain physical characteristics, including beards and sideburns, may interfere with obtaining a satisfactory face seal with masks. A satisfactory face seal cannot be achieved while wearing conventional eyeglasses.

Return to fresh air immediately if:

- Leakage is detected
- High breathing resistance occurs
- Inhaled air becomes extremely hot
- Any feeling of nausea, dizziness, or ill being develops

Respiratory equipment does not protect the wearer from gases or vapors that can be absorbed by the skin.

Never alter or modify any respiratory protection device or associated equipment.

Do not use a respirator if you have a medical condition that prevents you from doing the job safely.

20.2 Donning and Testing

The proper procedures for donning and testing all half-face and full-face masks used with respiratory equipment in the Mandan Refinery are described below.

20.2.1 Half-Mace Masks (MSA & 3M)

- Place the respirator over the mouth and nose, then pull the head harness over the crown of the head. Position the face-piece low on the nose.
- Take the bottom straps in both hands and place them in back of the neck and hook together.
- Position headbands with top headband on top back of head and the bottom headband around neck just below the ears.
- Pull the ends of the head harness and bottom straps to adjust the tightness. Do not pull too tight.

Testing: Test respirator for leakage, using positive and negative pressure methods.

- Place a hand over the exhalation valve cover and exhale gently. A positive pressure should be felt inside the face piece. If leakage is detected, reposition the face piece and/or readjust the tension of the straps. Repeat this procedure until a good seal is obtained.
- Place hands or pieces of cardboard over both inhalation ports, inhale gently and hold your breath for five to ten seconds. The face piece should collapse slightly. If air leakage is detected, reposition the face piece and/or readjust the tension of the straps. Repeat the procedure until a good seal is obtained.

20.3 Full-Face Masks (i.e. Air Line Masks, Pressure Demand Self Contained Breathing Apparatus, Ultra-Twin & PAPR)

Pull out head net straps, so that the ends are at the buckle. Then, grip face piece between thumb and fingers. Insert chin well into lower part of face piece and pull head net back overhead. Do not pull the head net over the face piece as this will scratch the face-shield. To obtain a firm and comfortable fit against the face at all points, adjust headbands as follows:

- See that straps lie flat against head.
- Tighten lower or neck straps. Pull straight back not to the side.
- Tighten the side straps.
- Place both hands on head net and push it towards the neck.
- Repeat tightening operations.

Testing: Test respirator for leakage, using positive and negative pressure methods.

- Place a hand over the regulator hole in the mask. Inhale gently so that the face piece collapses slightly and hold the breath for five to ten seconds. The face piece will remain collapsed while the breath is held providing the assembly is air tight. If any leakage is detected around the facial seal, readjust the head harness and repeat the test until there is no leakage. If other than facial seal leakage is detected, it must be found and corrected before another test is made.

20.4 Instructions & Limitations

20.4.1 Half-Mask and Full-Face Cartridge Type Respirators

Instructions: Install proper chemical cartridges making sure that the gasket areas are in proper position at the cartridge receptacles. Hand-tighten the cartridge with caution to prevent damage, and to insure a good seal against the gasket area. Fit and test the mask as described in the section on donning and testing. If the wearer notices chemical odors, tastes, or nose or throat irritations while wearing a properly sealed mask, it is evidence that the cartridges need to be replaced. Service time of the cartridges will vary according to the conditions of use. Cartridges, even though sealed in plastic, must not be stored where they may be exposed to contaminants, as this will render them useless. Cartridges must be replaced at the end of the work shift.

After use, sanitize the mask, insert in a plastic bag, and return mask to storage cabinet.

Limitations: Do not use in an oxygen-deficient atmosphere. Do not use in an atmosphere immediately hazardous to life or health. Do not use in an atmosphere that may contain vapors that are irritating to the eyes. Do not use as protection against chemicals having poor odor-warning properties. Do not use as protection against H₂S.

20.4.2 PAPR (Powered Air-Purifying Respirator)

An approved air-purifying device designed for use in atmospheres not immediately dangerous to life or health.

Instructions: The PAPR can be used with the full-face piece. The motor-blower, battery pack and filters are worn as an assembly on the support belt. The breathing tube connects the belt-mounted assembly to the face piece. PAPR can be used in lieu of a half-mask respirator for dusts and limited asbestos work.

Limitations: The PAPR is certified for wearer protection against dusts, fumes and mists, which have a time-weighted average of less than 0.05 milligram per cubic meter. PAPR filters do not remove poisonous gases or vapors from the air supply. This respirator does not supply oxygen. Do not use in oxygen deficient atmospheres.

20.4.3 Air-Line Mask

Two persons must be completely equipped and a third person must stand by the air cylinder cart. Active radio communications for the stand-by person is required when opening flanges in an operating unit.

Exception: When the airline hose cart equipment is utilized for insulation work, the air cylinder cart stand-by person is required, but persons working in mask equipment may number from one to whatever number is needed to accomplish the job. Confined space work, or if material is at IDLH level, would still require at least two persons in masks.

Limitations: Breathable air supply lines restrict mobility. Failure of the breathable air system requires immediate exit from a hazardous area. Service life of the escape cylinder is approximately five minutes.

There are no check valves in the air line connected to the bottle cart. Care must be taken to properly plan the work, to ensure that there is enough air to complete the work task and secure flanges. In the event that a separate bottle cart must be hooked up to supply additional air, see the section below titled hooking up an additional bottle cart.

Instructions & Equipment List:

- A two-wheeled cart with two compressed breathing air cylinders, 233 cubic feet of lines, and 15 pack skids are also available.
- Cart-mounted four-hose manifold with pigtail (i.e. high pressure hose)
- Equipment box cart mounted:
 - o Regulator: Reduces air cylinder pressure to 65-85 psi.
 - o Low-pressure alarm: Sounds between 540-570 psi
 - o Wrench
 - o Red/black barricade tape
 - o Orange stand-by vest
 - o Emergency whistle attached to top of cart lid
 - o Red tags
- 2- 5 Minute egress packs (i.e. 1 each in yellow bag). Must be assembled at job site.
- Breathing air hoses: Each lay of hose may be up to a maximum length of 300 feet. Must be assembled at job site.
- Separate SCBA for the stand-by personnel. The SCBA does not need to be worn, but must be located at the job site with the stand-by person.

Set up at Job Site:

- Cart to be placed near and upwind of job site. Place on level terrain, outside of barricaded area such that you can see the workers and manifold gauges.
- Remove protective covers and plugs from hoses, bottle cart regulator, and cart cylinders. Place protective covers and plugs in bottle cart tool box to keep them free of contamination. Check markings on cylinder to insure O2 content has been tested. If it has not been tested, then do not use. Crack cylinder valves and close to clean cylinder fittings.

- Connect pigtail assembly, low-pressure alarm, pressure regulator and manifold assembly to cart cylinders and air supply manifold. Snug fittings with wrench. Do not over tighten.
- Attach airline hoses (i.e. each lay of hose is 300' maximum length) to cart manifold. Be sure quick-connect fittings are locked and leak free. Check for leaks by opening bottle valve (i.e. with terminal hose ends in hand) until system is pressured, and then block valve back in. If a pressure drop is noted, check plug in connectors at manifold for proper seat and all hose connections for leaks. If a leak is still detected, return to Safety Equipment Room for service.
- Note: When opening bottle valve, the bell alarm should sound between 540-570 psi if it is functioning properly.
- Lay out hoses to job site, being sure hoses are protected from heat, acid, sharp edges, and other hazards.
- Remove egress units from the yellow bags.
- o Check egress air cylinder for pressure of 3000 pounds or in full range indicator. If pressure is found to be 100 psig more or less, return to Safety Equipment Room for service. Do not use.
- o The egress air cylinder valve should not be opened unless used for emergency egress.
- Put on egress unit: Put left arm and head through the unit's sling strap. The pad is to rest on the right shoulder and the cylinder is to rest on left hip. The high-pressure hose is to wrap around your back and waist with the regulator on your left hip. Adjust the shoulder strap for fit. Then fasten the waist belt snugly.
- Note: Certain entries into confined spaces will require the wearer to use a safety harness with a lifeline attached.

Go to Job Site:

- Don the facemask and make seal. Must be done in fresh air area.
- Hold the quick connect fitting of the cart airline hose in hand to insure check valve is not leaking, and signal the stand-by person at the cart to pressure up system (i.e. open valve on one of the two cart cylinders). Use cylinder with lowest pressure indication.
- Attach the airline hose to the egress unit regulator and the air will start, then attach the regulator to the mask.
- Emergency egress from a hazardous area can be accomplished using either the breathable air system (i.e. cart with hose) or the portable egress unit cylinder. To use the portable cylinder:
 - o Open the egress unit cylinders main block valve.
 - o Leave the area immediately with cart airline hose connected or disconnect, whichever is appropriate for area egress.
 - o The egress unit portable air cylinder contains approximately 5 minutes of breathable air.
 - o If the breathable air system low-pressure alarm sounds (i.e. 540-570 psi on cylinder being used), the stand-by person is to close the cylinder valve of the cylinder being used, and immediately crack open the other cylinder valves so air flow to persons working in masks is not interrupted.
 - o Should the low-pressure alarm sound on the second air cylinder, the stand-by person must open cylinder valves of both cylinders on cart and alert persons working in masks they should then return to fresh air immediately. 15 pack cylinder skids allow more cylinders to be opened after the first one is used up.

Utilizing a Second Bottle Cart:

- Cart to be placed near and upwind of job site. Place on level terrain, outside of barricaded area such that you can see the workers and manifold gauges.
- Remove protective covers and plugs from hoses, bottle cart regulator, and cart cylinders. Place protective covers and plugs in bottle cart tool box to keep them free of contamination.

Check markings on cylinder to insure O₂ content has been tested. If it has not been tested, then do not use. Crack cylinder valves and close to clean cylinder fittings.

- Connect pigtail assembly, low-pressure alarm, pressure regulator and manifold assembly to cart cylinders and air supply manifold. Snug fittings with wrench. Do not over tighten.
- Utilize the jumper connection air line between the RIT (Rapid Intervention Team) fitting on the cart in use and RIT fitting on new cart. Note that the RIT fitting is of a different type than the airline fitting.
- Close cylinder air on the cart that is in use.
- Disconnect the pigtail from the regulator of the cart in use.
- Turn on cylinder air from new cart.

Securing the Equipment:

- Disconnect the MMR (Mask Mount Regulator) from mask. Return the MMR to the holder (i.e. hockey puck) in the belt.
- Disconnect airline hose from regulator and replace hose plugs
- Depressurize airline hose at cart manifold and disconnect pig tail and pressure regulator assembly from manifold and cart cylinders.
- Store all equipment properly and return cart to be serviced.
- When this system is used, all personnel must have been trained in its proper use.

20.4.4 Pressure Demand (Self-Contained Breathing-Apparatus)

Instructions: Check cylinder pressure. Pressure should be 4500 psi or in full range on indicator. If less pressure, service life will be reduced accordingly. Put on the apparatus by one of the following methods:

- Open the case and extend the shoulder straps full length. Lean forward, grasp the cylinder and back plate firmly, with both hands (i.e. thumbs toward the cylinder valve). Lift the apparatus up over the head and rest it on the back. The shoulder straps will fall into place over the shoulders. Adjust the straps before straightening up. Fasten the waist belt snugly.
- Extend the shoulder straps. Don the apparatus like a vest. Lean forward while adjusting the shoulder straps. Fasten the waist belt securely.
- Open the cylinder valve at least 3 full turns. Check all the fittings for leaks
- Don the mask, connect the mask and take a deep breath in to activate normal breathing.

Fit and test the mask as described in the section on fitting and testing. Breathe normally as the apparatus automatically satisfies breathing requirements. If any leaks are found, correct them before using the apparatus.

The pressure demand (i.e. SCBA) is approved as a 60 minute duration unit. However, service life will be affected by several factors including type of physical activity, excitement, training, and experience of the user.

When the air in the cylinder has been used down to the remaining 20 to 25% of the cylinders capacity (i.e. approximately 5 minutes), an alarm warns the wearer. The cylinder pressure gauge will read between 1035-1215 lbs. At the time of the alarm or visual observation of this pressure reading, return to fresh air and replace the cylinder.

During normal use, the purge (i.e. red) valve is closed. It provides a continuous flow of air to the face piece. The purge (i.e. red) valve is adjusted to provide the desired flow. If the purge (i.e. red) valve must be used, your air supply time will be reduced.

Securing the SCBA:

- Unit to be used again immediately: With you thumb release the lock to the face piece and remove from face piece. Place MMR (Mask Mount Regulator) into holder (i.e. hockey puck) on the waist belt.
- Unit not to be used again immediately: With you thumb release the lock to the face piece and remove from face piece. Place MMR (Mask Mount Regulator) into holder (i.e. hockey puck) on the waist belt. Remove SCBA and lengthen all straps.
- Close the cylinder by turning the valve handle clockwise.
- Release the pressure on the high-pressure hose by opening the purge (i.e. red) valve.
- Deactivate PASS unit
- Release the cylinder draw strap clamp push down on the black release handle for the cylinder and remove the used cylinder from the back plate.
- Replace the cylinder with a fully charged one, tighten the draw strap clamp.
- Sanitize the face piece.
- Place apparatus in carrying case and return case to storage cabinet.
- Notify the Fire Department or Warehouse for cylinder replacement.

Limitations:

- Service life is limited to the amount of air in the apparatus. When entry into an atmosphere, which is or may be immediately dangerous to life or health, is required, this unit must have a minimum of 4000 psi cylinder pressure.
- The bulk and weight restrict activity and movement.

20.4.5 Abrasive Blasting Hood

Instructions:

- Connect the hood to the breathable air system or to breathable air cylinders with an airline hose (i.e. 250 feet maximum length). Be sure quick-connect fittings are locked and leak free. Air is supplied through a charcoal filter/pressure regulator and CO monitor from a compressor or breathable air cylinders.
- Adjust the headband and the tie lace for comfort and best vision.
- Fold back cape and stretch open the collar.
- Place helmet on the head and adjust the collar. Connect and tighten the cape straps under the arms.
- Adjust the constant flow control valve to the desired air flow.
- Get to fresh air immediately if the breathable air system low-pressure alarm sounds, the pressure in the breathable air cylinder drops below 500 psi, or if the CO alarm horn sounds.
- After use, sanitize the inside of the hood and return to storage.

Limitations: Do not use in an atmosphere immediately dangerous/hazardous to life or health (IDLH). Abrasive blasting hoods provide no protection if the air supply fails. Wearer must return to a respirable atmosphere by retracing entry route. Wearer must wear hearing protection when abrasive blasting.