

Ocenco Incorporated

M-20

Self Contained Self Rescuer

Instruction Manual

Manual No. N22069

Revision A, ECN 3071

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1. Introduction

The M-20 was designed with two primary objectives, reliability and ease of use. The M-20 is the easiest of all self-rescuers to use. Six simple steps (see section 5.4) and these six steps should be practiced over and over by the trainees until it becomes second nature.

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2. Description of the M-20

2.1 Classification

The Ocenco M-20 is a compressed oxygen, self-contained escape breathing apparatus. Self-contained means the M-20 supplies breathable air independent of the surrounding atmosphere. The M-20 will provide breathable air to a person escaping from an area of toxic gas or oxygen deficiency.

2.2 Limitations

2.2.1 Escape Breathing Apparatus

All self-rescuers, including the M-20, are considered escape breathing apparatus. Escape breathing apparatus should not be used to actively fight fires or intentionally enter toxic atmosphere unless it is necessary to pass through a toxic atmosphere to escape.

2.2.2 Physical Exertion

All breathing apparatus, including self-rescuers, place some limited amount of stress on the user due to either the weight of the unit, increased breathing resistance or an increase in temperature of the inhaled air. For this reason it is always advisable to limit the level of physical exertion, if possible, while wearing any self rescuer.

2.2.3 Duration

The M-20 is approved jointly in the United States by the National Institute of Occupational Safety and Health (NIOSH) and the Mine Safety and Health Administration (MSHA) for a duration of 10 minutes. The duration of all self-rescuers can vary depending on the user's oxygen consumption rate. Five factors affect the user's oxygen consumption rate:

- 1.) The amount of work required to escape affects the duration. Low ceilings, steep inclines and irregular floors increase the work required to escape. Less work results in greater duration.
- 2.) The Physical condition or fitness of the user affects the duration. A high heart rate, old age, and high percent of body fat decrease the fitness of the subject. The more fit the user, the greater the duration.
- 3.) Regardless of the fitness of the user, the amount of oxygen required is proportional to the user's weight. The less the user weighs, the greater the duration.
- 4.) The user's breathing rate affects the duration. The rate can be increased by excitement and fear. The lower the breathing rate, the greater the duration.
- 5.) The degree of training and familiarity can affect the duration. The more training and experience the subject has with self-rescuers, the more his breathing will be calm and controlled. If a subject is familiar with a particular escape way it may improve the mechanics of his escape. The greater the training and familiarity, the greater the duration.

2.3 Components

The M-20 consists of four main assemblies: the cover, the base, the latch and the breathing Assembly. In the description of these assemblies the component names are in *UPPERCASE* letters.

2.3.1 COVER Assembly

The COVER has an integral yellow TAB which, when lifted, releases any vacuum developed due to the change in atmospheric pressure from the surface to underground. Two cover overcases are affixed to the cover to provide protection from shock and vibration.

2.3.2 BASE Assembly

The clear BASE has integral belt loops and a base overcase that is affixed to the bottom of the base to provide protection from shock and vibration.

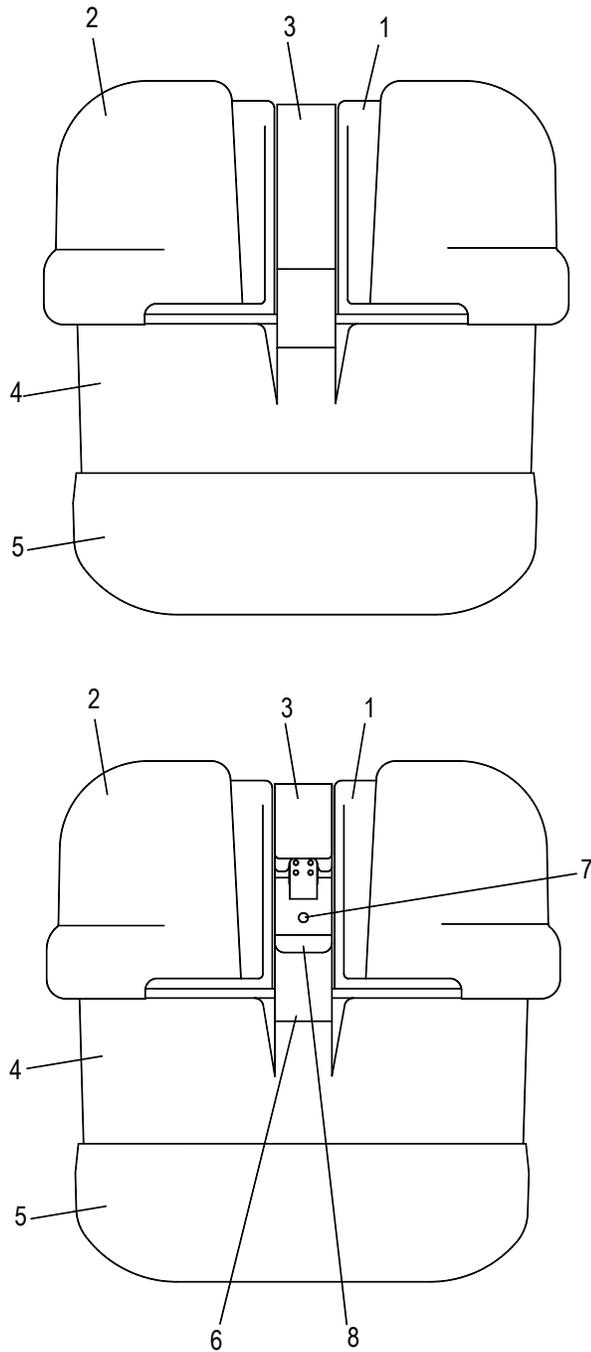
2.3.3 LATCH Assembly

The stainless steel LATCH band and stainless steel S-HOOK attach to opposite sides of the BASE and clamp the COVER to the BASE. The S-HOOK attaches to the user side of the BASE.

The LATCH band is released by raising the yellow lever on the LATCH band. After the lever is raised, the COVER can be separated from the BASE. The BASE stays attached to the user's belt, and the COVER is discarded. The yellow nylon NECK STRAP is exposed after the COVER is removed.

The yellow lever holds a tamper ball that falls away when the lever is lifted.

M-20 Case

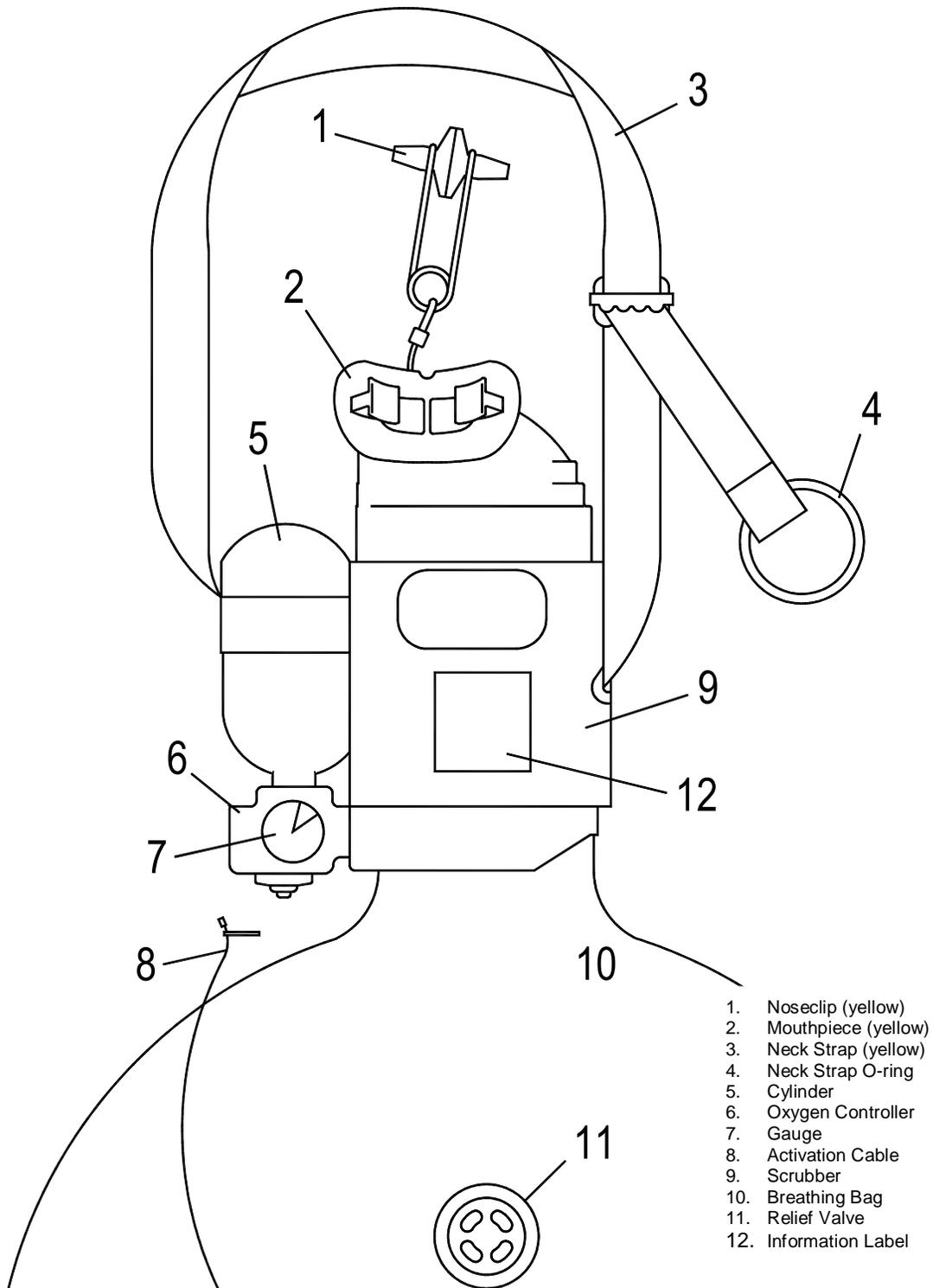


1. Cover
2. Overcase Cover
3. Latch Band
4. Base
5. Overcase Base
6. S-Hook
7. Tamper Ball
8. Lever

2.3.4 BREATHING ASSEMBLY

1. Noseclip: the Noseclip is attached to the Mouthpiece. The yellow pads on the Noseclip are made of high quality natural rubber to grip the nose.
2. Mouthpiece: the yellow Mouthpiece is molded of high strength silicone rubber. The Mouthpiece is placed in the mouth where the flange on the Mouthpiece seals in front of the gums and the stops on the Mouthpiece keep the mouth slightly open.
3. Neck Strap: pulling upwards on the yellow Neck Strap, disconnects the Activation Cable from the Oxygen Controller. This action starts the flow of oxygen into the Breathing Bag.
4. Neck Strap Ring: pulling upward on the Neck Strap Ring, shortens the Neck Strap. It is particularly helpful to shorten the Neck Strap in crawling situations.
5. Cylinder: the stainless steel Cylinder is of single piece construction with no welds or joints of any kind. All of the oxygen supplied to the user is USP grade compressed oxygen.
6. Oxygen Controller: the Oxygen Controller starts the flow of oxygen into the Breathing Bag and automatically increases the oxygen flow during high work rates.
7. Gauge: the Gauge indicates the amount of oxygen in the Cylinder. The green zone on the Gauge indicates the Cylinder is full of oxygen. The red zone indicates the Cylinder is low on oxygen and should be removed from service.
8. Activation Cable: the stainless steel Activation Cable is attached to the oxygen Controller and permanently attached to the inside of the Base. Pulling the M-20 out of its Base releases the Activation Cable from the Oxygen Controller and starts the flow of oxygen into the Breathing Bag.
9. Scrubber: the Scrubber is a chamber of Lithium Hydroxide that ~~scrubs~~ scrubs+ or removes the carbon dioxide from the exhaled air.
10. Breathing Bag: the orange Breathing Bag is a 6.5 liter reservoir that receives oxygen from the Oxygen Controller and exhaled air from the Scrubber.
11. Relief Valve: the Relief Valve is a one-way valve that allows any excess air in the Breathing Bag to escape. The Relief Valve limits the pressure on the lungs during exhalation. The Relief Valve is located in the middle of the Breathing Bag.
12. Information Label: contains unit serial number, manufacturing date, carry date, and store date.

M-20 Breathing Assembly



2.4 Theory of Operation

- 1.) When the Neck Strap is pulled from the Base, the oxygen valve is activated. Oxygen continuously flows from the cylinder to the Breathing Bag at a rate of 1.5 liters per minute.
- 2.) During the first inhalation, and when the Bag flattens, the Demand Regulator is activated and increases the oxygen flow from 1.5 liters per minute up to as much as 100 liters per minute.
- 3.) During inhalation, oxygen is pulled from the bag through the Scrubber and into the Mouthpiece.
- 4.) During exhalation, carbon dioxide laden air is exhaled into the Mouthpiece through the Scrubber and into the Breathing Bag. During inhalation and exhalation, the carbon dioxide is being absorbed by the Lithium Hydroxide scrubber.
- 5.) Sometimes during low work rates, the oxygen controller will supply more oxygen than the user can consume and excess gas exits the Relief Valve. The starting of the oxygen flow, the increased flow rate during high work rates and the occasional exhausting of gas through the Relief Valve all occur automatically, the user needs only to breathe.

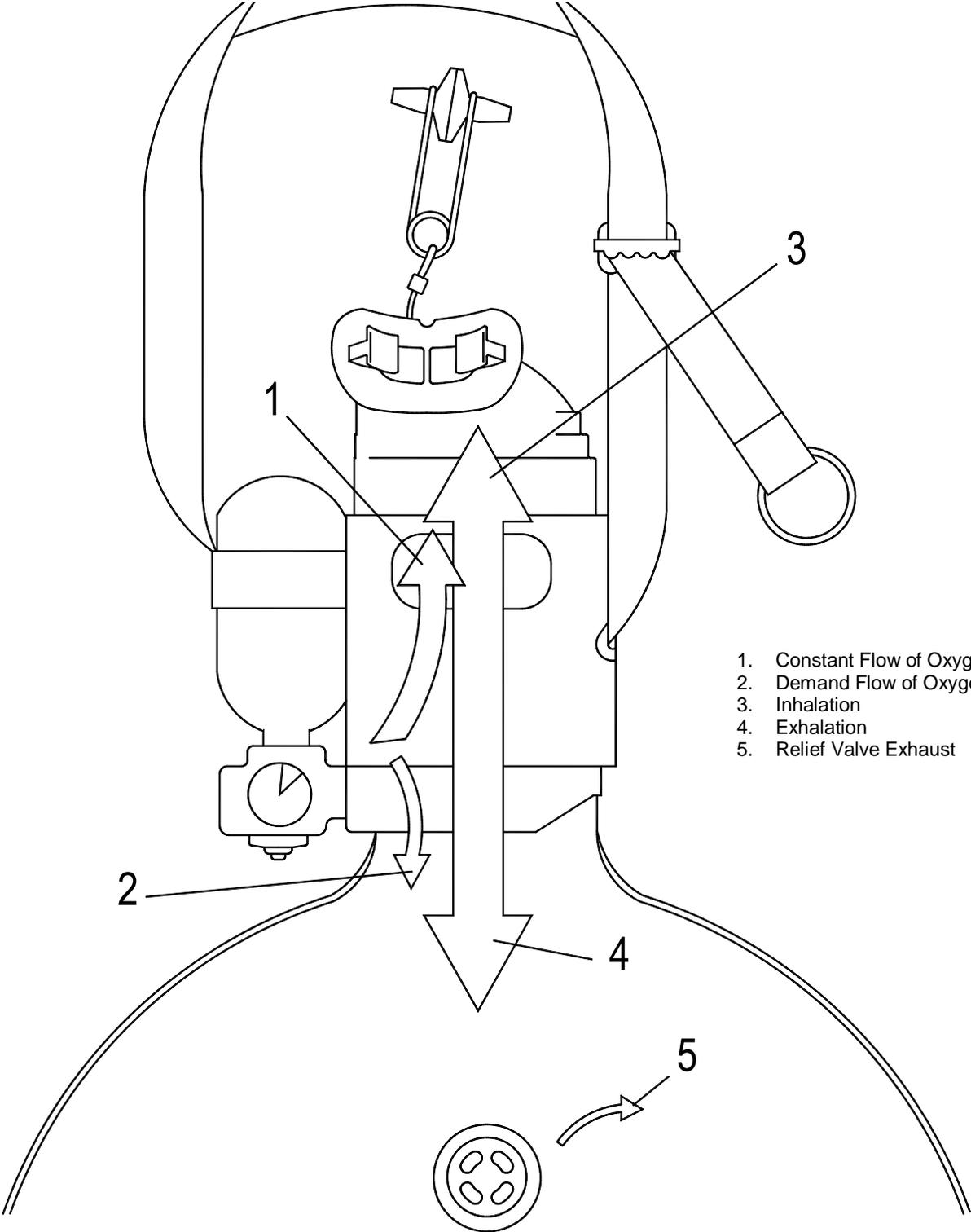
2.5 Specifications

Duration:	10 minutes, NIOSH / MSHA
Dimensions:	3.0 x 6.5 x 7.2 (in) 7.6 x 16.5 x 18.3 (cm)
Weight of breathing apparatus:	2.0 lbs (0.9 kg)
Weight of breathing apparatus with case:	3.30 lbs (1.5 kg)
Minimum storage temperature:	10 degrees F (-12° C)
Maximum storage temperature:	140 degrees F (60° C)

Storage at temperatures above 140 degrees F (60° C) for short periods will not adversely affect the M-20. In an emergency, don the M-20 regardless of temperature.

Scrubber life is limited to one escape event or one oxygen charge. Mandatory factory service is required after 10 years if stored and 5 years if M-20 is carried. End of service life is 15 years.

M-20 Theory of Operation



- 1. Constant Flow of Oxygen
- 2. Demand Flow of Oxygen
- 3. Inhalation
- 4. Exhalation
- 5. Relief Valve Exhaust

3. M-20 Care and Maintenance:

3.1 How to Care for the M-20

The M-20 is designed to be belt worn in an underground mining environment. The M-20 is fully shock absorbed in all directions within an impact and abrasion resistant case. Ocenco, Incorporated, NIOSH (USA), and private testing laboratories have performed numerous durability tests on the M-20 to ensure that it will withstand the harsh underground mining environment. However, like all self-rescuers it is not indestructible. Abusing your own self-rescuer is risking your life in the event of an emergency. Abusing someone else's self-rescuer should be considered criminal. Within the system of distributing the M-20 to mining personnel there should be consideration for accountability of the condition of the self-rescuer when it is returned. Teaching trainees to care for the M-20 must be a combination of instruction and enforcement.

Your life may depend on the care you give your self-rescuer. The list of things you should NOT do to the M-20 could be extensive. The more common abuses are:

- 1.) If the M-20 is accidentally opened, do not attempt to re-close it.
- 2.) Do not drop the M-20, particularly when taking off the belt.
- 3.) Do not clean the M-20 with anything other than soft brush.
- 4.) Do not immerse the M-20 in water. Even though the M-20 has been tested to withstand immersion in water, it is not recommended on a regular basis.
- 5.) Do not sit on the M-20.
- 6.) Do not drag the M-20 on the ground.
- 7.) Do not place the M-20 near heat greater than 140° F (60° C).
- 8.) Do not put tape or stickers on the M-20 that would impede its opening or reading the gauge.

3.2 How to Inspect the M-20

The M-20 must be visually inspected on a daily basis prior to being used underground.

Your inspection should consist of the following:

- 1.) Check the gauge. The pointed white indicator on the Gauge is normally in the green. Remove the M-20 from service if the white Gauge Indicator is in the red. If the case is damaged and the gauge cannot be read, the unit must be removed from service. If the view through the clear Base is obstructed for any reason, such that a proper examination cannot be performed (e.g. scuff marks, stickers, paint) the M-20 must be removed from service. The white mark on the Gauge is the zero pressure mark.
- 2.) Inspect the apparatus for the indications of high force impacts. Indications of high force impacts are listed below. If any of these signs are present the M-20 must be removed from service:
 - a. Case cracked, burned, deformed, or excessively worn.
 - b. Excessive gap between Cover and Base. This indicates that unit has been opened and re-closed.
 - c. Damaged Latch or Cover Band. Severe dents or wear spots in the band or the band is out of position.
 - d. Gauge bent or white indicator needle broken.
 - e. Dirt, debris, or moisture visible through the Case.
 - f. Belt loops broken. A cracked Belt Loop is an indication of a severe impact while off the belt.
- 3.) Missing Tamper Ball
- 4.) Ensure that the M-20 EEBD has not exceeded the life date printed on the information label.

Ensure belt worn period (5 consecutive years) has not expired.

If the M-20 fails any of the above inspections, it should be removed from service and returned to Ocenco Incorporated facility.

4. Donning Instructions:

4.1 When to use the M-20

The M-20 should be used immediately at the first indication of a fire or explosion even though no smoke is visible. Carbon monoxide is odorless and colorless, so you could breathe fatal amount of the gas before smoke is present. If you suspect an oxygen deficient atmosphere, put on the M-20 since it also gives you protection in an oxygen depleted atmosphere. Don't wait: put on the apparatus and escape to fresh air.

Possible Indications of an emergency:

1. Sight of smoke
2. Smell of smoke
3. Sight of fire
4. Fire alarm or carbon monoxide alarm
5. Sudden increase of air temperature
6. Sound of explosion
7. Vibrations of explosion
8. Interruption of ventilation
9. Someone around you has difficulty breathing or passes out

In the event of an emergency, always *don your self-rescuer before attempting to escape or help others.*

4.2 How to Use the M-20

4.2.1 Donning the M-20:

- 1.) Release yellow lever and discard cover.
- 2.) Remove unit by pulling yellow neck strap upwards.
- 3.) Insert yellow mouthpiece.
- 4.) Fit yellow noseclip
- 5.) Fit and adjust yellow neck strap
- 6.) Breathe through mouth and escape.

These are the six fundamental steps that should be practiced numerous times by the trainees.

Depending on style of hardhat used, it may be necessary to remove the hat before fitting the neck strap.

4.3 Transition from the M-20 to EBA 6.5

It is critical that the overall escape strategy is complete and accounts for mining personnel reaching the surface. If the escape time is greater than the duration of the self-rescuer, provision must be made to further protect the mining personnel. Storing the Ocenco, Incorporated EBA 6.5 within reach of the M-20 allows an extension of escape time.

Transition from the M-20 to EBA 6.5 should first be illustrated by use of the training video and then practiced, hands on, by the trainees. The training video shows the donning of the M-20 and then shows the following transition to the EBA 6.5:

Transition Instructions

1. Pull latch release pin.
2. Lift and pull each latch ring to release bands.
3. Remove cover from base. Grab the two handle straps and pull case apart, discard cover and rubber seal.
4. Open oxygen valve fully counterclockwise, in direction of arrow.
5. Remove M-20 neck strap.
6. Place EBA 6.5 neck strap overhead.
7. Inhale from M-20, hold breath and remove the M-20 mouthpiece and noseclip.
8. Pull EBA 6.5 mouthpiece toward face. The mouthpiece plug will automatically be removed from the mouthpiece. Insert mouthpiece and breathe through mouth only. Use head strap for additional support of mouthpiece, if required.
9. Apply noseclip to nose. Do not attempt to inhale or exhale through your nose.
10. Purge bag with oxygen to eliminate nitrogen: exhale, hold breath and deflate bag by pressing on the bag. Inhale deeply through the mouthpiece, and then breathe normally (oxygen will be supplied from the demand regulator).
11. Adjust neck strap for comfort.
12. Wrap waist harness around waist, clip and adjust for fit by pulling on strap end.
13. Place goggles over eyes to prevent irritation from smoke or other irritants.
14. ESCAPE

Proper handling, maintenance, and other information as supplied in this manual are essential to the effective use of the EBA 6.5. The user should be familiar with Instructions for Use 1-12 before attempting to use the EBA 6.5.

M-20 Approval Label

<p>PERMISSIBLE TEN MINUTE SELF-CONTAINED COMPRESSED OXYGEN BREATHING APPARATUS FOR ESCAPE ONLY MINE SAFETY AND HEALTH ADMINISTRATION NATIONAL INSTITUTE FOR OCCUPATIONAL SAFETY AND HEALTH MSHA-NIOSH APPROVAL ISSUED TO OCENCO, INCORPORATED Pleasant Prairie, WI. 53158 12-05-94 APPROVAL NO. TC-13F-269 THE APPROVED ASSEMBLY CONSISTS OF THE FOLLOWING OCENCO, INCORPORATED PART NUMBER: N20002 MODEL M-20</p>	<p>United States Department of Labor MSHA Mine Safety and Health Administration</p>	<p>U.S. Department of Health, Education, and Welfare Center for Disease Control NIOSH National Institute for Occupational Safety and Health</p>
		<p>P/N 336004 Dwg. C15684 Rev. A</p>