APPENDIX AM

EXAMINATION AND TESTING OF SELF-CONTAINED SELF-RESCUERS (SCSRs)

Examination and Testing of Self-Contained Self-Rescuers (SCSRs) Recovered from the Upper Big Branch Mine Disaster

MSHA/NIOSH Report

November 18, 2011

Executive Summary

On April 5, 2010 an underground explosion at Performance Coal Company's Upper Big Branch (UBB) mine located in Raleigh County, West Virginia, did massive damage throughout large portions of the mine and created high concentrations of carbon monoxide (CO) in much of the mine atmosphere. Miners working in the UBB mine at the time of the explosion were equipped with the CSE SR-100, a NIOSH/MSHA-approved one-hour self-contained self-rescuer (SCSR) per Title 42, *Code of Federal Regulations*, Part 84, (42 CFR, Part 84) bearing approval TC-13F-0239. On April 12, 2011, the Mine Safety and Health Administration (MSHA) requested the assistance of the National Institute for Occupational Safety and Health (NIOSH) to investigate SR-100s recovered from the UBB mine after the explosion. This report summarizes the SCSR evaluations performed as part of the resulting investigative effort.

The forty-one units recovered from inside or outside the mine by MSHA mine-site investigators were viewed to fall into one of two categories. They were classified either as opened, or unopened. The unopened units are also referred to as intact. Eighteen SCSRs were classified as unopened and 23 SCSRs were classified as opened. Units recovered outside the mine included both unopened and opened SCSRs.

Three of four intact units tested on a Breathing and Metabolic Simulator (BMS) provided at least 60 minutes of respiratory support when consumed at a standard rate. The fourth unit lost its starter oxygen due to a manufacturing flaw and the test was terminated at approximately four minutes.

A combination of different recovery times, different storage conditions, and time elapsed since all the units had been recovered, hindered observations on the opened units, and greatly increased the difficulty of analysis. These factors essentially limited the conclusions that could be drawn for these units. Three of the opened units' conditions were consistent with use at a light to moderate rate of consumption and six of them exhibited characteristics consistent with use at a higher rate of consumption. The remainder of the opened units appeared to exhibit conditions more consistent with only being exposed to ambient atmosphere.

Background

MSHA's mine-site investigators collected the SR-100, SCSRs from the UBB mine. According to the MSHA mine-site investigators the SCSRs presented to NIOSH for evaluation came from a variety of locations. Most units were recovered from within the mine; however, a group of units that included unopened as well as opened units was recovered from a mantrip vehicle that had been brought out of the mine within 24 hours of the explosion. The units recovered from within the mine were not recovered until more than 60 days had elapsed from the time of the incident due to the need to follow standard mine rescue and recovery protocols in the aftermath of the explosion. At the time of collection, the MSHA mine-site investigators stored the recovered units in one of three ways. Some units were individually bagged in plastic, some were individually bagged in paper, and others were bagged collectively in large plastic bags. All bagged units were placed into large plastic storage boxes and held with other evidence in trailers.

MSHA maintained the chain of custody of all the SCSRs during all phases of this investigation. These apparatus are considered by MSHA and the other investigators as evidence in the UBB mine investigation. Prior to beginning the evaluations of the SCSRs, interested parties were invited to observe all evaluation activities. The only outside interested parties present to observe testing and examination were the United Mine Workers of America (UMWA) and CSE Corporation (hereafter referred to as CSE). Representatives of the UMWA and CSE were present for all of the testing and examination activities. No other interested parties attended at any time. The time frame for evaluating and testing was governed by circumstances and findings. The SCSRs were delivered to MSHA's facilities in Bruceton, Pennsylvania, on or about June 15, 2011. Laboratory evaluations began July 18, 2011, and were completed by August 9, 2011.

Objectives

1.) Inspect and catalog the condition of SR-100 units, as recovered during the MSHA investigation
2.) Evaluate the life support performance of SR-100 units in the as-received condition according to the established protocol (Attachment 1)

Methods

The evaluation of the recovered SR-100s was conducted at the NIOSH, National Personal Protective Technology Laboratory (NPPTL) facilities in Bruceton, Pennsylvania. The evaluation was conducted by NIOSH and MSHA personnel in accordance with a protocol established for this investigation (Attachment 1).

Inspection

Past experience with accident investigations has revealed that one of the most important products of the evaluation is an accurate visual record of the evidence. To this end, NIOSH and MSHA cataloged and created a visual record using digital photographs. Photographs were made of all SCSRs, as received, and the inspection of the SR-100s was documented with pictures as well. During this inspection, examiners assessed the

condition of both external and internal system components. To the greatest extent possible, examiners inspected each SCSR according to the manufacturer's approved visual inspection criteria. (See Attachment 2) It was not possible to follow the manufacturer's inspection procedure completely on opened units. When the units are opened, the lids become separated from the SCSRs along with the closure straps which contain the serial number and manufacturing date. With the assistance of CSE, serial numbers of these units were determined according to the serial number of the oxygen starter assembly which is recorded on the body of the chemical canister portion of the unit. The closure or security strap also retains the heat indicator which falls away and is almost always lost when the unit is opened. All observable aspects of the manufacturer's visual inspection were noted where possible.

The opened SR-100s were subjected to a methodical disassembly, culminating with a visual assessment of the chemical bed. Due to the varying conditions of storage, collection and the amount of time that had elapsed since the units were collected, this assessment could only be used for gross determination of status. As the chemical bed is reacted and consumed, its appearance changes gradually. If the unit is disassembled within a short time of use, it is possible to compare the appearance of the chemical bed within the SCSRs under examination with those of SCSRs similarly evaluated under known conditions of use. Since the UBB units had been exposed to ambient atmosphere for an extended amount of time after being opened, or opened and used, any kind of graduated assessment due to additional reaction of the chemical from this exposure was obscured. However, because exposure to atmosphere only, as opposed to being exposed to use, followed by exposure to atmosphere, creates a different pattern of reaction within the chemical bed, it was possible to distinguish between units that had been breathed through before exposure to the atmosphere, and units that had been exposed only to the atmosphere after being opened. Additionally, among the units deemed to have been breathed through, it was possible to determine which units had likely been consumed rapidly, and which units had likely been consumed at a slower rate. Photos were used to document all visual assessments.

Only two of the 18 unopened SCSRs clearly passed all inspection criteria. These two SCSRs were found in a storage box which apparently protected them from the immediate effects of the explosion. Either through the effects of the explosion or from damage incurred prior to the explosion, the remaining 16 intact units failed visual inspection. It is not possible to determine if all of the negative indications observed were due to the explosion or existed prior to it.

The life-support capacity of the unopened SR-100s was assessed by means of a performance test using a Breathing and Metabolic Simulator (BMS). The BMS testing used on the unopened SR-100s can not be regarded as a direct substitute for human subject testing specified at 42 CFR, Part 84, but performance can be compared to other units tested using the BMS. For this test the BMS was set to extract 1.35 lpm oxygen, and inject 1.15 lpm carbon dioxide at a ventilation rate of 30 lpm. Units failing inspection are not expected to perform well, so for this reason, only two of the 16 unopened units failing inspection were performance tested along with the two passing all

inspection criteria. Three of these units performed adequately when tested on the BMS. The fourth unit, one of the two which passed all inspection criteria lost its charge of starter oxygen due to a metal shaving which was interfering with an O-ring seal in the starter mechanism. This unit could only have been used in manual- or cold-start mode.

For the intact SCSRs evaluated on the BMS, the full manufacturer's inspection could be conducted including the ASMD (Acoustic Solids Movement Detector) test. (See Attachment 3) The ASMD test analyzes the noise induced in the unit by moving it. The noise produced by the SCSR when shaken is used as an indicator of shock and vibration damage incurred by the chemical bed within the SCSR. In the field, this assessment is made using a hand-held instrument provided by CSE. In the laboratory it is made using a more sophisticated set of instrumentation which includes a small anechoic chamber. Neither of these assessment techniques could be conducted on the opened SCSRs, but the laboratory ASMD method was applied to each of the unopened SR-100, SCSRs which were performance tested. Excessive noise as evaluated by either of the test instruments is an indication of chemical-bed damage that may adversely affect the performance of the SCSR. SCSRs which fail the ASMD test, also fail inspection. The two units found in the storage container exhibited ASMD values of 18dB, and the two which failed visual inspection exhibited ASMD values of 53dB and 41dB. All of these were within the 60dB cutoff to pass the ASMD test.

Findings

Exceptional or notable findings are as follows:

Unopened-units:

1.) Sixteen of the eighteen unopened units failed visual inspection for various reasons.

2.) When tested on the BMS, one of the unopened SCSRs lost its startup oxygen as a result of a metal shaving interfering with an O-ring seal on the starter mechanism. This unit could only have been used in manual- (or cold-start) mode. It is not possible to manually start the SCSR in strict accordance with the CSE Users' Instructions (Attachment 2, page 14) when testing on the BMS. Therefore, the test was discontinued as soon as the unit failed to provide enough volume for the simulator to inhale, which occurred about four minutes into the test.[1]

3.) The other three tested units performed adequately.

Detailed findings are documented in Table 1, and each of the examined units is illustrated in Attachment 4.

Findings regarding the opened units must be tempered by the knowledge that all of the units had been exposed to ambient atmosphere for over a year by the time they were presented to NIOSH for investigation and the subsequent evaluations. The chemicals

[1] In light of information gathered during an extensive investigation of the SR-100 oxygen starter mechanism, this defect was seen to be an anomaly. This finding represents the sole observation.

contained in the units are designed for one-time use which is meant to occur immediately after the unit is unsealed. Once unsealed, chemical reactions will proceed regardless of whether the unit is donned by a user or not. However, the pattern of reaction will be different between a unit that is unsealed and donned and one that has simply been unsealed. That difference will be more obvious the sooner the evaluation occurs relative to the time the unit was first unsealed or opened. After a long enough time has passed, any differences between the two conditions will become completely obscured by the continued reaction of the chemicals. Certain assumptions have been made in an effort to most effectively conduct the unit inspections and subsequent life-support assessments. These assumptions can be characterized as follows:

1.) Circumstances of collection were therefore assumed to provide guidance for evaluation.
    a. Given that units were collected under, in broad terms, three different sets of circumstances: outside the mine, inside the mine in various locations, inside the mine in isolated pairs, it is assured that they were exposed to differing environments. However, it is assumed that any two units collected under a similar set of circumstances were exposed to essentially the same post-explosion environments. For example, two units which remained underground during the early phases of mine recovery both laid at random spots on the mine floor. The working assumption is that neither of them was lying in a puddle of water for any portion of that time.
    b. Given that units were collected at different times, and packaged for retention in different ways (i.e. plastic, paper, bulk), the assumption is that the units were all stored in the same area, and exposed to the same temperature and humidity environment between the time they were collected by MSHA and evaluated under this investigation.
2.) In the case of the most degraded units, it was assumed that similar external appearance could be relied upon as a good indicator of internal appearance. This was most important, and the prevailing assumption, for units thought to have been used quite heavily according to their external appearance. Because they were so heavily contaminated with an extremely caustic effluent of reaction (consistent with high use), only one of them was dismantled to affirm the observation of heavy use.

Under these assumptions, the units were evaluated in groups focused on similar collection circumstances. The notable or exceptional observations and associated findings regarding the opened units are as follows:

1.) All twenty-three units were not received in standard deployed configuration; all units were either used, opened for use, or broken open by the forces of the explosion. Consequently, it is not possible to make a pass/fail judgment with regard to the required inspection criteria.
2.) The oxygen closures of twenty opened SCSRs had punctured which indicates that the units had been activated prior to being received for inspection. This

determination was made by examining the start-up closure, a frangible disc, of each compressed oxygen container. Despite this finding, there is no method to verify that oxygen flowed into the units from the start-up containers.
4.) Six of the open units are in a condition that one would expect of units that had been consumed rather vigorously and rather completely.
5.) Three of the open units are in a condition more consistent with units that had been consumed rather slowly, but also rather completely.
6.) The remaining 14 units are in a condition more consistent with units that had been opened, but remained unused (i.e. not breathed through).
7.) Two of the 14 units mentioned in 6.) were judged to have been forced open by the explosion and showed no signs of attempted use. These units served as a rather useful reference point.

Table 2 is the complete listing of findings regarding the opened units.

Exhibit #	Recovery Location	SN	MFR Date	Visual Inspection	ASMD	Notes	Life Support Duration
PE-0039-a	Inside	224160	Oct-08	Pass	Pass	Found in a storage container	Lost starter oxygen due to a burr on the starter plunger. Test stopped at 4 minutes.
PE-0039-b	Inside	228283	Nov-08	Pass	Pass	Found in a storage container	66 Minutes
A-02-A	Outside	227015	Oct-08	Fail	Pass	Heat indicator red	66 Minutes
PE-0088	Inside	133640	Jun-06	Fail	Pass	Shows signs of heat/soot	63 Minutes

Table 1 - Index of performance-tested units

Exhibit #	Location	Serial Number	MFR Date	Oxygen Activated	Notes	Overall Condition Consistent with use? Yes/No	Spent KO_2	Oxygen consumption rate
PE-0101	Inside	228539		Yes	Bagged in a paper bag - Caustic leakage evident S/N 228539 (from CSE)	Yes	Complete	High
PE-0198	Inside	139549		No observation	Bagged in a paper bag - Caustic leakage evident S/N 139549 (from CSE)	Yes	External observation only	No observation
PE-0197	Inside	139529		No observation	Bagged in a paper bag - Caustic leakage evident S/N 139529 (from CSE)	Yes	External observation only	No observation

PE-0108	Inside	139590		No observation	Bagged in a paper bag - Caustic leakage evident S/N 139590 (from CSE)	Yes	External observation only	No observation
PE-0110	Inside	139494		No observation	Bagged in a paper bag - Caustic leakage evident S/N 139494 (from CSE)	Yes	External observation only	No observation
PE-0111	Inside	228242		No observation	Bagged in a paper bag - Caustic leakage evident S/N 228242 (from CSE)	Yes	External observation only	No observation
PE-0130	Inside	238802	Feb-09	No	Bagged in plastic - No caustic leaking evident	No	Partial	NA
PE-0037	Inside	136909		Yes	Bagged in plastic - No caustic leaking evident, Bottle no. 48043	No	Partial	NA
PE-0027	Inside	228246		Yes	Bagged in plastic - No caustic leaking evident S/N 228246 (from CSE)	No	Partial	NA
PE-0053	Inside	137539		Yes	Bagged in plastic - Caustic leakage evident S/N 137539 (from CSE)	Yes	Complete	Low
PE-0046	Inside	179857		Yes	Bagged in plastic - No caustic leaking evident, Bottle no. A95255	No	Partial	NA
PE-0055	Inside	194266		Yes	Bagged in plastic - No caustic leaking evident S/N 194266 (from CSE)	No	Partial	NA
PE-0025	Inside	179758		Yes	Bagged in plastic - No caustic leaking evident S/N 179758 (from CSE)	No	Partial	NA
PE-0131	Inside	228439	Nov-08	No	Bagged in plastic - No caustic leaking evident	No	Partial	NA
A-02-B	Outside	201117		No	Bottle #A120126 Bagged collectively -No caustic leaking evident S/N 201117 (from CSE)	No	Partial	NA
A-02-C	Outside	228295		Yes	Bottle #A148070 Bagged collectively - No caustic leaking evident S/N 228295 (from CSE)	No	Partial	NA
A-02-D	Outside	179813		Yes	Bottle #A95080 Bagged collectively - No caustic leaking evident S/N 179813 (from CSE)	Yes	Complete	Low
A-02-E	Outside	228270		Yes	Bottle #A148553 Bagged collectively - No caustic leaking evident S/N 228270 (from CSE)	No	Partial	NA
A-02-F	Outside	228299		Yes	Bottle #A149998 Bagged collectively - Caustic leakage evident S/N 228299 (from CSE)	Yes	Complete	Low
A-02-G	Outside	179728		Yes	Bottle #A91663 Bagged collectively - No caustic leaking evident S/N 179728 (from CSE)	No	Partial	NA
A-02-H	Outside	180099		Yes	Bottle #A95444 Bagged collectively - No caustic leaking evident S/N 180099 (from CSE)	No	Partial	NA

A-02-I	Outside	179804		Yes	Bottle #A93445 Bagged collectively -No caustic leaking evident S/N 179804 (from CSE)	No	Partial	NA
A-02-J	Outside	179843		Yes	Bottle #A97114 Bagged collectively - No caustic leaking evident S/N 179843 (from CSE)	No	Partial	NA

Unit determined to have been opened by force of explosion
Unit identifiers beginning with "A" were assigned by NIOSH during the investigation at Bruceton

Table 2 - Index of opened units

This inspection and testing of respirators from Upper Big Branch was done at the request of MSHA as part of its investigation of the mine disaster. NIOSH and MSHA were not able to conduct an evaluation of respirators recovered from the Upper Big Branch mine accident site for more than a year after the accident. Those examining the units were limited in their ability to fully evaluate the respirators by the impact of the explosion on the units and the length of time following the explosion before the respirators could be examined and tested. Given these limitations, those examining the units exercised their best professional judgment and experience in presenting the findings in this report; but these findings should only be relied on and considered only within the constraints which limited their analyses.

Attachment 1
Evaluation Protocol

Investigation Protocol for Self-Contained Self-Rescuers (SCSRs) Recovered from the UBB Mine Explosion
May 20, 2011

1.0 Background

1.1 The CSE SR-100 is an MSHA NIOSH approved 1-hr SCSR.
1.2 The SR-100 was deployed at the Massey UBB mine.
1.3 On April 5, 2010 an explosion occurred at the Massey UBB underground mine.
1.4 Selected SCSRs collected during the MSHA investigation will be visually inspected and tested.
1.5 These apparatus are considered by MSHA as evidence in their investigation.

2.0 General Considerations

2.1 MSHA will maintain the chain of custody while the units are undergoing investigation.
2.2 Parties to the testing of the apparatus are MSHA, and NIOSH. These Parties may permit others to observe this inspection and testing. The Parties will control the inspections and tests and the test conditions. The Parties will notify observers of the time and place of the inspections and tests, but may limit the number of observers who can be present.
2.3 Units will be opened and inspected in the presence of all Parties, and observers subject to the conditions specified in 2.2.
2.4 The role of the observers is simply to observe. They may not control the inspection and testing, or test scenarios. If at any time during inspection and testing observers are deemed to be interfering with, or influencing inspection and testing, they will be asked to leave.
2.5 No human subject tests will be conducted. Performance assessments will be conducted using a breathing and metabolic simulator (BMS). This testing is not to be regarded as a direct substitute for human subject testing specified in Title 42, Code of Federal Regulations, Part 84.
2.6 The time frame for inspection and testing will be governed by findings and the availability of supplies. Under the current understanding of the situation, inspection and testing could span several weeks. The Parties must be in agreement on the acceptability of any components or supplies needed for inspection and testing.
2.7 NIOSH and MSHA facility safety personnel will be informed of the intent to inspection and test, and may be asked to consult on the overall safety of the activity, and to observe the inspection and test procedures to assure facility and personnel safety.

2.8 In order to assure the safety of laboratory personnel, all reasonable efforts will be made to determine if any toxic substances are involved relative to the SCSRs. If such substances may be on the SCSRs, they will be sanitized. This is a standard precaution.

3.0 Objective

3.1 MSHA and NIOSH will conduct a joint investigation of the SCSR's used in the Massey UBB mine explosion.

3.2 The objectives are:

3.2.1 To inspect and catalog the condition of the apparatus, as delivered to NIOSH by MSHA.

3.2.2 To evaluate the life support performance of the apparatus (if possible).

4.0 Method

4.1 The investigation will be conducted at NIOSH, Bruceton Research Center, in NPPTL facilities.

4.2 Procedure

4.2.1 Catalog and create a visual record (digital photographs) of all SCSR's, as received.

4.2.2 Inspection

4.2.2.1 Sanitize any SCSRs that require such a procedure, and conduct a visual inspection according to manufacturer's instructions

4.2.2.2 Assess condition of breathing hose and bag, as well as other system components

4.2.2.3 Digital photographs will be used for visual record.

4.2.3 Life Support

4.2.3.1 Unopened units: Performance test on Breathing and Metabolic Simulator (BMS)

4.2.3.2 Opened units: Perform a visual inspection and assess condition of the chemical bed. NOTE: Assessment of the chemical bed condition should not be construed as an indication of the condition at the time of recovery from the mine due to the length of elapsed time from recovery until evaluation at NIOSH, NPPTL.

4.2.3.3 Document life support assessments with digital photographs as appropriate.

5.0 Report

5.1 Prepare and submit a report on the results of the investigation to the MSHA investigation team.

Attachment 2
CSE Users' Instructions
Donning Manual

Safety
Works

Corporate Headquarters
600 Seco Road
Monroeville, PA 15146
Phone: 412-856-9200
Fax: 412-856-9203
Email: customerservice@csecorporation.com
Website: www.csecorporation.com

SR-100 NIOSH/MSHA 03/03 Rev 2
SRX-206-H
March 18, 2003

SR-100

60 Minutes Self Contained Self Rescuer

Donning Procedures
for
Person-Wearable
Self Contained Self Rescuer

CSE CORPORATION

600 SECO ROAD, MONROEVILLE, PA. 15146, USA

(412) 856-9200

MODEL SR-100 SCSR

CLOSED-CIRCUIT, ESCAPE ONLY, SELF-CONTAINED BREATHING APPARATUS

THESE RESPIRATORS ARE APPROVED ONLY IN THE FOLLOWING CONFIGURATIONS:

RESPIRATOR COMPONENTS							
TC-	PROTECTION[1]		RESPIRATOR	ALTERNATE POUCHES			CAUTIONS AND LIMITATIONS[2]
			Q15-20-0000-6	Q15-20-9002-6	Q15-20-9069-6	Q15-20-9042-6	
13F-239	60 min/SC/ESC		X	X	X	X	JMNOS

1. PROTECTION

SC - Self-Contained

ESC - Escape

2. CAUTIONS AND LIMITATIONS

J - Failure to properly use and maintain this product could result in injury or death.

M - All approved respirators shall be selected, fitted, used, and maintained in accordance with MSHA, OSHA and other applicable regulations.

N - Never substitute, modify, add, or omit parts. Use only exact replacement parts in the configuration as specified by the manufacturer.

O - Refer to User's Instructions, and/or maintenance manuals for information on use and maintenance of these respirators.

S - Special or critical User's Instructions and/or specific use limitations apply. Refer to User's Instructions before donning.

Special User Instructions

(In accordance with Section "S" of the NIOSH cautions and limitations)

CSE CORPORATION

Safety Works

SR-100 SCSR

Warranty Policy

CSE Corporation warrants to the original end-user purchaser this product to be free from defects in material and workmanship for 1 year from the date of purchase. During this period, CSE will repair or replace defective parts on an exchange basis. F.O.B. the factory at Monroeville, Pennsylvania. Freight charges to and from the CSE factory will be paid by the end-user purchaser. The decision to repair or replace defective parts shall be determined by CSE.

Validation: To validate this warranty, the registration card must be detached, completed and returned to CSE's offices within 30 days of purchase.

Conditions and Exclusions: To maintain this warranty, the purchaser must perform maintenance and inspection as prescribed in the owners manual and such other necessary care as may be required according to the use of the equipment in the reasonable judgment of CSE. Normal wear and tear, parts damaged by abuse, misuse, negligence, or accidents are excluded from this warranty. Purchaser acknowledges that, notwithstanding any contrary term or provision in the purchaser's purchase order or otherwise, the only warranty extended by CSE is the express warranty contained herein. PURCHASER FURTHER ACKNOWLEDGES THAT THERE ARE NO OTHER WARRANTIES EXPRESSED OR IMPLIED, INCLUDING WITHOUT LIMITATIONS, THE WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE; THAT THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF; THAT NO ORAL WARRANTIES, REPRESENTATIONS, OR GUARANTEES OF ANY KIND HAVE BEEN MADE BY CSE, ITS DISTRIBUTORS OR THE AGENTS OF EITHER OF THEM, THAT IN ANY WAY ALTER THE TERMS OF THIS WARRANTY; THAT CSE AND ITS DISTRIBUTORS SHALL IN NO EVENT BE LIABLE FOR ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES, INCLUDING BUT NOT LIMITED TO INJURY TO THE PERSON OR PROPERTY OF THE PURCHASER OR OTHERS, AND FROM OTHER LOSSES OR EXPENSES INCURRED BY THE PURCHASER ARISING FROM THE USE, OPERATION, STORAGE, OR MAINTENANCE OF THE PRODUCT COVERED BY THE WARRANTY; THAT CSE'S LIABILITY UNDER THIS WARRANTY IS RESTRICTED TO REPAIR OR REPLACEMENT OF DEFECTIVE PARTS AT CSE'S SOLE DISCRETION. The warranty shall be void if the date and/or serial numbers affixed to the products by CSE are removed, obliterated, or defaced.

CSE Corporation, 600 Seco Rd. , Monroeville, PA. 15146 (412) 856-9200 or 1-800-245-2224

Part Number _____ Serial Number_____

SR-100 Warranty Statement 8/5/01

Safety
Works

SR-100

Warranty Registration

Date of Purchase _____ Serial Number_____

Name_____Phone_____

Company_____

Address_____

_____

_____

Mail or Fax SR-100 Warranty Card (412-856-9203)

Warranty is void unless registration card is completed and returned to CSE within 30 days of receipt of product.

SR-100 SAFETY GUIDELINES:

THIS MANUAL MUST BE READ COMPLETELY BY ALL INDIVIDUALS USING, INSPECTING OR PROVIDING TRAINING FOR THE CSE SR-100. The CSE SR-100 will perform as designed only if it is maintained and used in accordance with the manufacturer's instructions and regulatory standards. FAILURE TO FOLLOW THESE INSTRUCTIONS AND REGULATIONS COULD RESULT IN SERIOUS INJURY OR DEATH.

SAFETY GUIDELINES – DEFINITIONS

SAFETY TERMINOLOGY. The following symbols are utilized throughout this manual to help you recognize safety related to the SR-100.

WARNING – Indicates a potential hazardous situation which, if not avoided, **could** result in **death or serious injury.**

CAUTION – Indicates a potential hazardous situation which, if not avoided, **may** result in **minor or moderate injury**.

Warning: The CSE SR-100 has been designed by CSE and approved as an Escape Self Contained Breathing Apparatus (ESCBA) and should only be used to escape from atmospheres Immediately Dangerous to Life and Health (IDLH).

Warning: The CSE SR-100 is not approved for use as a Self Contained Breathing Apparatus (SCBA) and should not be used for rescue, fire-fighting or underwater breathing.

Warning: Before donning SR-100 remove any foreign matter from your mouth such as chewing tobacco or gum.

Warning: Breathing through the SR-100 differs from breathing ambient air; temperature and resistance will be slightly higher. This is normal during use and never warrants removal of the mouthpiece.

Warning: The user should be familiar with operational primary escape ways, secondary escape ways and SR-100 cache locations.

Warning; Never remove the mouthpiece unless you have reached fresh air or you are replacing the unit you are wearing with a reserve unit.

Warning: Do not attempt to talk while wearing SR-100, maintain a tight seal on mouthpiece and nose clip. Try to communicate via hand signals or writing.

SR-100 SAFETY GUIDELINES: Continued

Warning: Remove the SR-100 from service if any of the following conditions exist: top or bottom moisture indicator is not blue, the security seal is broken, the unit was exposed to temperatures above 130^{0}F as indicated by the temperature indicator being red, or shows indications of physical abuse(Crushed, burnt, visible puncture holes, substantial cracks dents, or any other visible signs of trauma.)

Warning: The unit must temporarily be removed from service if the internal temperature of the unit drops below 32^{0}F. Once the internal temperature rises above 32^{0}F the unit may be returned to service.

Warning: Never attempt to use a damaged SR-100, unit already removed from service or that does not meet inspection criteria.

Warning: The SR-100 is intended as a one time use only product, once the unit is opened it is considered spent and should be disposed of properly.

Warning: Avoid direct contact between the breathing bag and open flames or chemicals during use.

Warning: The SR-100 and carrying pouch should be kept clean. Do not submerge the SR-100 in water or use petroleum solvents to clean.

Warning: The SR-100 is approved with the SR-100 carrying pouch, any modification or substitution of this pouch should be removed immediately and replaced with an approved SR-100 pouch.

Warning: The user should perform the daily inspection of the CSE SR-100 prior to carrying the unit.

Warning: Only a trained and qualified individual may perform the 90 day inspection of the CSE SR-100.

Warning: Do not introduce petroleum based liquids or flammable liquids into the unit. The chemical (potassium super oxide) in this unit is not combustible but it can ignite flammable liquids when they come in contact.

NOTES:

APPENDIX III: ACCESSORIES

Part Number	Description
Q152000006	SR-100 SELF CONTAINED SELF RESCUER
Q152090026	SR-100 POUCH
X151590058	SUSPENDERS
X151590098	BELT, ULTRA SMALL 28” - 34”
X151590108	BELT, SMALL 30” - 37”
X151590118	BELT, MEDIUM 36” - 43”
X151590128	BELT, LARGE 39” - 45”
X151590138	BELT, X-LARGE 45” - 51”
X151590148	BELT,XX-LARGE 51” - 57”
X151590158	BELT, XXX-LARGE 56” - 62”
X151590398	TRAINING VIDEO
2170611001	ACOUSTICS SOLIDS MOVEMENT DETECTOR
2170612001	ASMD SPOT CHECKER
21706KIT01	ACOUSTICS SOLIDS MOVEMENT DETECTOR KIT

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SR-100
NIOSH/MSHA Approved
TC-13F-239

APPENDIX II:GLOSSARY

ASMD - Acoustic Solids Movement Detector

CO_2 - Carbon Dioxide

EGRESS - to go or come out

EPA - Environmental Protection Agency

ESCBA - Escape Self Contained Breathing Apparatus

IDLH - Immediately Dangerous to Life and Health

KO_2 - Potassium Super Oxide

LiOH - Lithium Hydroxide

MSHA– Mine Safety and Health Administration

NIOSH - National Institute of Occupational Safety and Health

O_2 - Oxygen

PWSCSR - Pearson Wearable Self Contained Self Rescuer

SCSR - Self Contained Self Rescuer

APPENDIX I: SR100 SPECIFICATIONS

	SR100
Weight: Carried	5.7 lbs./2.6kg
Weight: In Use	4.9lbs/2.2kg
Dimensions	7.75” x 4” x 5.5”
Deliverable Oxygen	3.5 ft.^{3}/100 Liters
Rated Duration (minimum)	60 Minutes
Method of Operation	Chemical based re-breather KO2/LiOH
Oxygen supply rate (liters per minute)	On Demand
Bag Volume (liters)	9+/-0.5
Storage Temperatures	32° – 130° F 0°– 54° C
Maximum Service Life	10 Years
Warranty	1 Year
Approvals	MSHA/NIOSH TC-13F-239

SR-100 INFORMATION

GENERAL DESCRIPTION

The CSE SR-100 provides the highest level of respiratory protection for workers who must perform duties in conditions classified as having the potential to be Immediately Dangerous to Life and Health (IDLH). The light weight, compact design of the CSE SR-100 make it ideal to be carried on an individual’s belt so that it can be donned in a matter of seconds in the event that the atmosphere changes to IDLH.

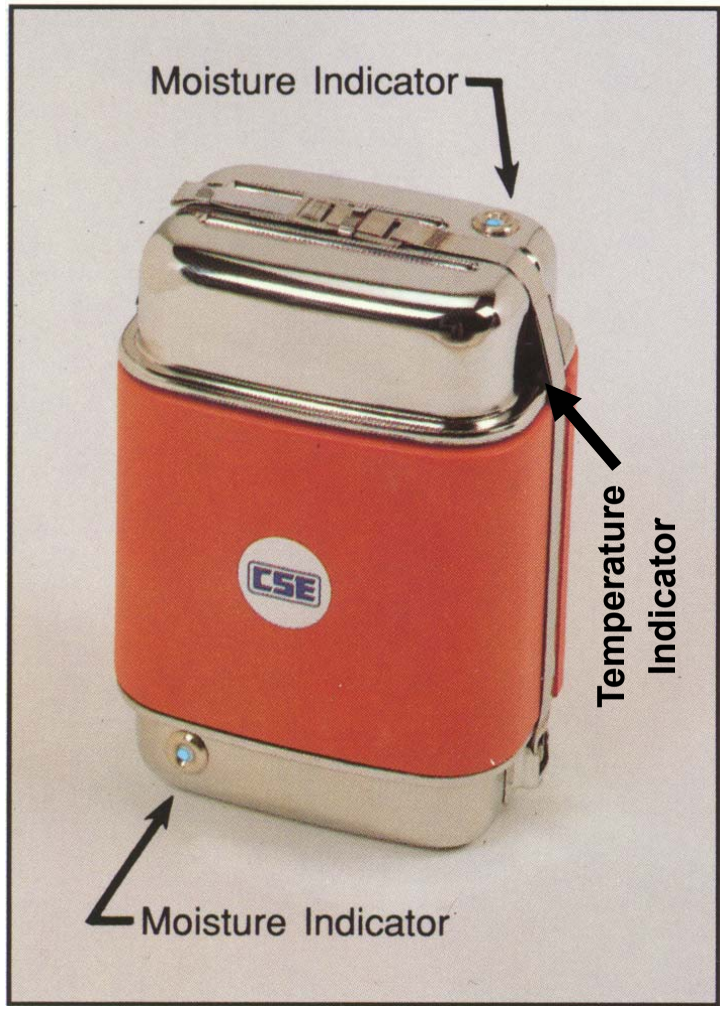
Approved as an Escape Self Contained Breathing Apparatus (ESCBA) the CSE SR-100 may also be referred to as Person Wearable Self Contained Self Rescuer (PWSCSR), rebreather or closed circuit breathing apparatus. The SR-100 recycles the user’s exhaled breath, chemically removing carbon dioxide and replenishing the oxygen based on the user’s demand or work rate. The unit uses a bi-directional chemical canister system in which the users exhaled breath makes two passes through the carbon dioxide absorption/oxygen generation canister before the gas returns to the user. This innovative technology provides the highest level of protection for potentially IDLH applications found in mining, tunneling, chemical plants, pulp/paper plants, water treatment plants, and confined space entry.

The CSE SR-100 provides 100 liters of useable oxygen in the event the user must escape from a potential IDLH atmosphere.

SR-100 FEATURES

Sealed Configuration
The SR-100 is enclosed in a rugged stainless steel case.

Moisture and Temperature Indicators



MAINTENANCE

Keep the SR-100 clean, especially around the moisture indicators and the Temperature indicator. Use a damp cloth to wipe clean. Do not clean SR-100 with petroleum based solvents. Avoid dirt build-up between the carrying pouch and the canister.

The Carrying Pouch should be cleaned periodically using mild laundry detergent in cold water and air dried.

DISPOSAL INSTRUCTIONS

Contact CSE Corporation, CSE Distributor or Licensed Hazardous Material Handler for disposal of SR-100.

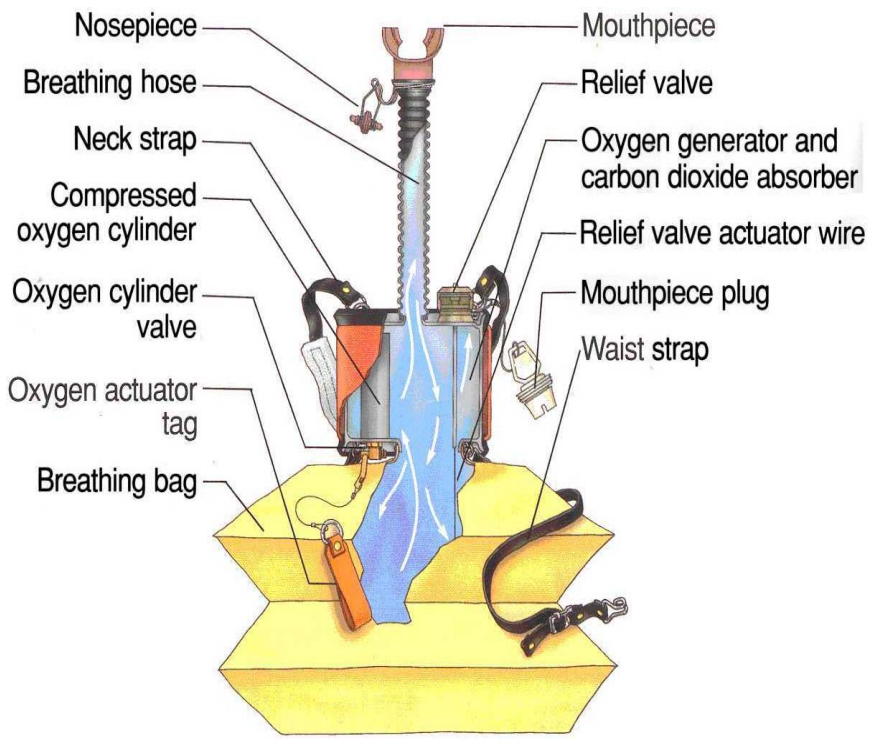
The EPA Hazardous Waste Classifications are:

D001, RQ, Potassium Superoxide, corrosive, 8, UN2466, PGI

D002, RQ, Potassium Superoxide, 5.1, N2466, PGI

Applicable state waste codes, codes that apply to conditions of the products use or specific Hazardous Waste Handler codes should be identified in accordance with federal, state and local regulations.

SR-100 Internal Components



SR-100 OPERATION

Donning from Kneeling Position

Remove SR-100 from carrying pouch and place it on the ground in front of you.

If equipped with a hard hat and lamp place it on the ground in front of you so that the light shines on the SR-100.

Unfasten the pull tab of the security band located at the top of the unit and place your pointer finger through the loop while placing your opposite hand on the top of the unit.

Now pull the tab toward you while pressing with the other hand against the top of the unit. As the security band is released the top and bottom covers can be removed.

Loop the neck strap over your head. Do not adjust the strap until you have completed the donning procedure.

Donning from Standing Position

Remove SR-100 from carry pouch and cradle the unit in one hand.

With the free hand unfasten the pull tab of the security band located at the top of the unit and place your pointer finger through the loop.

While firmly cradling the unit in your opposite hand pull the tab toward you. As the security band is released the top and bottom covers can be removed. Hold on to the goggles.

Loop the neck strap over your head. Do not adjust the strap until you have completed the donning procedure.

SHIPPING PROCEDURES: Continued

When preparing SR-100 packages for transportation by Cargo Aircraft the packages must be plainly marked with the above information and the following statement:

THIS PACKAGE IS NOT AUTHORIZED FOR TRANSPORTATION ABOARD AIRCRAFT IF IT HAS BEEN OPENED.

If you have any question regarding shipping procedures please call CSE Corporation Customer Service at 1-412-856-9200.

SHIPPING PROCEDURES

The CSE SR-100 is a Chemical Oxygen Generator, therefore it is classified as Hazardous Material by the U.S. Department of Transportation and United Nations Dangerous Goods. All SR-100 shipments should be prepared by an individual trained in hazardous materials shipping regulations and shipped in approved packaging with appropriate markings, labeling, shipping documentation, placard and carrier specific requirements:

Proper Shipping Name.....Chemical Oxygen Generator.
Approval .....CA 9912010
Hazard Class.....5.1
Subsidiary Risk.....N/A
UN Number.....3356
Packing Group.....II
SR-100 Net quantity of hazardous materials per .....0.6 kg

When preparing SR-100 packages for transportation by Motor Vehicle, Rail Freight, and Cargo Vessel the packages must be plainly marked with the above information and the following statement:

THIS PACKAGE IS NOT AUTHORIZED FOR TRANSPORTATION ABOARD AIRCRAFT.

SR-100 OPERATION: Continued

Removing a difficult top or bottom cover

Normally the top and bottom covers are easily removed once the security band has been released. In the unlikely event that the covers do stick, they can be removed by following the procedures listed below.

The top cover can be removed by twisting it just as you would twist off the lid of a jar.

The bottom cover can be removed by standing on the security band after it has been released and pulling on the body of the unit.

Holding the unit firmly in both hands, tap the top or bottom cover against a solid surface to knock the cover off.

A screw driver or tool can be used to pry difficult covers off, take care not to puncture or rip the breathing bag and hose when using a tool.

3+3 DONNING PROCEDURES

The 3+3 DONNING PROCEDURES provide an efficient method for donning the SR-100. The first 3 Primary Steps are designed to quickly isolate the individuals respiratory system from potentially IDLH atmosphere. Properly trained the user should be able carry out the Primary Steps in approximately 10 seconds. The next 3 Secondary Steps are designed to make the necessary adjustments to the unit while the user is safely under oxygen.

The user must be proficient in the 3+3 DONNING PROCEDURE before entering the work place.

3 Primary Steps

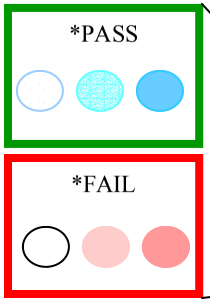
1. Activate Oxygen
2. Insert Mouthpiece
3. Put on Nosepiece

3 Secondary Steps

4. Put on Goggles
5. Adjust Straps
6. Replace Hard Hat and Move Out

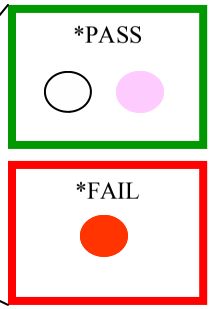
CSE SR-100 INSPECTION CRITERIA: Continued

Moisture Indicator



* Actual color shade may differ slightly

Temperature Indicator



* Actual color shade may differ slightly. Fail indicates unit has been subjected to temperatures exceeding 130˚F.

CSE SR-100 INSPECTION CRITERIA: Continued

Check the Temperature indicator located on the security band, right side of top cover. The Temperature indicator is a dull white to dull pink under normal conditions.
Remove the unit from service if the Temperature Indicator turns to a bright red.

New SR-100 without carrying pouch and with approved carrying pouch.

The carrying pouch should be loose fitting so that the unit may be easily removed when needed in an emergency. See Maintenance for carrying pouch cleaning.

1. Oxygen

Pull the large fluorescent orange **oxygen actuator tag down** to activate the oxygen.

2. Mouthpiece

Remove the mouthpiece plug and immediately insert the **Mouthpiece** into your mouth, exhale into the unit first then start to **breathe normally.**

CSE SR-100
INSPECTION CRITERIA

DAILY VISUAL INSPECTION:

Readiness of the SR-100 is confirmed visually, at any time, by quickly checking the indicators and general condition of the unit prior to entering the workplace.

Check for the following items:

PASS **Remain in Service**	**FAIL** **Remove from Service**
Date of Manufacture, less than 10 years	Date of Manufacture, if date exceeds 10 years.
Security band is secure.	Security band has been become slack, unattached, or unfastened.
Top and bottom moisture indicators are blue. Temperature indicator, located on the side of the unit should be pink or white.	If the top and bottom moisture indicators of either indicator is white or pink or damaged do not attempt to use. If the temperature indicator, located on the side of the unit is red, do not attempt to use.
Top and bottom covers are properly aligned.	Top and bottom covers are jarred or misaligned.
Top and bottom cover seals are properly aligned.	Top and bottom cover seals are cut, split or displaced.
No signs of significant trauma	Signs of significant trauma (beyond normal wear and tear) such as substantial dents in the top and bottom covers or substantial dents, breaks or punctures in the orange plastic outer cover. If the unit has been crushed, burnt, or suffered any damage that cause the security strap to become slack , unattached, or unfastened.

DURATION:Continued

The degree of training and familiarity can affect the duration. The more training and experience the subject has with an SCSR, the more their breathing will be calm and controlled. If a subject is familiar with a particular escape way, it may improve the mechanics of their escape. The greater the training and familiarity, the greater the duration.

Talking can increase breathing resistance by allowing saliva to enter the breathing hose and possibly enter the canister. Minimizing talking and swallowing one's own saliva, the greater the duration.

Removing all non-essential carrying weight, the greater the duration.

All SCSR(s) place some limited stress on the user due to increased breathing resistance and an increase in the temperature of the inhaled breath. For this reason, it is always advisable to limit the level of physical exertion, if possible, while wearing any SCSR.

3. Nosepiece

Grip each tab of nosepiece and squeeze gently while pulling the two nose pads apart just enough to slip the **nosepiece** on to nose so that both nostrils are completely closed.

4. Put On Goggles

Put on safety **goggles**. Corrective lens may be worn over top of goggles by looping temples of glasses under goggle straps.

DURATION

The SR-100 is tested and approved by several approval/ certification laboratories. These approvals will carry different duration ratings based on the testing criteria of the particular testing laboratory. Each of these units provide a certain range of protection based on the factors listed below. The duration of ALL SCSR(s) will vary, depending on the user's oxygen consumption rate. In most circumstances, your SR-100 will provide approximately 1 hour of protection. However, there are a number of factors that can affect the user's oxygen consumption and duration. These are:

The amount of work required to escape affects the duration. Running, walking bent over, crawling or climbing a ladder for example will increase the work required to escape. Less work results in greater duration.

The physical condition or fitness of the user affects the duration. A high heart rate, age and percent of body fat suggest inferior levels of fitness. The more fit the user, the more efficient utilization of oxygen, permitting higher work rates or longer durations.

The user's fitness, weight, response to inspired carbon dioxide and tolerance to breathing resistance all affect the amount of oxygen required by the user. The more fit and the less weight, the greater the duration.

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.

MANUAL START PROCEDURES

The user can easily confirm that the oxygen starter system has released oxygen into the breathing bag by two observations.

Once the Oxygen Actuator has been pulled the user will hear a faint hiss of the oxygen being released from the bottle into the unit for a few seconds.

Second and more noticeable indication, the user will see the breathing bag fill as long as the mouthpiece plug is still inserted into the mouthpiece.

In the event the compressed oxygen starter does not activate or the oxygen vents through the mouthpiece because the plug is left out of the mouthpiece during activation, the user should manually start the unit.

1. Remove the Mouthpiece from your mouth. The nose piece should remain attached to the nose.

2. Inhale ambient air through the mouth.

3. Exhale into the mouthpiece to begin inflating the breathing bag.

4. Repeat this process 3 to 6 times until the breathing bag is full.

5. Continue with the 3+3 Donning Procedure.

6. Begin the egress by moving at a moderate work rate, allowing the breathing bag to inflate with the excess oxygen. Once the bag is full, you can then increase your egress to a more normal rate.

5. Adjust Strap

Neck Strap Adjustment. Proper adjustment can be checked by raising your head to look up. If you feel a pull on the mouthpiece, the unit is too low on your chest. Wrap the **waist strap,** which hangs from the bottom of the canister, around your waist and fasten it to the clip on the opposite side of the canister.

6. Replace Hat and Move out

Replace **hard hat** and **move out**.

* After donning your SR-100, discard any non-essential equipment, and/or gear, to minimize your carrying weight.

SECOND UNIT TRANSITION DONNING PROCEDURES

In most circumstances, your SR-100 will provide approximately 1 hour of protection enabling you to safely exit an IDLH atmosphere. However, there are a number of factors that can affect the user's oxygen consumption and duration (See pages 15 - 16 for **Duration**). While donning a second unit is procedurally the same as donning the first unit it is important for the user to be prepared to carry out this change over.

The user should be trained on **Second Unit Transition Donning Procedures.**

1. Access a second unit from cache at the earliest possible time during the egress.

2. Monitor time on first unit, the volume of the breathing bag and breathing resistance. Near the end of use, the breathing bag volume will become noticeably lower and/or the breathing resistance will become almost intolerable. At the end of use the user will be unable to draw any more oxygen from the system.

3. Change over to second unit following donning procedures while there is still volume to the breathing bag and resistance is still tolerable.

Attachment 3
CSE Users' Instructions
Daily and 90-Day Inspetions Manual

Safety
Works

Corporate Headquarters
600 Seco Road
Monroeville, PA 15146
Phone: 412-856-9200
Fax: 412-856-9203
Email: customerservice@csecorporation.com
Website: www.csecorporation.com

SR-100 SCSR

Daily Visual and 90 Day Inspection Criteria

ASMD
Instruction Manual

SR-100 ASMD 10/02 Rev 1
SRX-206-H
October 16, 2002

SR-100

NIOSH/MSHA Approved

TC-13F-239

CSE CORPORATION

Safety Works

ASMD

Warranty Policy

CSE Corporation warrants to the original end-user purchaser this product to be free from defects in material and workmanship for 1 year from the date of purchase. During this period, CSE will repair or replace defective parts on an exchange basis. F.O.B. the factory at Monroeville, Pennsylvania. Freight charges to and from the CSE factory will be paid by the end-user purchaser. The decision to repair or replace defective parts shall be determined by CSE.

Validation: To validate this warranty, the registration card must be detached, completed and returned to CSE's offices within 30 days of purchase.

Conditions and Exclusions: To maintain this warranty, the purchaser must perform maintenance and inspection as prescribed in the owners manual and such other necessary care as may be required according to the use of the equipment in the reasonable judgment of CSE. Normal wear and tear, parts damaged by abuse, misuse, negligence, or accidents are excluded from this warranty. Purchaser acknowledges that, notwithstanding any contrary term or provision in the purchaser's purchase order or otherwise, the only warranty extended by CSE is the express warranty contained herein. PURCHASER FURTHER ACKNOWLEDGES THAT THERE ARE NO OTHER WARRANTIES EXPRESSED OR IMPLIED, INCLUDING WITHOUT LIMITATIONS, THE WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE; THAT THERE ARE NO WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF; THAT NO ORAL WARRANTIES, REPRESENTATIONS, OR GUARANTEES OF ANY KIND HAVE BEEN MADE BY CSE, ITS DISTRIBUTORS OR THE AGENTS OF EITHER OF THEM, THAT IN ANY WAY ALTER THE TERMS OF THIS WARRANTY; THAT CSE AND ITS DISTRIBUTORS SHALL IN NO EVENT BE LIABLE FOR ANY CONSEQUENTIAL OR INCIDENTAL DAMAGES, INCLUDING BUT NOT LIMITED TO INJURY TO THE PERSON OR PROPERTY OF THE PURCHASER OR OTHERS, AND FROM OTHER LOSSES OR EXPENSES INCURRED BY THE PURCHASER ARISING FROM THE USE, OPERATION, STORAGE, OR MAINTENANCE OF THE PRODUCT COVERED BY THE WARRANTY; THAT CSE'S LIABILITY UNDER THIS WARRANTY IS RESTRICTED TO REPAIR OR REPLACEMENT OF DEFECTIVE PARTS AT CSE'S SOLE DISCRETION. The warranty shall be void if the date and/or serial numbers affixed to the products by CSE are removed, obliterated, or defaced.

CSE Corporation, 600 Seco Rd. , Monroeville, PA. 15146 (412) 856-9200 or

1-800-245-2224

Part Number _____ Serial Number_____

ASMD Warranty Statement August 5, 2001

Safety
Works

ASMD
Warranty Registration

Date of Purchase _____ Serial Number_____

Name_____Phone_____

Company_____

Address_____

_____

_____

Mail or Fax ASMD Warranty Card (412-856-9203)

Warranty is void unless registration card is completed and returned to CSE within 30 days of receipt of product.

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Warranty Registration…….. 24

Warranty Policy ……..…...25

SR-100 SAFETY GUIDELINES

THIS MANUAL MUST BE READ COMPLETELY BY ALL INDIVIDUALS USING, INSPECTING OR PROVIDING TRAINING FOR THE CSE SR-100. The CSE SR-100 will perform as designed only if it is maintained and used in accordance with the manufacturer's instructions and regulatory standards. FAILURE TO FOLLOW THESE INSTRUCTIONS AND REGULATIONS COULD RESULT IN SERIOUS INJURY OR DEATH.

SAFETY GUIDELINES – DEFINITIONS

SAFETY TERMINOLOGY. The following symbols are utilized throughout this manual to help you recognize safety related to the SR-100.

WARNING – Indicates a potential hazardous situation which, if not avoided, **could** result in **death or serious injury.**

CAUTION – Indicates a potential hazardous situation which, if not avoided, **may** result in **minor or moderate injury**.

Warning: The CSE SR-100 has been designed by CSE and approved as an Escape Self Contained Breathing Apparatus (ESCBA) and should only be used to escape from atmospheres Immediately Dangerous to Life and Health (IDLH).

Warning: The CSE SR-100 is not approved for use as a Self Contained Breathing Apparatus (SCBA) and should not be used for rescue, fire-fighting or underwater breathing.

Warning: Before donning SR-100 remove any foreign matter from your mouth such as chewing tobacco or gum.

Warning: Breathing through the SR-100 differs from breathing ambient air; temperature and resistance will be slightly higher. This is normal during use and never warrants removal of the mouthpiece.

Warning: The user should be familiar with operational primary escape ways, secondary escape ways and SR-100 cache locations.

Notes:

SR-100 SAFETY GUIDELINES: Continued

Warning; Never remove the mouthpiece unless you have reached fresh air or you are replacing the unit you are wearing with a changeover unit.

Warning: Do not attempt to talk while wearing SR-100, maintain a tight seal on mouthpiece and nose clip. Try to communicate via hand signals or writing.

Warning: Remove the SR-100 from service if any of the following conditions exist: top or bottom moisture indicator is not blue, the security seal is broken, the unit was exposed to temperatures above 130°F and the temperature indicator is red, or show indications of physical abuse (crushed, burnt, visible puncture holes, substantial cracks dents, or any other visible signs of trauma.)

Warning: The unit must temporarily be removed from service if the internal temperature of the unit drops below 32^0F. Once the internal temperature rises above 32^0F the unit may be returned to service.

Warning: Never attempt to use a damaged SR-100, unit already removed from service or that does not meet inspection criteria.

Warning: The SR-100 is intended as a one time use only product, once the unit is opened it is considered spent and should be disposed of properly.

Warning: Avoid direct contact between the breathing bag and open flames or chemicals during use.

Warning: The SR-100 and carrying pouch should be kept clean. Do not submerge the SR-100 in water or use petroleum solvents to clean.

SR-100 SAFETY GUIDELINES: Continued

Warning: The user should perform the daily inspection of the CSE SR-100 prior to carrying the unit.

Warning: Only a trained and qualified individual may perform the 90 day ASMD inspection of the CSE SR-100.

Warning: Do not introduce petroleum based liquids or flammable liquids into the unit. The chemical (potassium super oxide) in this unit is not combustible but it can ignite flammable liquids when they come in contact.

INSPECTION DATA LOG BOOK

		Indicators				
Serial No.	**Date**	**Top**	**Bottom**	**Tempera-ture**	**90-Day ASMD**	**Inspector's Name**
		Pass/Fail	Pass/Fail	Pass/Fail	Pass/Fail	

INSPECTION DATA LOG BOOK

		Indicators				
Serial No.	**Date**	**Top**	**Bottom**	**Tempera-ture**	**90-Day ASMD**	**Inspector's Name**
		Pass/Fail	Pass/Fail	Pass/Fail	Pass/Fail	

ACOUSTIC SOLIDS MOVEMENT DETECTOR (ASMD)

GENERAL DESCRIPTION

Designed to be used by SR-100 operators, the Acoustic Solids Movement Detector (ASMD) was created as a non-destructive method to detect changes in the chemical bed of the SR-100, either through misuse or normal wear and tear. Although, in most cases the trauma can be seen, there are times when the SR-100 does not show significant damage, therefore this manual is to be used as a reference guide for the proper usage and care of the SR-100.

By attaching the ASMD to the front center of the SR-100, a simple shake test can be performed by shaking the unit in an up and down motion, several times. A LED indicator on the ASMD will inform the user as to whether the unit passes the criteria to remain in service. Any unit which does not meet the criteria must be removed form service.

This Test is to be repeated on each SR-100 at least every 90-Days.

CSE SR-100 DAILY INSPECTIONS CRITERIA:

The carrying pouch should be loose fitting so that the unit may be easily removed when needed in an emergency.

New SR-100 without carrying pouch and
with approved carrying pouch.

INSPECTION DATA LOG BOOK

		Indicators				
Serial No.	**Date**	**Top**	**Bottom**	**Tempera-ture**	**90-Day ASMD**	**Inspector's Name**
		Pass/Fail	Pass/Fail	Pass/Fail	Pass/Fail	

INSPECTION DATA LOG BOOK

		Indicators				
Serial No.	**Date**	**Top**	**Bottom**	**Tempera-ture**	**90-Day ASMD**	**Inspector's Name**
		Pass/Fail	Pass/Fail	Pass/Fail	Pass/Fail	

CSE SR-100 DAILY INSPECTION CRITERIA

DAILY VISUAL INSPECTION:

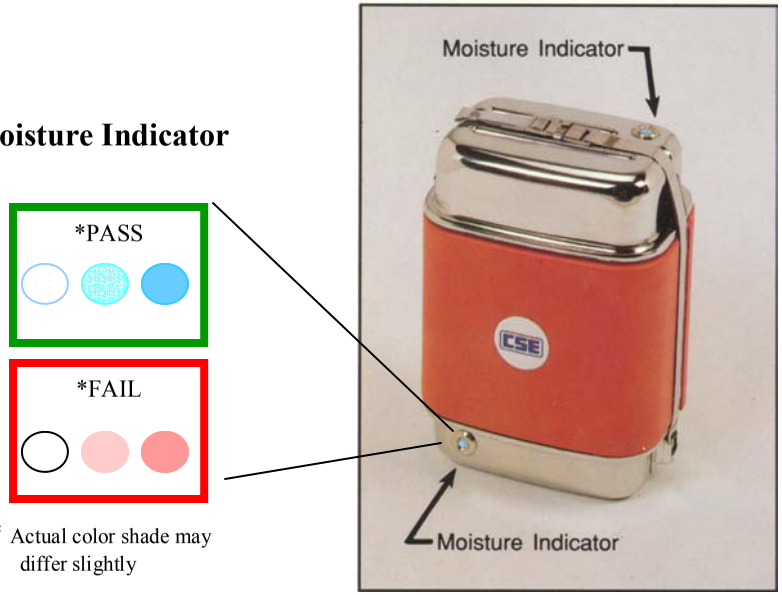
Readiness of the SR-100 is confirmed visually, at any time, by quickly checking the indicators and general condition of the unit prior to entering the workplace.

Check for the following items:

PASS **Remain in Service**	**FAIL** **Remove from Service**
Date of Manufacture, less than 10 years	Date of Manufacture, if date exceeds 10 years.
Security band is secure.	Security band has been become slack, unattached, or unfastened.
Top and bottom moisture indicators are blue. Temperature indicator, located on the side of the unit should be pink or white.	If the top and bottom moisture indicators of either indicator is white, pink or damaged do not attempt to use. If the temperature indicator, located on the side of the unit is red, do not attempt to use.
Top and bottom covers are properly aligned.	Top and bottom covers are jarred or misaligned.
Top and bottom cover seals are properly aligned.	Top and bottom cover seals are cut, split or displaced.
No signs of significant trauma. (Beyond normal wear and tear.)	Signs of significant trauma (beyond normal wear and tear) such as substantial dents in the top and bottom covers or substantial dents, breaks or punctures in the orange plastic outer cover. If the unit has been crushed, burnt, or suffered any damage that cause the security strap to become slack , unattached, or unfastened

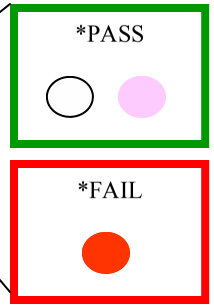
CSE SR-100 DAILY INSPECTIONS CRITERIA: Continued

Moisture Indicator



* Actual color shade may differ slightly

Temperature Indicator



* Actual color shade may differ slightly. Fail indicates unit has been subjected to temperatures exceeding 130°F.

INSPECTION DATA LOG BOOK

Where required by law or regulation, a responsible person should inspect the unit and record the findings in a log or data book. At minimum, the serial number, inspection date, indicator colors, and the inspector's name should be noted.

		Indicators				
Serial No.	**Date**	**Top**	**Bottom**	**Tempera-ture**	**90-Day ASMD**	**Inspector's Name**
		Pass/Fail	Pass/Fail	Pass/Fail	Pass/Fail	

APPENDIX II:GLOSSARY

ASMD - Acoustic Solids Movement Detector

CO_2 - Carbon Dioxide

EGRESS - to go or come out

EPA - Environmental Protection Agency

ESCBA - Escape Self Contained Breathing Apparatus

IDLH - Immediately Dangerous to Life and Health

KO_2 - Potassium Super Oxide

LiOH - Lithium Hydroxide

MSHA– Mine Safety and Health Administration

NIOSH - National Institute of Occupational Safety and Health

O_2 - Oxygen

PWSCSR - Pearson Wearable Self Contained Self Rescuer

SCSR - Self Contained Self Rescuer

CSE SR-100 DAILY INSPECTIONS:

Criteria for Units to Remain to Service

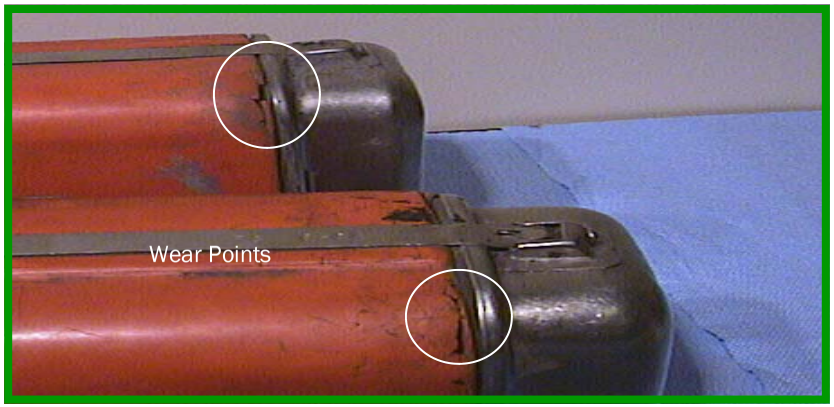
These three units have been in service for approximately six years and show the typical signs of normal wear and tear. The plastic dust covers are abraded on the corners and along the edges. There are also some dents in the top and bottom stainless steel covers.

However, the security bands are in place and the color indicators are blue, indicating no ingress of moisture. The two seals between the top and bottom covers and the chemical canister appear to be securely in place. These units pass the daily and 90-day visual inspection criteria.

CSE SR-100 DAILY INSPECTIONS:

Criteria for Units to Remain in Service

This unit's condition shows normal wear and tear. The abraded corner on the plastic cover and minor dent in the stainless steel top cover do not cause the unit to fail visual inspection. The unit may remain in service if it passes the remainder of the inspection.



These wear points are the result of abrasion and minor impacts that do not adversely affect the SR-100 performance. These units may remain in service if they pass the remainder of inspection criteria.

CSE SR-100 INSPECTION CRITERIA CONTINUED:

5. If the RED LED is visible only once or twice on the first or second shake or not at all the SR-100 may be returned to service. If the RED LED lights up consistently while shaking, the SR-100 must be taken out of service. Please remember to test the SR-100 in a smooth up and down motion rather than violently shaking the unit which could cause unrelated noises and give a false reading.

6. The ASMD is powered with a 9V, field replaceable, battery. If for some reason the power does not come on, replace the battery. To replace the battery, remove the battery compartment cover from the ASMD case, lift pad and remove the battery from the compartment and separate the snap connector from the battery. Connect a fresh 9V battery to the snap connector and wrap it within the foam cushion. Holding the foam tightly against the battery, replace the battery compartment cover. If the power still does not come on, return the ASMD to CSE for repair.

CSE SR-100 INSPECTION CRITERIA CONTINUED:

4. Hold the SR-100 firmly, placing one hand on the top and one hand on the bottom of the unit. Move the unit in a swinging up and down motion from shoulder to waist. This should be repeated four times in a smooth motion.

(look for the RED LED to flash on and off).

(2)Pictures showing the position of the hands/arms during the shake test.

CSE SR-100 DAILY INSPECTION:

Damaged Units, Remove from Service

Examples of damaged units.

All units displayed must be removed from service

Warning: Never attempt to us a damaged SR-100 or unit already removed from service.

CSE SR-100 DAILY INSPECTION:

Damaged Units, Remove from Service

Seals are protruding and security band out of alignment. Such conditions result from forceful impacts.

These units must be removed form service.

This unit has received a severe impact to its top cover. As a result, the top cover has a significant dent and the seal ring has been displaced.

This unit must be removed from service.

CSE SR-100 90 DAY INSPECTION CRITERIA CONTINUED:

90 DAY VISUAL AND ASMD INSPECTIONS CONTINUED:

3. Now your SR-100 is ready to be checked using the Acoustic Solids Movement Detector (ASMD). Check the readiness of the ASMD unit by first turning the ASMD unit on and tapping the case with your finger. This makes a noise causing the red failure indicator to flash on and off. This will confirm the ASMD power switch is on..

Picture showing location of Switch on the ASMD.

CSE SR-100 90 DAY INSPECTION CRITERIA CONTINUED:

90 DAY VISUAL AND ASMD INSPECTIONS:

This is the ASMD Test as detailed:

1. Remove your SR-100 from its carrying pouch.

If difficulty is experienced in getting the SR-100 into or out of its carrying pouch, it can be cleaned with clean, cool water and air-dried. Do not use harsh chemicals or detergents on the pouch or the SR-100 unit. If a pouch wears out and is no longer serviceable, it must be replaced.

2. Slide the harness of the ASMD over the top metal lid and down the orange casing until the straps fit around the lid and case of the SR-100 (Covering the round CSE sticker). Now pull the two Velcro straps firmly through the buckle to tighten the ASMD against the SR-100. Continue to tighten the two straps until the foam of the rubberized sound sensor is slightly compressed, then secure the straps by attaching the Velcro Sections.

Acoustic Solids Movement Detector Mounted on a SR-100

CSE SR-100 DAILY INSPECTION:

Damaged Units, Remove from Service

This unit fails the visual inspection because its seal has been displaced and is protruding from under the stainless steel cover.

This unit must be removed from service.

CSE SR-100 90 DAY INSPECTION CRITERIA:

ASMD SPOT CHECKER: Operating Instructions

The ASMD Spot Checker is used to check the calibration level of the Acoustic Solids Movement Detector (ASMD) making sure the ASMD's red LED comes on at the designated noise level.

Picture of the ASMD Spot Checker

1. To activate the ASMD Spot Checker, plug its power adapter into a 120V outlet, insert the cord from the power adapter into the bottom of the ASMD spot checker and turn on the switch located next to the plug at the bottom of the unit. A green LED will light up to show the power is on.

CSE SR-100 90 DAY INSPECTION CRITERIA CONTINUED:

ASMD SPOT CHECKER: Operating Instructions

2. With the power on you will hear an audible sound emitting from the ASMD Spot Checker. If the audible noise is not heard, return the ASMD Spot Checker to CSE Corporation for repair.

3. The ASMD Spot Checker should be returned to CSE every **six months** for calibration.

Checking ASMD with ASMD Spot Checker

1. Turn on the power switches of both the ASMD and the ASMD Spot Checker. Join the units at their rubber cones, squeeze the cones together so as to compress the foam pad attached to the ASMD rubber cone. At this time the red LED should be visible in the ASMD top panel. If the red LED is visible you are ready to begin using the ASMD. This check of the ASMD should be performed once each day you are going to evaluate SR-100's for noise.

2. If the red LED is not visible when tested with the ASMD Spot Checker, the ASMD must be removed from service and returned to CSE for repair.

Attachment 4
Illustrations

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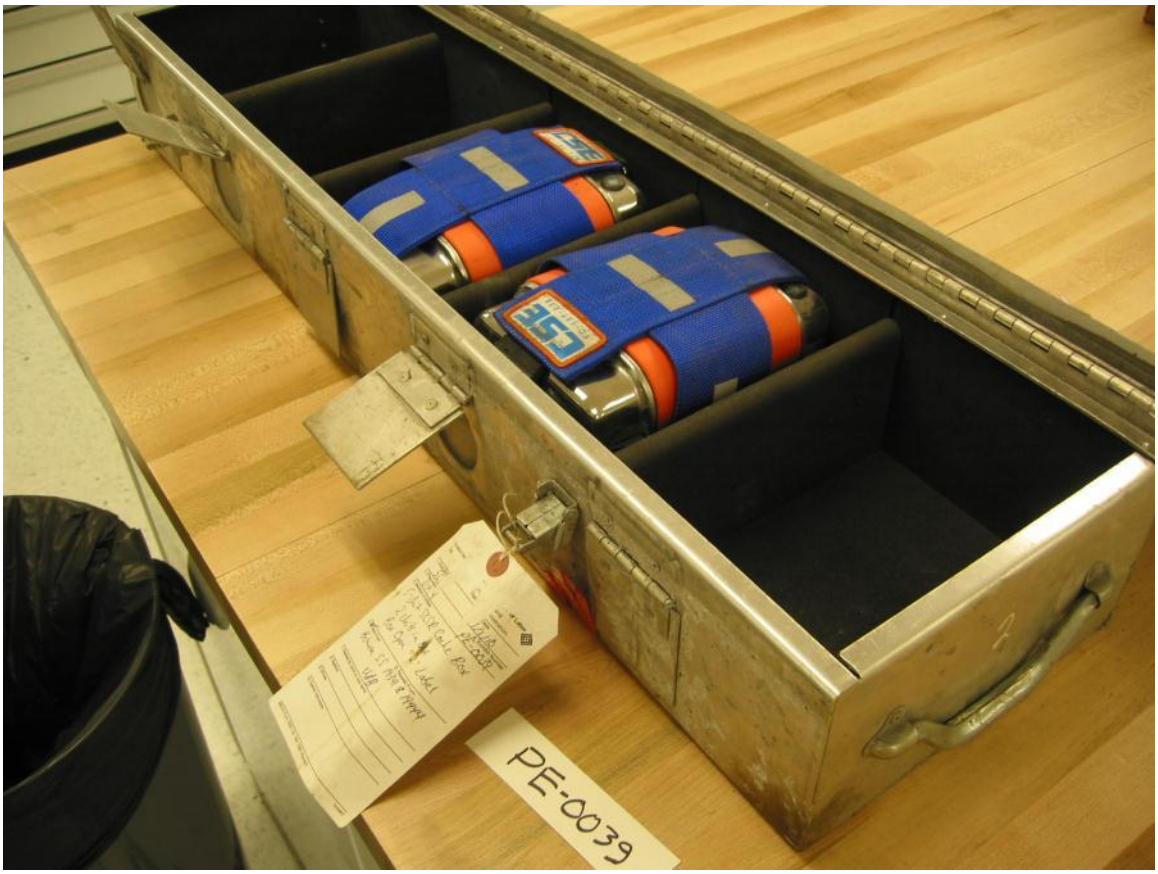

Figure 1 - PE-0039, Units -A and -B in Storage Box

Figure 2 - Unit PE-0039-A

Figure 3 - Unit A-02-A, as Received

Figure 4 - Unit PE-0088, as Received

Figure 5 - Units PE-0101, PE-0108, PE-0110, PE-0111, PE-0197, and PE-0198, as Received

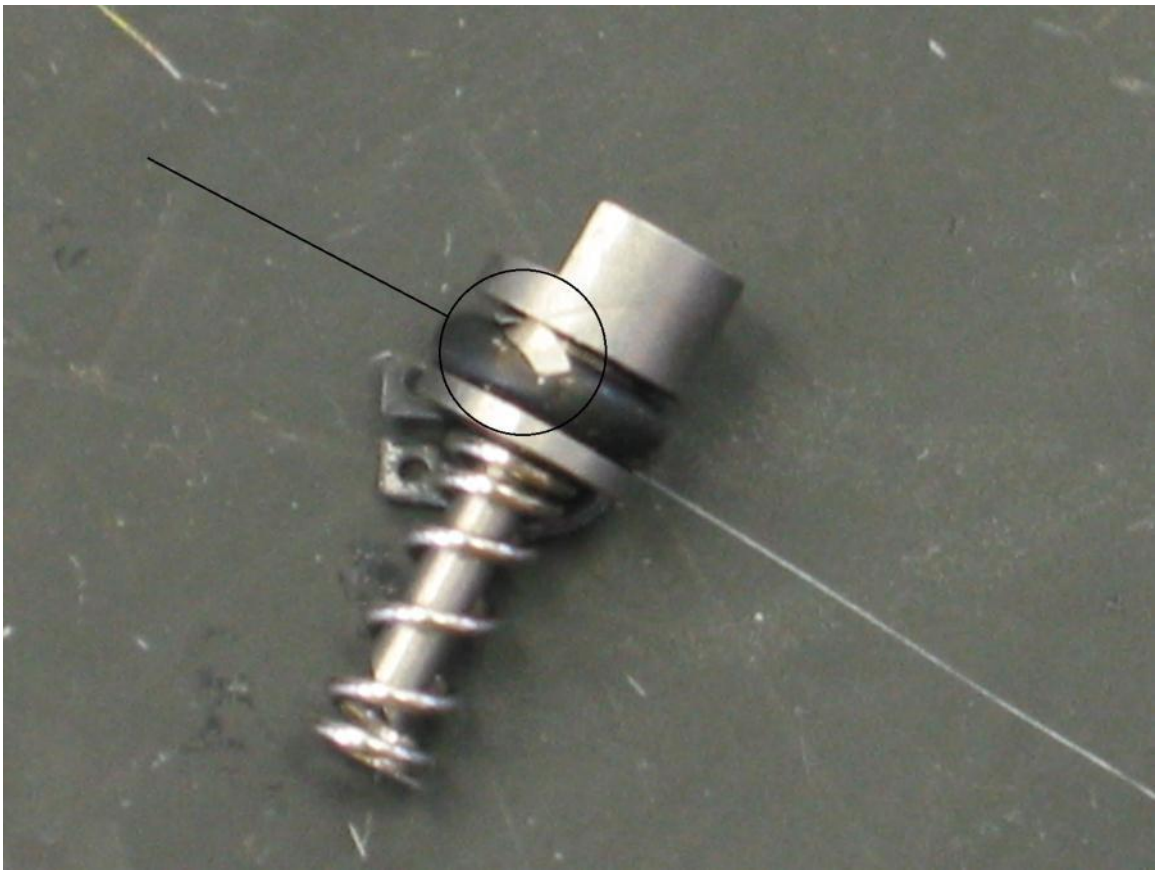

Figure 6 - Starter Plunger from Unit PE-0139-a , Showing Metal Shaving

Figure 7 - Unit A-02-B, as Received (Unactivated)

Figure 8 - Unit A-02-C, as Received and Remaining Chemical

Figure 9 - Unit A-02-D, as Received and Remaining Chemical

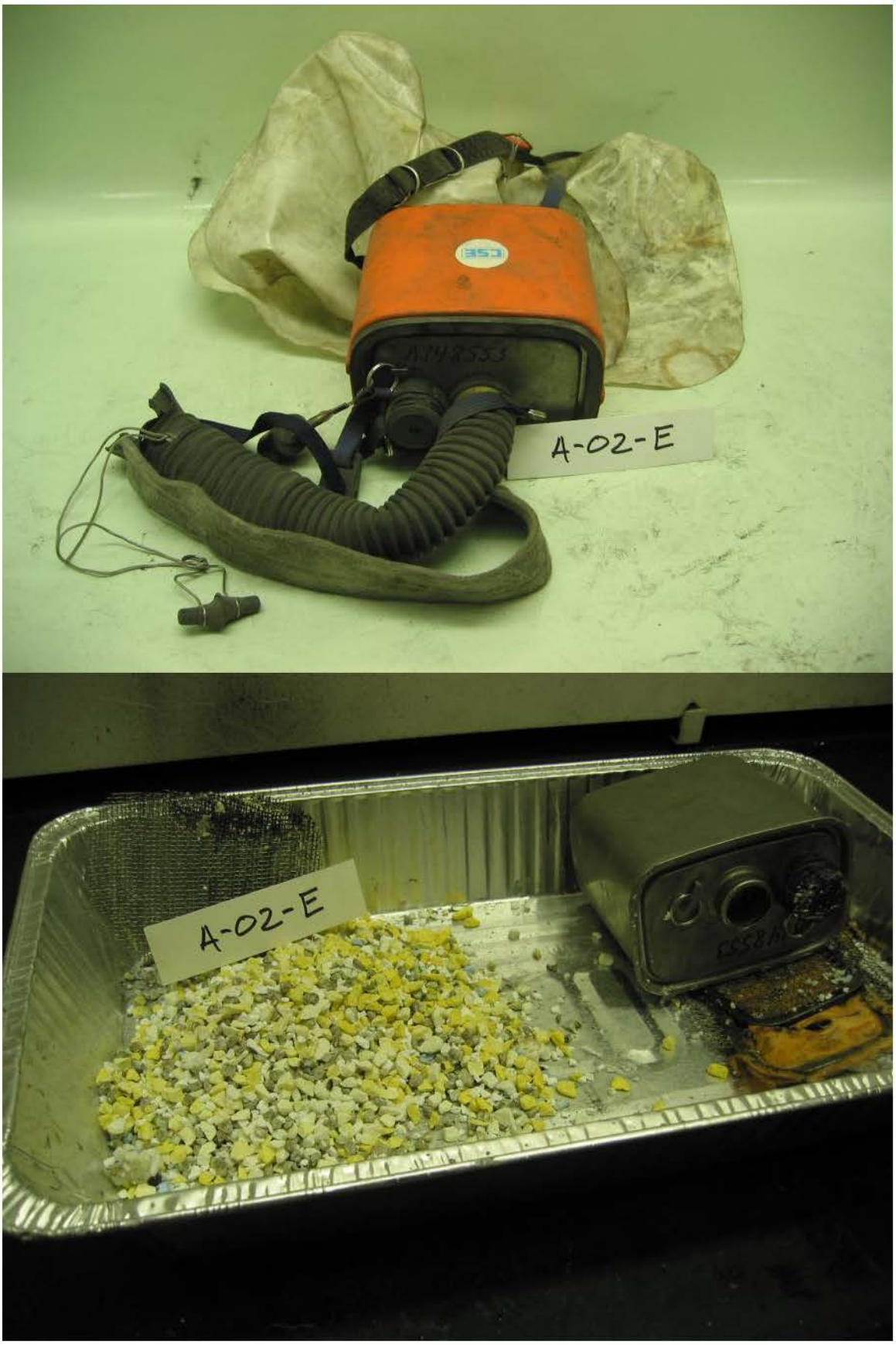

Figure 10 - Unit A-02-E, as Received and Remaining Chemical

Figure 11 - Unit A-02-F, as Received and Remaining Chemical

Figure 12 - Unit A-02-G, as Received and Remaining Chemical

Figure 13 - Unit A-02-H, as Received and Remaining Chemical

Figure 14 - Unit A-02-I, as Received and Remaining Chemical

Figure 15 - Unit A-02-J, as Received and Remaining Chemical

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