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CONTROL AND PREVENTION**

Assessment of Mine Refuge/ Rescue Chamber Technologies

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Introduction

The National Technology Transfer Center (NTTC) was asked by the National Institute for Occupational Safety and Health (NIOSH) to identify the mines within the United States of America that contain refuge chambers. An initial report was submitted to NIOSH on 15 February 2007. The information in that initial report included responses detailing mine refuge chamber information from mine operators and MSHA received by 31 January 2007. Of the 54 mines identified as containing or having contained mine refuge chambers, 19 mines did not respond with confirmation of and additional information about their chambers.

The following report summarizes the information obtained from the remaining 19 mines, as well as any additional mines identified as containing refuge chambers. Unfortunately, 5 of the mines identified during this study did not respond to provide detailed information as of the submittal of this report. However, 4 of those mines were able to confirm that they contained chambers.

The specifics of the original and subsequent NIOSH request are as follows:

1. Compile a listing of all underground mines in the United States that currently have refuge chambers. The listing will include mine name, mine location, type of mine and type of chamber.
2. Provide all relevant information on the design characteristics of the refuge chambers. This would include size, construction information and any and all information related to the chamber itself including communication systems, sanitation facilities, storage of food and water supplies, etc.
3. Where possible collect design specifications including engineering drawings, location within the mine complex and pictures.

The attached report summarizes the information that the NTTC was able to compile up to 9 September 2007 using primary and secondary resources. A short summary outlines the research and information about compiling methods as well as the limitations to the information provided. The remaining portions of the report are summary tables containing the available information about the mines, refuge chambers, and persons contacted during the research of this report. The report provides as complete a set of information as possible given the constraints of time and manpower.

Definition of Refuge Chamber

In the United States, there are different terms used to describe what is termed in this report as a refuge chamber. The reason for using different terms is to avoid MSHA Metal/Nonmetal mining refuge chamber requirements. MSHA requires refuge chambers for mines that do not have secondary escape routes (Gary Gomez, MSHA South Central District). If a refuge chamber is required, it needs to be connected to mine water lines, compressed air lines, and have two forms of communication. A designated refuge chamber also is inspected by MSHA. For this reason, mines that are not required to have

refuge chambers will designate a safe area that can be sealed from the rest of the mine and use a different term such as 'designated place of safety.' By doing this, the mine can avoid the MSHA requirements for refuge chambers.

For the purposes of this report, a refuge chamber is an area, place, haven or shelter within an underground mine that can be sealed off from the rest of the mine in order to protect miners who are unable to get out of the mine in an emergency. The shelter contains equipment (such as food, air, water, first aid, communications, and sanitation facilities) that allow the miners to survive until they can be retrieved or escape. Common words and phrases used to describe these places include mine refuge, refuge chamber, mine safe haven, designated places of safety (DPOS), gathering point, and staging area.

Methodology

The following section summarizes the methodology used to compile information for both the first report and this report. The initial phase of the research portion of this effort involved identifying mines and mining companies that use refuge chambers. A preliminary list of mines containing refuge chambers was identified by searching internet sources (mine company web sites, mine association web sites, Mine Safety and Health Administration (MSHA) web sites, and state mine-safety related websites) and contacting agencies and persons with expertise in or knowledge of refuge chambers. Once identified, the agencies and people were contacted by email, telephone, or in person. The NTTC identified a total 61 mines that reportedly contained refuge chambers. Of those 61 identified, 53 were confirmed as containing chambers. Specific information on these mine's refuge chambers were obtained from mining company representatives, State mine inspectors, Federal (MSHA) inspectors and industry association contacts.

MSHA Headquarters also was contacted to determine if they had any mine refuge information. MSHA indicated that a similar list of United States mines containing refuge chambers was being compiled by the Applied Engineering Division (AED) of MSHA's Approval and Certification Center. NTTC and AED met to discuss and compare findings. AED obtained their information from the MSHA District Offices (6 Metal/Non Metal and 11 Coal offices). The information they compiled identified 28 mines that contained refuge chambers. They also knew that there were approximately 50 mines in the US that had refuge chambers. This information supported the information compiled by NTTC.

In order to avoid duplication of effort, the NTTC and AED began working together to compile a list of contacts that could provide detailed information on mine refuges for the mines identified. Initially, NTTC and AED attempted to obtain the contact information for company mine personnel involved in refuge chamber oversight (safety personnel, engineers, and executives). The AED provided contact information for 28 mines and agreed to attempt to identify email addresses for 6 of those mines. The NTTC attempted to identify the remaining 26 mine contacts.

Specific information on the mine's refuge chambers was primarily through direct contact of company personnel. The AED was restricted by federal law to contacting no more than 9 mines. The NTTC was tasked to obtain the information about the 52 remaining companies. At the time of this report submittal, mine refuge chamber information has been obtained for 57 of the 61 mines identified and is included in Table 1. Detailed chamber information (including chamber specifications) was compiled for 53 of those mines. A listing of the states that do not have mines with refuge chambers is included in Table 2. A total of 184 people were contacted by email and/or telephone to obtain the information summarized in this report. This list is provided in Table 3.

Summary of Results

A total of 61 United States mines were identified as possibly containing mine refuge chambers. The NTTC was able to obtain detailed information on 57 of the 61 mines identified and was able to confirm that 53 of the mines will have, currently have, or have had chambers. A total of 47 mines were confirmed to currently have chambers, 4 mines have had chambers, 2 mines will have chambers, 4 mines had no chambers, and 4 mines had chamber information that was not confirmed. There was conflicting information on the types and number of chambers located within some mines. The attached Table 1 provides a complete summary of the refuge information obtained for each mine identified.

The total number of mines with refuge chambers is not certain because: 1. the mines identified may be an incomplete list because only those U.S. mines potentially with refuge chambers were contacted as part of this study; and 2. the total number of refuge containing mines are subject to change. Current MSHA metal/non-metal regulations require a mine or mine section to have a refuge chamber if there is only one egress route. As mines develop new areas, it may be necessary to use refuge chambers as these areas may not have an emergency escape route until development is complete. Additionally, mine companies have begun to proactively require refuge chambers in their mines. For example, Newmont Mining Company issued a corporate mandate requiring the installation of refuge chambers in their mines by the end of 2006 (Matt Burwell, DEA Inc.).

Of the 53 mines identified and confirmed as having chambers, only 3 coal mines were identified as having refuge chambers. However, there were unconfirmed reports that International Coal Group (ICG) had purchased 30 portable chambers for their mines. With new state regulations being enacted (such as those in West Virginia), the number of coal mines with refuge chambers is expected to increase. The remaining chamber containing mines were metal/non-metal. Mines that formerly contained chambers and mines that indicated that they plan on installing chambers were included in the total number of 53. Additionally, there were unconfirmed reports that two radioactive waste repositories contained or were planning on installing chambers. The following provides a complete breakdown of the mine types:

<u>Mine Type</u>	<u>Number with Refuge</u>
Coal	3
Gold	15
Copper	3
Lead/zinc	10
Limestone	2
Molybdenum	1
Oil Shale	2
Platinum	2
Potash	3
Radioactive	
Storage	2 (unconfirmed)
Salt	3
Silver	4
Trona	3
Uranium	2
<u>Total</u>	53 (excludes unconfirmed)

The following provides a breakdown of what types of refuges were found in the mines:

<u>Chamber Type</u>	<u>Number of Mines</u>
Built-in	20
Portable	24
Built-in and Portable	6
<u>Unknown/unconfirmed</u>	3
<u>Total</u>	53

The construction specifications for, and locations of, the built-in refuge chambers varied. Generally, these chambers are constructed in drifts or excavated areas along a main escape route or near an escape shaft. Typically, they have steel end-walls that have sealable steel doors sealing the ends. Water, electricity, and compressed air are hard connected to the shelter and supplied through the mines' system. Many chambers have backup lighting, water, and air. Other construction methods include building a wooden structure and covering it with a coating of shotcrete. All chambers had communication capabilities such as leaky feeder systems, mine pager telephones, or radios. Summaries of the specifications for built-in chambers are included in Table 1. Some mining companies provided detailed summaries, photographs, and maps of their built-in refuge chambers. This information is included in Attachments A through J.

The construction specifications for and locations of the portable chambers varied. They are typically located within a short walking distance of the work area. Portable chambers are either made by the mining company, a local fabrication shop, or are ordered from refuge chamber manufacturers. Their construction varied. The structures are typically of steel construction and are welded onto pallets for ease of transport. They contain supplies including water and first aid. The simpler units have sealing compound to seal doors and no stand alone supply of compressed air, and limited supplies. The

manufactured chambers have more supplies, are self sealing, and can contain compressed air, monitoring equipment, toilets, and air scrubbing equipment. All chambers had communication capabilities such as leaky feeder systems, mine pager telephones, or radios. Summaries of the specifications for built-in chambers are included in Table 1. Some mining companies provided detailed summaries, photographs, and maps of their portable refuge chambers. This information is included in Attachments K through N.

Limitations

When reviewing the data and results presented in this report, certain limitations need to be considered.

- Not everyone contacted responded to the inquiry.
- People who agreed to provide information did not always provide information.
- Different sources provided varying accounts of the chambers specifications for some of the mines.
- Some sources indicated that certain mines contained chambers and other sources indicated the contrary. For some mines, the information was not confirmed by actual mine operators.
- MSHA is limited in the assistance they can offer NTTC. They are not permitted to contact more than 9 companies without receiving special permission as Federal law prevents them from performing a survey of more than 9 companies.

Summary and Recommendations

The research outlined in this report provides the most comprehensive information on the use of mine refuge stations in the United States. The number of mines utilizing some sort of refuge was greater than initially anticipated and across a wide range of mining sectors. There is a probability that not all refuges have been identified. The number of U.S. mines and their requirement for refuge chambers is constantly changing. Therefore, every mine in the US would need to be routinely contacted and respond to inquiries to maintain a complete inventory.

The information in this report includes responses from mine operators, MSHA, and other sources received by September 10, 2007. There were four mines that indicated they would respond with detailed specifications and did not. They may respond after the completion of this report. If additional information is received, it will be forwarded to NIOSH.

TABLE 1

**United States Underground Mines Known to Contain
Refuge Chambers**

TABLE 1
United States Underground Mines Known to Contain Refuge Chambers

State	Mine Operator/ Company	Mine Contact	Mine	Comments	Material Mined	Original Source(s) to Identify Mine as Having Chamber
Alaska 2P	Teck Cominco American	Dave Godlewski VP, E&PA Teck Cominco American	Pogo Mine Fairbanks, AK	Mine currently does not have any underground refuge chambers. Miners can exit any area of the mine in less than the required MSHA time through multiple exits. During the mine development they used two, 6 person portable refuge chambers. They do have plans to construct two refuge chambers in 2007 as follows: Location: They are to be constructed in 15'W x 15'H x 15'L drifts previously used for diamond drilling along the main mine ramp. Also developing new ore body, L2, and will construct a refuge off that access ramp. Construction Specifications: Drift will be covered with shotcrete and the chamber will have a capacity of 10-15 miners. Supplies and Features: Information not included in description provided.	Gold	Dave Godlewski VP, E&PA Teck Cominco American
Arizona 1P	Cementation USA Inc. (also listed as Resolution Copper Mining LLC)	1. Bill White, Safety Superintendent 2. Mike J. Wegleitner, Manager of H&S 520-689-9374 Ext. 39	Resolution Mine Superior, AZ	Contains 1 'round model' DEA, Inc. refuge chamber. See Attachment K for diagram and pictures of this chamber. Requested additional information from mine representatives two additional times. No additional information was provided. MSHA Website mine database indicates this mine is non-producing.	Copper	1. MSHA District 2. Bill White Safety Superintendent Resolution Mine 3. Mike J. Wegleitner, Manager of H&S Resolution Mine
Colorado 1B1	Twentymile Coal Company	Dianna Ponikvar-Scott Safety Supervisor Twentymile Coal Company	Foidel Creek Mine Oak Creek, CO	Mine has a single, built-in chamber. They are looking at the option of getting portable refuge chambers for each working section but have not made a decision whether to obtain and install any at this time. Location: The chamber is located next to a main air shaft in the central portion of the mine. This location is accessible to all working areas of the mine and has access to the surface through the adjacent air shaft. Construction Specifications: The chamber is built into the seam with coal ribs for walls and has cement block stoppings with sealable steel doors at the end. Supplies and Features: The chamber is supplied by water and compressed air lines. It contains meals ready-to-eat (MRE), a portable toilet, water, a shower, and supplemental roof support. Air is monitored using a CO and CH4 monitor. They do not have any bottled air as a supplemental air supply.	Bituminous Coal	1. Bill York-Fern State of Colorado
7B1	National King Coal, LLC	Dan Redetzke Mine Engineer National King Coal	King Coal Mine Hesperus, CO	Mine contains one built-in chamber. Pictures of chamber are included in Attachment H. Location: Approximately 6,500' in by the portal and approximately 8,000' out by the projected point of furthest penetration, at entry #5, between cross-cuts 39 and 40 in 2-south mains. Construction Specifications: Two concrete block walls at each end with 5' x 5' steel doors in each wall to form an airtlock at ends of chamber. Sidewalls are coal ribs. Size is approximately 1,500 sq. ft and the chamber can accommodate 15 persons for 48 hours. Has a 6-inch borehole connecting chamber to the surface. Supplies and Features: Contains enough food, water, and lightsticks for 15 persons for 48 hours. Has blankets and sleeping pads for half of occupants to rest at a time and a PETT toilet system. There is one ton of bagged rock dust, 48 draeger tube air samplers (1 per hour), a dedicated air oxygen line and a telephone line supplied through the 6-inch borehole to the surface. A 16/4 electrical cable telephone line connects from the surface to Femco mine telephones located inside and directly outside of chamber for communications with rescu	Lignite Coal	William Reitze District 9 MSHA

TABLE 1
United States Underground Mines Known to Contain Refuge Chambers

State	Mine Operator/ Company	Mine Contact	Mine	Comments	Material Mined	Original Source(s) to Identify Mine as Having Chamber
Colorado (cont'd)	Phelps Dodge Corporation and Climax Molybdenum Company	Chris Rose Health and Safety Manager	Henderson Mine Empire, CO	<p>Mine contains 5 built-in refuge chambers. Detailed chamber information, photographs, and location maps are provided as Attachment C.</p> <p>Location: One chamber is built on each of the 5 separate mine levels. These locations were selected due to close proximity to large concentrations of miners. The chambers are at a great enough distance from the panel caving process to insure stability. See Attachment C for detailed description and maps of chamber locations.</p> <p>Construction Specifications: Chambers are constructed in mined excavations. Three are dead end chambers with one access door and two include access to a second escapeway. The ends of the chambers are sealed with concrete or concrete block bulkheads. The chambers are designed to accommodate up to 50 people under emergency conditions for 48 hours if mine supplied air and water are disconnected. Size of chambers range from 680 to 1,200 square feet.</p> <p>Supplies and Features: Each chamber is connected to mine's hard-piped compressed air and water lines. There are three 600 ft³ oxygen cylinders with a regulator as supplementary supply. Contains a secure storage area with stopping materials, hand tools, wedges, duct tape, rags, first aid supplies, blankets, water (at least 6 gallons), 50 family-size meals ready-to-eat (MREs), portable toilets, and an emergency procedures manual. Air can be monitored with a multi-gas monitor (O₂, CO, LEL). Communications to the surface is through a land line telephone, a battery powered Gaitronics telephone, a computer (in most chambers), and/or a leaky feeder system. Each chamber can accommodate 50 persons for 48 hours if disconnected from mine water and air and longer if supplies are not interrupted.</p>	Molybdenum	1. MSHA District 2. Bill York-Fern State of Colorado
	Cotter Corporation	Glen Williams	C-JD-9 Nucla, CO	<p>Mine contains one built-in refuge chamber. The refuge chamber has not been used for an emergency.</p> <p>Location: Not included in description provided.</p> <p>Construction Specifications: The chamber is constructed of wood materials coated in fire retardant. It is approximately 10' wide x 20' deep. The occupancy and method of ingress/egress to the chamber was not provided.</p> <p>Supplies and Features: The chamber is supplied with drinking water and contains an oxygen bottle (size of bottle not provided). Surface communication with the chamber is through the mine's mine phone system.</p>	Uranium- Vanadium	MSHA District
			C-JD-8 Gulnare, CO	<p>Mine contains one built-in refuge chamber. The refuge chamber has not been used for an emergency.</p> <p>Location: Not included in description provided.</p> <p>Construction Specifications: The chamber is constructed of wood materials coated in fire retardant. It is approximately 14' wide x 15' deep. The occupancy and method of ingress/egress to the chamber was not provided.</p> <p>Supplies and Features: The chamber is supplied with drinking water and contains an oxygen bottle (size of bottle not provided). Surface communication with the chamber is through the mine phone system.</p>	Uranium- Vanadium	MSHA District

TABLE 1
United States Underground Mines Known to Contain Refuge Chambers

State	Mine Operator/ Company	Mine Contact	Mine	Comments	Material Mined	Original Source(s) to Identify Mine as Having Chamber
Colorado (cont'd) 101	Mount Royal Ventures LLC	Matt Collins Mine Manager	Cash Mine Idaho Springs, CO	<p>The mine contains one built-in refuge chamber that was constructed in compliance with a direct mandate from the MSHA Denver field office. The chamber has never been used. Detailed information relating to the chamber, the reasoning behind its placement, and photographs/maps are provided as Attachment G.</p> <p>Location: The location was mandated by MSHA (See Attachment G for a discussion on the chamber location selection).</p> <p>Construction Specifications: The chamber is a dead-end, 8' long x 8' wide drift that has been isolated from the mine workings by the construction of concrete block wall made from 8" x 8" block filled with concrete. The entrance to the chamber is covered by a 3/8" thick x 6.5' high x 3' wide steel door. The chamber can hold the underground crew of 6 to 8 persons comfortably (they can sit, stand, or recline). See Attachment G for chamber photographs.</p> <p>Supplies and Features: Chamber contains 10-gallons potable water, first aid kit, backboard/stretchers, small hand tools, duct tape, spray foam (fire rated), brattice cloth, bench and a 5# ABC fire extinguisher. The chamber is connected to the mine's compressed air system. Communications to surface are through a 12 volt, battery powered pager phone (Galtronics, Femco, MSA or equivalent). There are no food supplies or sanitation facilities. No monitoring equipment or water/air purifying systems are within the chamber.</p>	Gold	MSHA District
Idaho 101	New Jersey Mining Co.	Grant Brackebusch, P.E. New Jersey Mining Co.	Golden Chest Mine	<p>Mine has one built-in refuge chamber. Many of the specifications were not included in the description provided. Additional information was requested but no response was received.</p> <p>Location: Not included in description provided.</p> <p>Supplies and Features: Supplied with hand tools, drinking water, stopping material, a compressed air line and a water line. The New Jersey mine is just starting an exploration crosscut so it does not have a refuge chamber.</p>	Gold	Grant Brackebusch, P.E. New Jersey Mining Co.
??	U.S. Silver - Idaho, Inc.	Dave Gray Safety Director Galena Mine	Galena Wallace, ID	<p>In a telephone call, Mr. Gray indicated they had refuge chambers and he would provide information if NTTCC would send an email with specifics. Email provided. No information received to date.</p>	Silver	MSHA District
101	Placer Mining Corporation	Robert Hopper President	Bunker Hill Mine Kellogg, ID	<p>Mine contains one built-in chamber.</p> <p>Location: Chamber is located approximately 2 miles into the mine at a point central to the working areas.</p> <p>Construction Specifications: The chamber is approximately 15' deep x 20' wide and is made out of an excavated area. Three sides are native rock and the fourth is concrete block with an access door. The chamber was designed to accommodate up to 6 people. There are typically 4 miners in the mine at any time.</p> <p>Supplies and Features: The chamber is connected to mine power, water, and compressed air. Supplies include a pager phone, containers of potable water, first aid kit, a stretcher, blankets, hammer, nails, duct tape, and visqueen plastic sheeting. Mr. Hopper was uncertain if there was any monitoring equipment and there was no toilet facilities.</p>	Lead/Zinc	MSHA District

TABLE 1
United States Underground Mines Known to Contain Refuge Chambers

State	Mine Operator/ Company	Mine Contact	Mine	Comments	Material Mined	Original Source(s) to Identify Mine as Having Chamber
Idaho (cont'd)	Hedra Mining Company	Jim Angle Safety Coordinator and Jon Jordan Chief Engineer Lucky Friday Mine	Lucky Friday Mullan, ID	<p>Mine contains an unknown number of Built-in refuge chambers. Information on the chambers varied. The descriptions of the chambers varied by the three people who provided information on the mine (Jim Angle, Jon Jordan, and Robin McCulloch). Jim Angle indicated that he would provide additional information on the refuge chamber in a follow-up email.</p> <p>Location: According to Jon Jordan, the chambers are located on each operating level and they are made from mined openings. They are typically dual purpose locations (shifters office, shop area, or mined out area that is also a refuge chamber).</p> <p>Construction Specifications: Jim Angle indicated that the refuge chambers are fabricated by constructing a chamber out of wood and covering it with a layer of shotcrete. A steel door is welded onto the side for an entry. The most recently constructed chamber was built as follows: 4x6 wood frame covered with wood, wired, and then coated with shotcrete. Robin McCulloch indicated that the mine has a chamber that is a 10' x 20' container vessel stocked with supplies.</p> <p>Supplies and Features: Jon Jordan indicated that he was uncertain of the specific contents of the chambers but knows that they are supplied by compressed air and water lines and contain first aid and water. Communications are by pager telephone and dial telephone systems.</p>	Silver	1. MSHA District 2. Robin McCulloch MT State Bureau of Mines
3 BI 1 P	Sterling Mining Corporation	Daniel Groves Safety Supervisor	Sunshine Mine Kellogg, ID	<p>They are in the process of reopening their mine that has been shut down since 2001. Mine currently has only one egress point so they are constructing three permanent refuge chambers and have one portable chamber. The portable chamber is in the Sterling Tunnel being dug to connect the Sunshine mine to the adjacent Con-Sil Mine (aka. Silver Summit Mine). When the tunnel is completed, the refuge chambers will not be needed since there will be a secondary escapeway through the tunnel to an escape shaft being reconditioned within the Con-Sil mine. This escape shaft is currently in disrepair and its base is flooded. Once the tunnel dig and shaft refurbishment is complete, the chambers will not be needed but will remain in place.</p> <p>Portable chamber -</p> <p>Location: Contained in the tunnel being constructed and located near working face. It is moved by bucket loader as the excavation advances.</p> <p>Construction Specifications: Constructed of 1/8-inch steel by a local fabricator to the following dimensions: 7.5' long x 8' tall x 6' wide.</p> <p>Supplies and Features: Contains piped-in air and water lines (with compressed air and water bottle backup), first aid supplies, dry toilet with lime, and a pager telephone for communication. No air purifying or monitoring equipment is present.</p> <p>Permanent Chambers -</p> <p>Location: Chambers are being constructed adjacent to main shaft (Jewell Shaft) at the mines 3 levels (2,500, 2,700, and 3,100 feet). The 2,500 level chamber is currently under construction and will serve as a staging area, lunch room, and refuge chamber. The 2,700 and 3,100 level chambers will be dedicated refuge chambers only.</p> <p>Construction Specifications: The shell and door are constructed of wood (4x6 frame covered with sheet goods). The exterior is painted with fireproof paint and the interior is lined with plastic burlap to provide a seal so that the chamber has positive pressure. Plastic Burlap also is used to seal the door.</p>	Silver	MSHA District

TABLE 1
United States Underground Mines Known to Contain Refuge Chambers

State	Mine Operator/ Company	Mine Contact	Mine	Comments	Material Mined	Original Source(s) to Identify Mine as Having Chamber
Idaho (cont'd)	Sterling Mining Corporation (cont'd)	Daniel Groves Safety Supervisor (cont'd)	Sunshine Mine Kellogg, ID (cont'd)	Supplies and Features: Each chamber contains piped-in air and water lines (with compressed air and water bottle backup), first aid supplies, dry toilet with lime, and a pager telephone for communication. They plan to have food and alternative lighting but are uncertain of the type of each. The size of the chambers is unknown until they determine number of potential occupants. No air purifying or monitoring equipment is present.	Silver	MSHA District
161			Con-Sil Mine Silver Summit Mine Kellogg, ID	Location: One built-in chamber located adjacent to the escape shaft within mine. It is in place while the escape shaft is being refurbished. Construction Specifications: The shell and door are constructed of wood (4x6 frame covered with sheet goods). The exterior is painted with fireproof paint and the interior is lined with plastic burlap to provide a seal so that the chamber has positive pressure. Plastic Burlap also is used to seal the door. Supplies and Features: Each chamber contains piped-in air and water lines (with compressed air and water bottle backup), first aid supplies, dry toilet with lime, and a pager telephone for communication. They plan to have food and alternative lighting but are uncertain of the type of each. The size of the chambers is unknown until they determine number of potential occupants. No air purifying or monitoring equipment is present.	Silver	MSHA District
Kansas	Lyons Salt Company	Steve Kadel President and General Manager Lyons Salt Company	Lyons Salt Company Lyons, KS	Mine contains one built-in refuge chamber. Location: The chamber is built in a drift adjacent to the escape shaft and is an integral part of the escape shaft. It has been used only for access to the escape shaft because the main hoist was down, not because of a mine disaster. Construction Specifications: Dimensions are 12' x 30' and can accommodate 30 people. It contains cinder blocks, brattice, 2x4's, nails, tools. Connected to the surface by an air shaft. Supplies and Features: It has pipe supplied water and air, blankets, sleeping bags, a first aid kit, and a land line telephone for communication. Additional supplies can be lowered to the chamber by the air shaft. No air monitoring or sanitation is contained in the chamber.	Salt	MSHA District
161			Independence Salt Company Kanopolis, KS	3/12/07 - In a telephone call between MSHA and Jim Varda, Mr. Varda indicated that they do not have a safe haven in their mine.	Salt	MSHA District
161	Hutchinson Salt Company	Max Liby Mine Manager	Hutchinson Salt Company Hutchinson, KS	Mine has one built-in refuge chamber that has never been used in an emergency. Photographs and a diagram of the chamber are included as Attachment E. Location: Chamber is located at the escape shaft. Construction Specifications: Dimensions are 30' x 35 feet and it is constructed of concrete block walls sealed into the floor and walls. It has accommodated up to 60 people during fire drills. The chamber receives air and additional supplies from the surface via a shaft that contains a hoist. Supplies and Features: It has water and space blankets, 5 gallon buckets for sanitation purposes, and a battery telephone and intercom connected to the surface. Occupancy can be indefinite since supplies can be lowered directly into the chamber from the surface via the hoist. No air purifying or monitoring equipment is present.	Salt	MSHA District
Kentucky	Rogers Group	Ed Elliot Safety Supervisor	Jefferson County Stone	MSHA Table indicated that there was a chamber within the mine. Ed Elliot (mine Safety Supervisor) indicated that they do not have any refuge chambers and they have not had them in the past. They feel that using SCSRs is adequate for escape purposes in a hardrock mine. However, they are currently looking into the possibility of using refuge chambers.	Limestone	MSHA District

TABLE 1
United States Underground Mines Known to Contain Refuge Chambers

State	Mine Operator/ Company	Mine Contact	Mine	Comments	Material Mined	Original Source(s) to Identify Mine as Having Chamber
Kentucky (cont'd) 1P	Vulcan Materials	Bill Huffman Safety Supervisor	Richmond Road	No longer have any refuge chambers in use. They used one temporarily when one of their escapeways was down so they could continue to work in that area. It was a portable refuge chamber that was located next to the out-of-service escapeway so that it would have access to water and telephone. He was unable to provide additional information.	Limestone	MSHA District
Missouri 1P	Doe Run Mines	Dennis Murphy Manager, Safety & Environmental Doe Run Mines	Buick Mine	Mine contains one portable 'designated point of safety' (DPOS). These are portable refuge chambers but are not identified as such to avoid the MSHA metal/non-metal requirements for chambers (the requirement to be connected to piped air, potable water, and two forms of communication). Location: Located in either dead-end headings or in drifts away from escape shafts. Construction Specifications: Constructed of steel and vary in size from 10' x 20' to 15' x 25'. Designed to accommodate 10 to 15 personnel. Supplies and Features: Contains 3 pressurized air tanks set to discharge 2 liters per minute per person (enough air supply for 10 people for 1 day). Supplies include drinking water, first aid kits, blankets, mine maps, caulk gun with caulking, copy of escape/evacuation plan, a fire extinguisher, an air tank wrench, a no smoking sign, and a toilet consisting of a bucket and plastic bags. Communication system is supplied by a page telephone. No monitoring equipment or air purifying equipment is supplied.	Lead/zinc	Gary Gomez, Safety Specialist, South Central District, MSHA
1P			Sweetwater Mine	Mine contains one portable 'designated point of safety' (DPOS). These are portable refuge chambers but are not identified as such to avoid the MSHA metal/non-metal requirements for chambers (the requirement to be connected to piped air, potable water, and two forms of communication). Location: Located in either dead-end headings or in drifts away from escape shafts. Construction Specifications: Constructed of steel and vary in size from 10' x 20' to 15' x 25'. Designed to accommodate 10 to 15 personnel. Supplies and Features: Contains 3 pressurized air tanks set to discharge 2 liters per minute per person (enough air supply for 10 people for 1 day). Supplies include drinking water, first aid kits, blankets, mine maps, caulk gun with caulking, copy of escape/evacuation plan, a fire extinguisher, an air tank wrench, a no smoking sign, and a toilet consisting of a bucket and plastic bags. Communication system is supplied by a page telephone. No monitoring equipment or air purifying equipment is supplied.	Lead/zinc	Gary Gomez, Safety Specialist, South Central District, MSHA
3P			Viburnum Mine Number 29	Mine contains three portable 'designated point of safety' (DPOS). These are portable refuge chambers but are not identified as such to avoid the MSHA metal/non-metal requirements for chambers (the requirement to be connected to piped air, potable water, and two forms of communication). Location: Located in either dead-end headings or in drifts away from escape shafts. Construction Specifications: Constructed of steel and vary in size from 10' x 20' to 15' x 25'. Designed to accommodate 10 to 15 personnel. Supplies and Features: Contains 3 pressurized air tanks set to discharge 2 liters per minute per person (enough air supply for 10 people for 1 day). Supplies include drinking water, first aid kits, blankets, mine maps, caulk gun with caulking, copy of escape/evacuation plan, a fire extinguisher, an air tank wrench, a no smoking sign, and a toilet consisting of a bucket and plastic bags. Communication system is supplied by a page telephone. No monitoring equipment or air purifying equipment is supplied.	Lead/zinc	Gary Gomez, Safety Specialist, South Central District, MSHA

TABLE 1
United States Underground Mines Known to Contain Refuge Chambers

State	Mine Operator/ Company	Mine Contact	Mine	Comments	Material Mined	Original Source(s) to Identify Mine as Having Chamber
Missouri (cont'd) 3P	Doe Run Mines (cont'd)	Dennis Murphy Manager, Safety & Environmental Doe Run Mines (cont'd)	Casteel Mine, Number 35	Mine contains three portable 'designated point of safety' (DPOS). These are portable refuge chambers but are not identified as such to avoid the MSHA metal/non-metal requirements for chambers (the requirement to be connected to piped air, potable water, and two forms of communication). Location: Located in either dead-end headings or in drifts away from escape shafts. Construction Specifications: Constructed of steel and vary in size from 10' x 20' to 15' x 25'. Designed to accommodate 10 to 15 personnel. Supplies and Features: Contains 3 pressurized air tanks set to discharge 2 liters per minute per person (enough air supply for 10 people for 1 day). Supplies include drinking water, first aid kits, blankets, mine maps, caulk gun with caulking, copy of escape/evacuation plan, a fire extinguisher, an air tank wrench, a no smoking sign, and a toilet consisting of a bucket and plastic bags. Communication system is supplied by a page telephone. No monitoring equipment or air purifying equipment is supplied.	Lead/zinc	Gary Gomez, Safety Specialist, South Central District, MSHA
5P			Brushy Creek	Mine contains five portable 'designated point of safety' (DPOS). These are portable refuge chambers but are not identified as such to avoid the MSHA metal/non-metal requirements for chambers (the requirement to be connected to piped air, potable water, and two forms of communication). Location: Located in either dead-end headings or in drifts away from escape shafts. Construction Specifications: Constructed of steel and vary in size from 10' x 20' to 15' x 25'. Designed to accommodate 10 to 15 personnel. Supplies and Features: Contains 3 pressurized air tanks set to discharge 2 liters per minute per person (enough air supply for 10 people for 1 day). Supplies include drinking water, first aid kits, blankets, mine maps, caulk gun with caulking, copy of escape/evacuation plan, a fire extinguisher, an air tank wrench, a no smoking sign, and a toilet consisting of a bucket and plastic bags. Communication system is supplied by a page telephone. No monitoring equipment or air purifying equipment is supplied.	Lead/zinc	Gary Gomez, Safety Specialist, South Central District, MSHA
1P			Fletcher Mine	Mine contains one portable 'designated point of safety' (DPOS). These are portable refuge chambers but are not identified as such to avoid the MSHA metal/non-metal requirements for chambers (the requirement to be connected to piped air, potable water, and two forms of communication). Location: Located in either dead-end headings or in drifts away from escape shafts. Construction Specifications: Constructed of steel and vary in size from 10' x 20' to 15' x 25'. Designed to accommodate 10 to 15 personnel. Supplies and Features: Contains 3 pressurized air tanks set to discharge 2 liters per minute per person (enough air supply for 10 people for 1 day). Supplies include drinking water, first aid kits, blankets, mine maps, caulk gun with caulking, copy of escape/evacuation plan, a fire extinguisher, an air tank wrench, a no smoking sign, and a toilet consisting of a bucket and plastic bags. Communication system is supplied by a page telephone. No monitoring equipment or air purifying equipment is supplied.	Lead/zinc	Gary Gomez, Safety Specialist, South Central District, MSHA
1P	Martin Manetta	David Hawley David.Hawley@martinmarietta.com	Parkville Mine	<i>Has one portable Designated Place of Safety (DPOS) unit. Requested additional information on DPOS specifics. Additional information not provided.</i>	Limestone	Gary Gomez, Safety Specialist, South Central District, MSHA

TABLE 1
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State	Mine Operator/ Company	Mine Contact	Mine	Comments	Material Mined	Original Source(s) to Identify Mine as Having Chamber
Montana 1 BE	Stillwater Mining Company	Dee Bray Safety Manager East Boulder Mine	East Boulder Mine Big Timber, MT	<p>1/26/07. Dee Bray indicated that he would meet with the other mine safety people at Stillwater Mining Company (James Phips and John Leak) and put together summary information for their mine refuge chambers within the Stillwater and East Boulder Mines. Two sources provided the information included below.</p> <p>1. The following information was obtained from Robin McCulloch, Montana Bureau of Mines: Mine contains 1 refuge chamber. Location: Main level of mine. Construction Specifications: The chamber is the shell of a tunnel boring machine that had its internal mechanics removed. The boring machine was drilled into a non-producing area where it was grounded and gutted. An entrance was welded onto the empty tunnel boring vessel to create the chamber. Supplies and Features: Mr. McCulloch is unsure of the supplies contained inside.</p> <p>2. The following information was from Matt Burwell of DEA Inc. The mine contains from 1 to 6 'round model' DEA, Inc. refuge chambers. A diagram of this type of chamber is included in Attachment K.</p>	Platinum Group Ore	1. Robin McCulloch, Montana State Bureau of Mines. 2. Matt Burwell, General Manager, DEA, Inc. 3. MSHA District
1-6 P		James Phips Safety Manager Stillwater Mine	Stillwater Mine Nye, MT	<p>1/26/07. Dee Bray indicated that he would meet with the other mine safety people at Stillwater Mining Company (James Phips and John Leak) and put together summary information for their mine refuge chambers within the Stillwater and East Boulder Mines. Two sources provided the information included below.</p> <p>1. The following information was obtained from Robin McCulloch, Montana Bureau of Mines: Mine contains multiple refuge chambers that also serve as lunchroom and gathering spaces. Location: Refuges are located on the active working levels off of the footwall lateral near the bottom of a ramp. Construction Specifications: Constructed out of a short drift. No further information was discussed. Supplies and Features: Contains water, electric, a microwave oven, first aid, and other supplies. Communication is by telephone. It contains water, electric, communication, and other supplies.</p> <p>2. The following information was obtained from Matt Burwell of DEA Inc: The mine contains from 1 to 6 'round model' DEA, Inc. refuge chambers. A drawing and pictures of this type of chamber is included in Attachment K.</p>	Platinum Group Ore	1. Robin McCulloch, Montana State Bureau of Mines. 2. Matt Burwell, General Manager, DEA, Inc. 3. MSHA District
Nevada 8 P	Bonanza Exploration Inc. Newmont Mining Corporation	Joe Kircher Vice President and Chief Operating Officer William Howell Newmont Mining Corporation	Copperstone Mine Reno, NV Deep Post Mine	<p><i>Not listed on MSHA web site as a mine. Numerous attempts to contact made. 8/15/7 - Telephone call to mine receptionist indicated they were not interested in providing information. Final request email sent to Mr. Kircher. No response to date.</i></p> <p>Contains eight of DEA Inc.'s 16-man portable refuge chambers. Chambers have not been used for emergencies and the company is issuing a refuge chamber policy on 2/1/07. See Attachment L for schematic and pictures. Location: Not specified in description provided. Construction Specifications: Steel with stand-alone battery back power for 36+ hours and are connected to mine compressed air and water lines. Supplies and Features: Connected to mine air and water lines. Contain 35 gallons of bottled water, first aid, stokes baskets, blankets, 6 breathable compressed air and 4 medical oxygen bottles, chemical toilets, and split stream air conditioning. Air purification systems include 15 ExtendAir LiOH "curtains" and monitoring equipment for CO, CO₂, O₂, temperature and air pressure. The communication system includes a telephone, leaky feeder radio, and a fiber optic line (to be installed).</p>	Gold Gold	MSHA District Matt Burwell, General Manager, DEA, Inc.

TABLE 1
United States Underground Mines Known to Contain Refuge Chambers

State	Mine Operator/ Company	Mine Contact	Mine	Comments	Material Mined	Original Source(s) to Identify Mine as Having Chamber
Nevada (cont'd) 3P	Newmont Mining Corporation (cont'd)	William Howell Newmont Mining Corporation (cont'd)	Deep Star Mine	Contains three of DEA Inc.'s 16-man portable refuge chambers. See Attachment L for schematic and pictures. Location: Not specified in description provided. Construction Specifications: Steel with stand-alone battery back power for 36+ hours and are connected to mine compressed air and water lines. Supplies and Features: Connected to mine air and water lines. Contain 35 gallons of bottled water, first aid, Stokes baskets, blankets, 6 breathable compressed air and 4 medical oxygen bottles, chemical toilets, and split stream air conditioning. Air purification systems include 15 ExtendAir LJOH "curtains" and monitoring equipment for CO, CO ₂ , O ₂ , temperature and air pressure. The communication system includes a telephone, leaky feeder radio, and a fiber optic line (to be installed).	Gold	Matt Burwell, General Manager, DEA, Inc.
			Chukar Mine	Contains three of DEA Inc.'s 16-man portable refuge chambers. See Attachment L for schematic and pictures. Location: Not specified in description provided. Construction Specifications: Steel with stand-alone battery back power for 36+ hours and are connected to mine compressed air and water lines. Supplies and Features: Connected to mine air and water lines. Contain 35 gallons of bottled water, first aid, Stokes baskets, blankets, 6 breathable compressed air and 4 medical oxygen bottles, chemical toilets, and split stream air conditioning. Air purification systems include 15 ExtendAir LJOH "curtains" and monitoring equipment for CO, CO ₂ , O ₂ , temperature and air pressure. The communication system includes a telephone, leaky feeder radio, and a fiber optic line (to be installed).	Gold	Matt Burwell, General Manager, DEA, Inc.
			Midas Mine	Contains 7 of DEA Inc.'s 16-man portable refuge chambers. See Attachment L for schematic and pictures. Location: Not specified in description provided. Construction Specifications: Steel with stand-alone battery back power for 36+ hours and are connected to mine compressed air and water lines. Supplies and Features: Connected to mine air and water lines. Contain 35 gallons of bottled water, first aid, Stokes baskets, blankets, 6 breathable compressed air and 4 medical oxygen bottles, chemical toilets, and split stream air conditioning. Air purification systems include 15 ExtendAir LJOH "curtains" and monitoring equipment for CO, CO ₂ , O ₂ , temperature and air pressure. The communication system includes a telephone, leaky feeder radio, and a fiber optic line (to be installed).	Gold	Matt Burwell, General Manager, DEA, Inc.
			Leeville Mine	Contains six of MineArc's 15-man and 1 of MineArc's 12-man portable refuge chambers. See Attachment M for presentation containing specification and pictures. Location: Not specified in description provided. Construction Specifications: Steel with stand-alone battery back power for 36+ hours and are connected to mine compressed air and water lines. Supplies and Features: Connected to mine air and water lines. Contain 35 gallons of bottled water, first aid, Stokes baskets, blankets, 3 breathable compressed air and 3 medical oxygen bottles, an oxygen candle, chemical toilets, and split stream air conditioning. Air purification systems is forced circulation through a chemical bed that performs CO/CO ₂ scrubbing, and moisture removal. Chamber has monitoring equipment for CO, CO ₂ , O ₂ , temperature and air pressure. The communication system includes a telephone, leaky feeder radio, and a fiber optic line (to be installed).	Gold	Matt Burwell, General Manager, DEA, Inc.

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United States Underground Mines Known to Contain Refuge Chambers

State	Mine Operator/ Company	Mine Contact	Mine	Comments	Material Mined	Original Source(s) to Identify Mine as Having Chamber
Nevada (cont'd) 7P	Newmont Mining Corporation (cont'd)	William Howell Newmont Mining Corporation (cont'd)	Carlin East Mine	<p>Contains seven of MineArc's 12-man portable refuge chambers. See Attachment M for presentation containing specifications and pictures.</p> <p>Location: Not specified in description provided.</p> <p>Construction Specifications: Steel with stand-alone battery back power for 36+ hours and are connected to mine compressed air and water lines.</p> <p>Supplies and Features: Connected to mine air and water lines. Contain 35 gallons of bottled water, first aid, Stokes baskets, blankets, 3 breathable compressed air and 3 medical oxygen bottles, an oxygen candle, chemical toilets, and split stream air conditioning. Air purification systems is forced circulation through a chemical bed that performs CO/CO2 scrubbing, and moisture removal. Chamber has monitoring equipment for CO, CO2, O2, temperature and air pressure. The communication system includes a telephone, leaky feeder radio, and a fiber optic line (to be installed).</p>	Gold	Matt Burwell, General Manager, DEA, Inc.
1P	Barrick Gold Corporation	Bruce Huber Director, Safety & Health Barrick Gold Corporation	Cortez Hills	<p>Barrick Gold will be purchasing a portable refuge chamber for placement in the mine in the near future.</p>	Gold	
66I 1P		Ken Groves Underground Rescue Coordinator/Trainer Safety and Health Div. Barrick Goldstrike Mines Inc.	Meikle Mine	<p>Mine contains six built-in refuge chambers and one portable refuge chamber. Portable refuge chambers are manufactured by MineARC systems. See Attachment A for pictures and a written description of the chambers.</p> <p>Portable Chamber - Location: Barrick indicated that their chamber is at the following location within the mine: 925. Constructions Specifications: Welded steel enclosure that is 7.8' high x 7.6' wide x 12.1' long. Designed to accommodate up to 12 people. Supplies and Features: Chambers are connected to mine and air with backup oxygen cylinders and candles in the chamber. Chamber also has CO and CO2 scrubbers, air conditioning, first aid kits, chemical toilets, and are equipped with mine telephone and landline telephones for communication. Temperature, humidity, and oxygen levels are monitored through an underground control system. Chambers are connected to mine power but have internal battery backup power in the case of mine power failure.</p> <p>Built-In Chambers - Location: Barrick indicated that their chambers are at the following locations within the mine: 1075, 1225, 1450, 1675, 3885 South Griffin, and 4190 Griffin.</p> <p>Constructions Specifications: Each chamber is designed to accommodate up to 12 miners. Chambers are approximately 15' x 15' x 30'; ground support with 8' friction bolts and 12' swelllex bolts, along with welded wire mesh panels, and covered with shotcrete. Entry into the chamber is through an air lock system. Supplies and Features: Chambers are connected to mine water and air and have backup oxygen and water contained in the chamber. They contain sealing compound for the doors, first aid kits, chemical toilets and are equipped with mine telephone and landline telephones for communication. Temperature, humidity, and oxygen levels are monitored through an underground control system.</p>	Gold	

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United States Underground Mines Known to Contain Refuge Chambers

State	Mine Operator/ Company	Mine Contact	Mine	Comments	Material Mined	Original Source(s) to Identify Mine as Having Chamber
Nevada (cont'd) 285 28	Barrick Gold Corporation (cont'd)	Ken Groves Underground Rescue Coordinator/Trainer Safety and Health Div. Barrick Goldstrike Mines Inc.	Rodeo Mine	<p>Mine contains two built-in and two portable refuge chambers. Portable refuge chambers are manufactured by MineARC systems. See Attachment A for pictures and a written description of the chambers.</p> <p>Portable Chamber - Location: Barrick indicated that their chamber is at the following location within the mine: 4270 and 3920 levels. Constructions Specifications: Welded steel enclosure that is 7.8' high x 7.6' wide x 12.1' long. Designed to accommodate up to 12 people. Supplies and Features: Chambers are connected to mine and air with backup oxygen cylinders and candles in the chamber. Chamber also has CO and CO2 scrubbers, air conditioning, first aid kits, chemical toilets, and are equipped with mine telephone and landline telephones for communication. Temperature, humidity, and oxygen levels are monitored through an underground control system. Chambers are connected to mine power but have internal battery backup power in the case of mine power failure.</p> <p>Built-In Chambers - Location: Barrick indicated that their chambers are at the following locations within the mine: 4100 and 3620.</p> <p>Constructions Specifications: Each chamber is designed to accommodate up to 12 miners. Chambers are approximately 15' x 15' x 30', ground support with 8' friction bolts and 12' swelllex bolts, along with welded wire mesh panels, and covered with shotcrete. Entry into the chamber is through an air lock system. Supplies and Features: Chambers are connected to mine water and air and have backup oxygen and water contained in the chamber. They contain sealing compound for the doors, first aid kits, chemical toilets and are equipped with mine telephone and landline telephones for communication. Temperature, humidity, and oxygen levels are monitored through an underground control system.</p>	Gold	
28	Queenstake Resources USA, Inc.	Brent L. Chamberlain Human Resource Manager Jerritt Canyon Mine	Jerritt Canyon Mine	<p>They have a total of 2 DEA inc. fabricated portable round refuge chambers. A schematic and pictures are included in Attachment K.</p> <p>Location: Chambers are located in areas under initial development where a secondary escape is not yet available. These areas typically have no more than a few people so the chambers (6-8 person capacity) are large enough to accommodate the work crew. They do not use any chambers in areas where they have more than one path of egress. Their placement is determined by the nature of the development but they typically try and locate them within 100 to 200 feet of the working area.</p> <p>Construction Specifications: The chambers are cylindrical steel structures with a steel entry door at one end. They have a capacity of 6 to 8 people and are designed as a short duration refuge.</p> <p>Supplies and Features: The chambers have power (not always), piped air supply, and a telephone (in the form of a Simco telephone or a leaky feeder radio or both). They contain water, first aid, and sealant materials (plastic molding material and silicone-like caulk) to seal the door. They do not expect them to be inside very long so the supplies are limited to those mentioned above. They do not have a beacon or a radio location device on the refuge.</p>	Gold	Matt Burwell, General Manager, DEA, Inc.

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United States Underground Mines Known to Contain Refuge Chambers

State	Mine Operator/ Company	Mine Contact	Mine	Comments	Material Mined	Original Source(s) to Identify Mine as Having Chamber
Nevada (cont'd) 28	Queenstake Resources USA, Inc. (cont'd)	Brent L. Chamberlain Human Resource Manager Jerritt Canyon Mine (cont'd)	Lee Smith Mine	They have a total of 2 DEA Inc. fabricated portable round refuge chambers. A schematic and pictures of this chamber is included in Attachment K. Location: Chambers are located in areas under initial development where a secondary escape is not yet available. These areas typically have no more than a few people so the chambers (6-8 person capacity) are large enough to accommodate the work crew. They do not use any chambers in areas where they have more than one path of egress. Their placement is determined by the nature of the development but they typically try and locate them within 100 to 200 feet of the working area. Construction Specifications: The chambers are cylindrical steel structures with a steel entry door at one end. They have a capacity of 6 to 8 people and are designed as a short duration refuge. Supplies and Features: The chambers have power (not always), piped air supply, and a telephone (in the form of a Simco telephone or a leaky feeder radio or both). They contain water, first aid, and sealant materials (plastic molding material and silicone-like caulk) to seal the door. They do not expect them to be inside very long so the supplies are limited to those mentioned above. They do not have a beacon or a radio location device on the refuge.	Gold	Matt Burwell, General Manager, DEA, Inc.
			Murray Mine	According to Brent Chamberlain, this mine is inactive and no longer contains refuge chambers.	Gold	Matt Burwell, General Manager, DEA, Inc.
			SSX Mine	They have a total of 2 DEA Inc. fabricated portable round refuge chambers. A schematic and pictures of this chamber are included in Attachment K. Location: Chambers are located in areas under initial development where a secondary escape is not yet available. These areas typically have no more than a few people so the chambers (6-8 person capacity) are large enough to accommodate the work crew. They do not use any chambers in areas where they have more than one path of egress. Their placement is determined by the nature of the development but they typically try and locate them within 100 to 200 feet of the working area. Construction Specifications: The chambers are cylindrical steel structures with a steel entry door at one end. They have a capacity of 6 to 8 people and are designed as a short duration refuge. Supplies and Features: The chambers have power (not always), piped air supply, and a telephone (in the form of a Simco telephone or a leaky feeder radio or both). They contain water, first aid, and sealant materials (plastic molding material and silicone-like caulk) to seal the door. They do not expect them to be inside very long so the supplies are limited to those mentioned above. They do not have a beacon or a radio location device on the refuge.	Gold	Matt Burwell, General Manager, DEA, Inc.
	US Government, Department of Energy	Frank Wong Lawrence Livermore National Laboratory	Yucca Mountain Repository	<i>James Rau indicated that they had recently purchased portable MineArc shelters for installation into the underground repository.</i>	Radioactive Waste Storage	James Rau MineARC

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State	Mine Operator/ Company	Mine Contact	Mine	Comments	Material Mined	Original Source(s) to Identify Mine as Having Chamber
New Mexico 4P 60I	San Juan Coal Company BHP Billiton	David Hales	San Juan South, Farmington	<p>Mine contains 4 portable and 6 built-in refuge chambers. Shelters have only been used during escape drills. Detailed descriptions and photographs provided by Mr. Hales are included as Attachment B.</p> <p>Built-In Chambers The six built-in chambers are considered semi-permanent because they may be consumed by longwall gob as mining continues. Location: Constructed shelters are located in the crosscuts between two entries and are out of the line of anticipated blast forces. They are placed at intervals not to exceed 6,000 feet to match the distances identified for SCSR spacing. Original intent was to place SCSR caches in chambers so that miners could rest, communicate with surface, and hydrate before continuing to next cache. New MSHA regulations prevent this because shelters are not designed to withstand 100 psi blast. Construction Specifications: Chambers average 18' wide x 10' high x up to 35' long and are placed in crosscuts with both ends sealed with solid concrete block walls hitched in place with paksetter bags. A borehole connects each shelter to the surface.</p> <p>Supplies and Features: Each shelter is provided air and communication through a borehole to the surface. Other supplies also can be provided through the hole, allowing for an indefinite occupancy time. Each shelter contains enough supplies for 20 persons for 100 hours. Air is provided by mine fans with portable fan backup. Contents include first aid, water, medical supplies, chemical light sticks, and toilet bags with disposable containers. Communication is through: 1. two-wire mine phones connected to the mine system and to the surface via borehole, 2. a leaky feeder radio system, or 3. a PED system.</p> <p>Portable Chambers The 4 portable chambers were manufactured by Jack Kennedy Metal Products and Buildings, Inc. A photo of a chamber and a copy of the Kennedy Chamber brochure is included in Attachment B. Location: One portable shelter is located on each working section and one chamber is a spare and stored underground. Construction Specifications: The chambers are of steel construction with a capacity of 20 people. The chamber was designed for a 100 hour occupancy and this can be extended if the chamber is connected to a borehole. Supplies and Features: Supplies include chemical light sticks, potable water, and a portable toilet. Communication is through a two wire mine phone. Chamber air is purged by compressed air bottles and oxygen is supplied by compressed oxygen bottles. CO2 is scrubbed using lithium hydroxide. Air is monitored using stain tubes and a multi-gas detector with spare batteries.</p>	Coal	1. Rebecca Boam, NM Mine Inspector (former) 2. Chris Hefner, NM Interim Mine Inspector (from 01/07)
	US Government, Department of Energy	Chris Hefner, New Mexico Mine Inspector, State of New Mexico	Waste Isolation Pilot Plant, Carlsbad	<p>Rebecca Boam (former New Mexico Mine Inspector) indicated that it has a refuge chamber. However, Chris Hefner (current New Mexico Mine Inspector) indicated that the mine does not have a refuge chamber. Miners use SCSR's to escape mine. It is a small mine with no longer than 1200 feet to an egress point so SCSR's are adequate.</p>	Underground radioactive waste respository located in a stable salt dome.	1. Rebecca Boam, NM Mine Inspector (former) 2. Chris Hefner, NM Interim Mine Inspector (from 01/07)

TABLE 1
United States Underground Mines Known to Contain Refuge Chambers

State	Mine Operator/ Company	Mine Contact	Mine	Comments	Material Mined	Original Source(s) to Identify Mine as Having Chamber
New Mexico (cont'd)	Mosaic Potash, Carlsbad, Inc.	Chris Hefner New Mexico Mine Inspector, State of New Mexico	Mosaic, Carlsbad	<p>The Mosaic Mine is extensive in size and contains multiple built-in chambers.</p> <p>Location: Primary chambers are located within 10 minutes of a working face. Secondary escape chambers are located every 30 minutes along escape route. These secondary chambers are stocked with enough SCRSs to get the miners to the next chamber.</p> <p>Construction Specifications: Chambers are constructed from an excavated area approximately 40' wide x 100' long x 9' high. Entrances are double sealed.</p> <p>Supplies and Features: Primary chambers contain skids that are loaded with all supplies and support facilities. The skids are kept in the chamber closest to working face. A list of the skids contents was not supplied. Chemical toilets are located in each chamber and communication is available by leaky feeder radio, radio, and mine telephones. Secondary chambers are stocked with chemical toilets and enough SCRSs to get miner to the next chamber.</p>	Potash	<ol style="list-style-type: none"> Gary Gomez, Safety Specialist, South Central District, MSHA Rebecca Boam, NM Mine Inspector (former) Chris Hefner, NM Interim Mine Inspector (from 01/07)
	Intrepid Potash NM LLC, Carlsbad	Alex Tamm Junior Mine Engineer and Johnny Rodriguez, Safety Manager	Intrepid East	<p>Intrepid East Potash mine contains 1 built-in refuge chamber. The mine is extensive in size and the chamber has not been used in an emergency. Detailed descriptions and photographs of the chamber is included as Attachment F.</p> <p>Location: Located approximately 1,500 feet travel distance from utility hoist (primary escape point) in the main shop area of mine. See Attachment F for location map.</p> <p>Construction Specifications: Chamber area is driven into pillar; walls, back, and floor are made of potash/salt. All bulkheads, doors, and regulators are made of steel. Average dimensions are 27' wide x 7' high and a total area of 5,330 ft². The main entrance is a 6' x 6' door on the south end of chamber and a secondary entrance of an adjustable 3' x 4' regulator on the north side of chamber. The chamber is designed to accommodate 35 people for 72 hours (the maximum amount of people underground).</p> <p>Supplies and Features: The chamber is connected to mine compressed air and water lines. Fifteen backup 300 ft³ air bottles and 17.5 gallons of bottled water are contained within the shelter. Additionally, one 25 kg can of sodium hydroxide for CO₂ scrubbing is stored. Other supplies include crackers, flashlight/batteries, hammer, shovel, axe, nail gun, tape, plywood, brattice (for blankets), wood blocks, a 20lb fire extinguisher, a toilet, toilet paper, and a first aid kit. Air can be monitored with a Draeger hand pump and reaction tubes (CO, H₂S, and CO₂). Communication to surface is through a standard MSHA permissible mine phone. A detailed list of supplies is included in Attachment F.</p>	Potash	<ol style="list-style-type: none"> Gary Gomez, Safety Specialist, South Central District, MSHA Rebecca Boam, NM Mine Inspector (former) Chris Hefner, NM Interim Mine Inspector (from 01/07)

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United States Underground Mines Known to Contain Refuge Chambers

State	Mine Operator/ Company	Mine Contact	Mine	Comments	Material Mined	Original Source(s) to Identify Mine as Having Chamber
New Mexico (cont'd) 161	Intrepid Potash NM LLC, Carlsbad (cont'd)	Alex Tamm Junior Mine Engineer and Johnny Rodriguez, Safety Manager	Intrepid West	Intrepid West Potash mine contains 1 built-in refuge chamber. The mine is extensive in size and the chamber has not been used in an emergency. Detailed descriptions and photographs of the chamber is included as Attachment F. Location: Located approximately 400 feet travel distance from production hoist (secondary escape point) near the production shaft area of the mine. See Attachment F for location map. Construction Specifications: Chamber area is driven into pillar, walls, back, and floor are made of potash/salt. The single door is steel. Dimensions of chamber are 31.5' wide x 58' long for a total area of 1,827 ft ² . The chamber is designed to accommodate 35 people for 45 hours. Supplies and Features: The chamber is connected to mine compressed air and water lines. Twelve backup 300 ft ³ air bottles and 17.5 gallons of bottled water are contained within the shelter. Additionally, 15 gallons of limepack for CO ₂ scrubbing is stored. Other supplies include a mine map and evacuation plan, crackers, flashlight, hammers, a saw, wooden blocks and wedges, a nail gun, foam to seal door, blankets, a 20 lb fire extinguisher, containers for toilets, toilet paper, and first aid supplies. Air can be monitored with a draeger hand pump with reaction tubes (CO ₂ , CO, NOx) and a battery operated O ₂ detector. Communication to surface is through a standard MSHA permissible mine phone. A detailed list of supplies is included in Attachment F.	Potash	1. Gary Gomez, Safety Specialist, South Central District, MSHA 2. Rebecca Boam, NM Mine Inspector (former) 3. Chris Helfner, NM Interim Mine Inspector (from 01/07)
New York 501 28	St. Lawrence Zinc Company, LLC	No mine contact identified. Information supplied by: Bill Wilson Team Leader Division of Safety Metal/NonMetal Northeast District MSHA	Balmat Mine No. 4 & Mill Gouverneur, NY	Mine has 5 built-in and two portable (curroated steel cylinders on skids) refuge chambers. Photographs of chambers are included in a presentation found in Attachment J. Location: Chambers are located within 700 to 1,000 feet of the working areas. Construction Specifications: Actual construction specification were not disclosed. Photographs of chambers are included in Attachment J. Supplies and Features: Each chamber is connected to potable water and compressed air lines and contains additional bottled water, first aid supplies, toilet facilities, additional tools and materials for sealing purposes. Communication is provided to each chamber by wired pager telephones.	Lead/zinc	1. MSHA Table 2. Bill Wilson Team Leader Division of Safety Metal/NonMetal Northeast District MSHA
Texas 161	United Salt	Ben Straka Mine Manager Hockley Mine	Hockley Mine	Information provided by Mr. Gary Gomez of MSHA. Mr. Ben Straka of Hockley Mine was contacted and indicated that he would prefer if I obtained information from MSHA. Mine has one built-in refuge chamber to service a mine that has 13 miners underground. Chamber was installed because there is only one main entry/exit shaft. Secondary small escape shaft and refuge chamber were installed to meet requirements. Location: Refuge chamber is located next to a small escape shaft containing a bullet man-cage (in crosscut 300 south and 170 east). Construction Specifications: Information not provided. Supplies and Features: The chamber has a three way intercom. Mr. Gomez was uncertain of what other supplies were stored in the chamber but thought that it was supplied with air and water.	Salt	Gary Gomez, Safety Specialist, South Central District, MSHA

TABLE 1
United States Underground Mines Known to Contain Refuge Chambers

State	Mine Operator/ Company	Mine Contact	Mine	Comments	Material Mined	Original Source(s) to Identify Mine as Having Chamber
Tennessee 12 P	East Tennessee Zinc Company	Dennis Hillman	Young, Coy and Immel Mines	MSHA Southeastern District (Larry Nichols) indicated that these three new zinc mines are not producing but have purchased 12 portable refuge chambers to be installed in these mines. When Mr. Hillman was contacted, he indicated that he would be willing to provide this information. 9/9/07 - No specifics information received to date.	Zinc Non-producing	Larry Nichols and Doniece Schlick Southeastern District MSHA
Utah 2 P	Calcite Explorations LLC	Reggie Portillo Miner	Calcite Explorations LLC Lehi, UT	The mine is a small mine with 2 miners working underground. They were required by MSHA to build a refuge chamber but MSHA has since indicated that they do not need one so it is no longer equipped for use. Mr. Portillo provided me with the information of how it was outfitted when it was operational. Location: Chamber was located on the bottom level of the mine approximately 1000' from the second escapeway. The location of the chamber was designated by MSHA. Construction Specifications: The chamber is approximately 10' deep x 10' wide and is made out of an excavated area. Three sides are native rock and the fourth is concrete block with a sealable access door. Supplies and Features: The chamber (when operational) contained a telephone and was supplied by piped water and air. There was dry-type food supplies and a small first aid kit. There was no toilet or monitoring equipment.	Crushed, Broken Limestone	MSHA District
	Kennecott Utah Copper Corporation (KUCC)	Stephen McLaughlin Underground Safety Engineer KUCC Resource Development	Salt Lake City, UT	Mine contains 2 portable refuge chambers built by MineARC. The chambers have not been used in any emergency. Location: Approximately 1,000 feet outby active face. Construction Specifications: The chamber is constructed from 1/4-inch steel and has dimensions of 7.8 ft high x 7.6 ft wide x 16.1 ft long. It is built on a skid for transport and weighs 8,000 pounds. The chambers are designed to accommodate 12 miners. Supplies and Features: The chambers contain bottled water, first-aid gear, lights, a "camping style" toilet, a two-wire mine paging phone system, and air conditioning. They are connected to mine power but have a battery backup system. Air can be monitored using gas detection tubes and the chamber has a built in air purifying system.	Copper	James Rau MineARC

TABLE 1
United States Underground Mines Known to Contain Refuge Chambers

State	Mine Operator/ Company	Mine Contact	Mine	Comments	Material Mined	Original Source(s) to Identify Mine as Having Chamber
Washington 161 28	Teck Cominco American	Dave Godlewski VP, E&PA Teck Cominco American	Pend Oreille Mine Metaline Falls, Washington	Mine contains one large built-in chamber and 2 portable chambers manufactured by Mid Canada Fiberglass LTD. of Ontario Canada (a fiberglass canoe and speciality company). Location: Information not disclosed. Construction Specifications: Portable chambers are 4' wide x 10' long x 6' tall. The built-in chamber is constructed from a 15' wide x 80' long mined out drift with 2 air lock doors. It is large enough to accommodate everyone in mine at any time. Supplies and Features: The portable and built-in units are connected to the mine's compressor air-lines and are CO monitored to shut the system down if 25 parts per million CO is detected. The portable units have 2-4500 psig Grade "D" breathing air cylinders as backup and the permanent chamber has 8 large breathing air cylinders. The following supplies are contained in both the portable and built-in units: 8 tubes meta caulk, a caulking gun, five 1-gallon jugs of drinking water, a plastic bucket for mixing sealing compound, seven 1-gallon bags of bentonite clay, regulators installed on breathing air cylinders, a portable toilet, a list of emergency telephone numbers, a small first aid kit, three garbage bags, a stretcher kit, a set of emergency procedures, a set of personnel check off sheets, and a box of spare light bulbs. Communication is provided by a page telephone and a dial telephone.	Lead-Zinc	Dave Godlewski VP, E&PA Teck Cominco American
West Virginia	International Coal Group		Unknown	Edward Roscioli of ChemBio Shelter indicated that ICG had recently purchased 30 inflatable mine shelters from ChemBio Shelter for placement in their mines. Attempted to confirm with ChemBio Shelter's partner A. L. Lee Corporation. No additional information was obtained.	Coal	Edward Roscioli CEO ChemBio Shelter
Wyoming 18	Greybull Petroleum, LLC	Jim Wieser Safety Manager Greybull Petroleum	Greybull Field Project	Mine contains one portable refuge chamber manufactured by DEA of Elko, NV. The chamber has never been used for any emergency. Location: Chamber placed at the end of tunnel approximately 760 feet beyond secondary escape raise to surface placed for the protection of drillers. Construction Specifications: Chamber is a steel, 8' diameter cylindrical shaped with overall dimensions of 8.5' high x 17' long. Supplies and Features: The chamber is connected to the mine's compressor air-lines with 2-K size bottles of compressed air as backup supply. The chambers contain first-aid gear, lights, a urinal, and a Femco telephone system. Air is monitored using Solaris gas detectors supplied to each underground worker. Chamber meets the requirements of MSHA 30 CFR 57-11502.	Oil Shale (Portal entry petroleum mine)	1. Donald G. Stauffenberg State Mine Inspector Department of Employment State of Wyoming 2. MSHA Table
			Osage Field Project	Mine is currently under construction and will contain one portable refuge chamber manufactured by DEA of Elko, NV. The chamber has never been used for any emergency. Location: Chamber will be placed in the tunnel once tunneling reaches approximately 1,000 feet of advance. Construction Specifications: Chamber is a steel, 8' diameter cylindrical shaped with overall dimensions of 8.5' high x 17' long. Supplies and Features: The chamber is connected to the mine's compressed air lines with 4-K size bottles of compressed air as backup supply. The chambers contain first-aid gear, lights, a urinal, and a Femco telephone system. Air is monitored using Solaris gas detectors supplied to each underground worker. Chamber meets the requirements of MSHA 30 CFR 57-11502.	Oil Shale (Portal entry petroleum mine)	1. Donald G. Stauffenberg State Mine Inspector Department of Employment State of Wyoming 2. MSHA Table
	OCI Wyoming LP	Terry Leigh	Big Island Mine & Refinery Green River, WY	Mr. Leigh indicated that they do have chambers and requested we provide him with an request email. Email provided. No additional information on chambers received as of 9/8/07.	Trona	MSHA District

TABLE 1
United States Underground Mines Known to Contain Refuge Chambers

State	Mine Operator/ Company	Mine Contact	Mine	Comments	Material Mined	Original Source(s) to Identify Mine as Having Chamber
Wyoming (cont'd) 161	General Chemicals Soda Ash	David Graham Manager Occupational Safety Dustin McGilvray IH Safety Supervisor	General Chemicals Mine Green River, WY	<p>The mine contains one refuge chamber and one "staging area". The staging area is a separate area within the mine that contains supplies for use in the event of an emergency. Neither has been used in an emergency. Correspondence containing information and photographs about the refuge chamber and staging area are included as Attachment D.</p> <p>Refuge Chamber Location: Next to fresh air of the #6 intake shaft. Location is within the general vicinity of 75% of active workings.</p> <p>Construction Specifications: Constructed between two trona pillars. The ends are sealed using reinforced metal stopping that is foamed to insure a seal. The dimensions of the chamber are 18.5' wide x 132' long x 9.5' tall for a total enclosed space of 23,200 cubic feet. The chamber is accessed through a rectangular opening in the metal stopping. Attachment D provides a diagram of the chamber.</p> <p>Supplies and Features: The chamber is connected to the mine's compressed air and water lines. There is an additional 60 gallons of bottled water. The chamber contains blankets, first-aid kit (including bandages, antibiotic ointment, eye wash, analgesics, antiseptic wipes, gauze, and triangular bandages), hand tools, stopping material, foam packs to foam (seal) mandrels/stoppings, a scaling bar, and two porta poties. Communication is through Gai-Tronics Corp. Permissible dial/page phone and a leaky feeder radio system. Monitoring equipment includes a Forman carried Industrial Scientific ITX multi-gas meter to monitor methane, CO, and oxygen as well as a Draeger bellows pump with Oxygen, CO, ammonia, and carbon dioxide analysis tubes.</p> <p>Staging Area Location: Located in the vicinity of the other 25% of active workings.</p> <p>Construction Specifications: The chamber appears to be a section of mined area that has been sealed at the ends to make a chamber. It is approximately 320' long x 18.5' wide x 9.5' tall with 6 smaller rectangular vestibules (each is 40' long x 18.5' wide x 9.5' tall) along the long wall. Attachment D provides a diagram of the area. Total volume of enclosed space is approximately 100,000 cubic feet. The entryway appears to be constructed of metal stoppings covered with foam. There is an airlock at the entryway. Borehole locations are identified on the ceiling of the area as well as on the earth's surface above. The borehole would be drilled at this location to supply food, water, and air in the event of an emergency.</p> <p>Supplies and Features: Supplies include first-aid, suitable stopping materials, foam packs, portable toilets, bottled water, and hand tools. Communication is through Gai-Tronics Corp. Permissible dial/page phone and a leaky feeder radio system. Monitoring equipment includes a Forman carried Industrial Scientific ITX multi-gas meter to monitor methane, CO, and oxygen as well as a Draeger bellows pump with Oxygen, CO, ammonia, and carbon dioxide analysis tubes.</p>	Trona	MSHA District

TABLE 1
United States Underground Mines Known to Contain Refuge Chambers

State	Mine Operator/ Company	Mine Contact	Mine	Comments	Material Mined	Original Source(s) to Identify Mine as Having Chamber
Wyoming (cont'd)	FMC Corporation	Rick Steenberg FMC Corporation	FMC @ Granger Green River, WY	MSHA sent email to their general inquiry address. Mr. Steenberg responded via telephone to MSHA and indicated that they do not have any refuge chambers.	Trona	MSHA District
161	Solvay Chemicals Inc.	Rowdy Heiser Safety Supervisor Solvay Chemicals	Solvay Chemicals Inc Green River, WY	<p>Solvay does not have an established refuge chamber per the definition of MSHA. They have an established "Staging Area" that is a separate area within the mine that contains supplies for use in the event of an emergency. Correspondence containing information about the staging area are included as Attachment I.</p> <p>Location : Staging area is located within an previously mined area on the 2 South Sub Main between 11 and 12 crosscut. This location is in close proximity of active mining panels to the southeast and southwest along both the primary and secondary escapeway.</p> <p>Construction Specifications : Located within a previously mined area and sealed with airlocks to minimize contamination with mine. Additional construction specifications and size are unknown.</p> <p>Supplies and Features : Area contains compressed oxygen cylinders, additional SCSRs, first aid kit, permissible page telephone, chemical lights, potable water, chemical toilet, miscellaneous hand tools, and foam packs and curtain materials. Mine also contains additional health and safety materials as listed in letter included as Attachment I.</p>	Trona	MSHA District

TABLE 2

**US States with Mines Not Known to Contain Refuge
Chambers**

TABLE 2
US States with Mines Not Known to Contain Refuge Chambers

State	Information Source	Comments
Alabama	Doniece Schlick Southeastern District MSHA	With the exception of Tennessee, she is aware of no metal/nonmetal mines with refuge chambers in this district. Unknown if there are any coal mines with chambers.
Arkansas	1. Michael VanDorn, MSHA in AR. 2. Gary Gomez Safety Specialist South Central District of MSHA.	1. The State of Arkansas has only one underground mine and it has no underground shelter. - Michael VanDorn 2. No underground mines in Arkansas. - Gary Gomez
California	Steve Hart, Department of Industrial Relations	California has 5 underground mines. None of them have refuge chambers.
Connecticut	MSHA Website	No underground mines listed on website.
Delaware	MSHA Website	No underground mines listed on website.
Florida	Ben Hart	No underground mines in Florida.
Georgia	Doniece Schlick Southeastern District MSHA	With the exception of Tennessee, she is aware of no metal/nonmetal mines with refuge chambers in this district. There are no reported underground coal mines in Georgia (MSHA Website).
Hawaii	MSHA Website	No underground mines listed on website.
Louisiana	Willard Graham, MSHA in LA	No refuge chambers in LA mines.
Maine	Steven Greeley Supervisor, Occupational Safety & Health Program, ME. Department of Labor	We have no active underground mines in Maine. All we have is surface mining.
Maryland	William Wilson Northeast District	No underground metal/nonmetal mines with chambers.
Massachusetts	MSHA Website	No underground mines listed on website.
Minnesota	MSHA Website	No underground mines listed on website.
Mississippi	MSHA Website	No underground mines listed on website.
New Hampshire	MSHA Website	No underground mines listed on website.
New Jersey	MSHA Website	No underground mines listed on website.
North Carolina	William Gerringe Chief, Mine & Quarry Bureau North Carolina Department of Labor	We have no active underground mining here in North Carolina thus no mine refuge chambers. All mining conducted in N.C. is surface metal/non-metal.
North Dakota	MSHA Website	No underground mine listed on website.
Ohio	John Zants and Harold Plumly (Ohio DNR Mine Inspectors)	John Zants and Harold Plumly responded indicating that there are no refuge chambers in Ohio mines at this time.
Oklahoma	1. Brian Goepfert 2. Gary Gomez Safety Specialist South Central District MSHA	The only metal/nonmetal mine in Oklahoma does not have refuge chambers. - Brian Goepfert One mine in OK and it has no refuge chamber. - Gary Gomez

TABLE 2
US States with Mines Not Known to Contain Refuge Chambers

State	Information Source	Comments
Oregon	Gary Lynch, Oregon Department of Geology and Mineral Industries	Currently, no underground mining in the state.
Pennsylvania	Joe Scaffoni, Bureau of Deep Mine Safety.	He indicated that he was unaware of any chambers in PA mines. PA has both limestone (10 – 12) and coal mines (around 40 underground in western PA).
Rhode Island	MSHA Website	No underground mines listed on website.
South Carolina	MSHA Website	No underground mines listed on website.
South Dakota	Mike Cepak, Natural Resources Engineering Director, Minerals and Mining Program, Department of Environment and Natural Resources	No underground mines in operation.
Vermont	MSHA Website	One underground quarry listed. Dandy Quarry run by Vermont Quarries Corp.
Virginia	Carroll Green, Supervisor, Division of Mines, VA Dept. of Mines, Minerals & Energy	Do not have any mines containing refuge chambers.
West Virginia	William Wilson Northeast District MSHA	No underground metal/nonmetal mines with chambers.

TABLE 3

List of People Contacted as Part of Report

**TABLE 3
People Contacted As Part of Report**

Location	Company	Contact Name/ Title	Contact Method	Comments	
Federal Government Agencies	MSHA HQ	Rodney Brown Public Information MSHA	Telephone	Provided MSHA Approval and Certification Center (A&CC) contact, Joe Judeikis.	
		George Fesak Policies and Procedures MSHA	Telephone	Provided Rodney Brown as contact.	
		Joe Judeikis Chief Applied Engineering Division Approval and Certification Center MSHA	Email Telephone In Person	Provided the information that his group (Applied Engineering Division) had collected and worked with NTTC to collect additional information from MSHA District Offices and mining companies.	
		Melinda Pon	Email	1/31/07 - Not responded to date. Unknown if request was forwarded.	
		Walter Slomski General Engineer MSHA	Email Telephone In Person	Worked with NTTC by sharing the information MSHA had collected to date and assisted in collection of additional mine refuge information from MSHA and mining companies.	
		Andrew Yanik General Engineer MSHA	Email Telephone In Person	Worked with NTTC by sharing the information MSHA had collected to date and assisted in collection of additional mine refuge information from MSHA and mining companies.	
		Alice Beacco	Email	1/31/07 - Not responded to date. Unknown if request was forwarded.	
		Ted Farmer Supervisor Utah Field Office	Forwarded Email Fax	Faxed me a response indicating that there are no underground coal mines in Utah that have refuge chambers.	
		Richard Laufenberg Assistant District Manager	Email	1/31/07 - No response to date.	
		MSHA Rocky Mountain District Office			

**TABLE 3
People Contacted As Part of Report**

Location	Company	Contact Name/ Title	Contact Method	Comments	
Federal Government (cont'd)	MSHA North Central District Office	Steven Richetta District Manager	Email	No mines in North Central District contain chambers.	
	MSHA Northeastern District Office	Michael Franklin Division of Safety	Email	Responded indicating that this District Office had responded to my inquiry.	
		Roger McClintock Supervisory Special Investigator		1/31/07 - Not responded to date. Unknown if request was forwarded.	
		James Petrie District Manager	Email	Forwarded my request to Bill Wilson.	
	MSHA South Central District Office	Bill Wilson Team Leader Division of Safety	Email	Provided information on the one mine in district that has a chamber.	
		Gary Gomez Safety Specialist	Email Telephone	Provided a summary of mines with refuge chambers in this district.	
		Edward Lopez Supervisor	Email	1/31/07 - Not responded to date. Unknown if request was forwarded.	
		Frederick Moore Missouri Field Office	Email	Provided information on Missouri mines with chambers.	
			Ralph Rodriguez Field Office	Email	Referred me to another contact within MSHA.

TABLE 3
People Contacted As Part of Report

Location	Company	Contact Name/ Title	Contact Method	Comments
Federal Government (cont'd)	MSHA South Central District Office (cont'd)	Michael VanDorn Little Rock Field Office	Email	Replied to my email on 1/3/07 and indicated that there is only 1 underground mine in AR and it has no refuge.
	MSHA Southeastern District Office	Michael Davis District Manager	Email	Forwarded my request to others in district.
		Arthur Ellis Assistant District Manager	Email	Forwarded my request to others in district.
		Larry Nichols Title Unknown	Email	Provided contact information for East Tennessee Zinc Company.
	MSHA Western District Office	Doniece Schlick Safety Specialist	Email	Provided summary of mines in district with refuge chambers.
		Ronald Goldade District Manager	Email	He is no longer in District. He forwarded my email to District Office.
	MSHA Coal District 1	John Kuzar District Manager	Email	No mines in District contain chambers.
		Thomas Light Assistant District Manager	Email	No mines in District 2 contain chambers.
	MSHA Coal District 2	William Pinceroff District Manager	Email	Forwarded NTTC inquiry email to Thomas Light.
		Carlos Mosley District Manager	Email	No mines in District 3 contain chambers.
	MSHA Coal District 3	Robert Hardman District Manager	Email	1/31/07 - Not responded to date. Unknown if request was forwarded.
		MSHA Coal District 4		

TABLE 3
People Contacted As Part of Report

Location	Company	Contact Name/ Title	Contact Method	Comments
Federal Government (cont'd)	MSHA Coal District 5	Jim Kiser	Email	No mines in district 5 contain chambers.
	MSHA Coal District 9	Ray McKinney District Manager	Email	Forwarded to Jim Kiser.
		Robert Cornett Assistant District Manager	Email	Forwarded my request to others in district.
		Ted Farmer Utah Field Office Supervisor	Fax	Indicated that he had no knowledge of any coal mines in Utah with refuge chambers.
State Government Agencies				
Alabama	Dept. of Industrial Relations, Mining and Reclamation	Michael Skates Dept. of Industrial Relations, Mining and Reclamation		1/31/07 - Not responded to date. Unknown if request was forwarded.
Alaska	Dept. of Natural Resources	Tom Crafford Dept. of Natural Resources	Email	Replied to my email indicating that there are 3 underground mines in AK. He forwarded my request to contacts at each mine and provided me with the contact names.
Arkansas	Geological Commission	John McFarland Chief Geologist	Email	1/31/07 - Not responded to date. Unknown if request was forwarded.
	Dept. of Labor	Bonita Stocks Contact Person Mine Safety Training	Email	1/31/07 - Not responded to date. Unknown if request was forwarded.
Arizona	State of Arizona	Tim Evans Deputy Mine Inspector	Email	1/31/07 - Not responded to date. Unknown if request was forwarded.
	State of Arizona	Pat Fitch Deputy Mine Inspector	Email	Forwarded my email inquiry to John Stanford.
	State of Arizona	Douglas Martin State Mine Inspector	Email	1/31/07 - Not responded to date. Unknown if request was forwarded.
	State of Arizona	John Stanford Deputy Mine Inspector	Email	Emailed me to indicate that Resolution Copper is the only mine in AZ with a chamber.
	State of Arizona	Kerry Ugalde Assistant to the Mine Inspector	Email	1/31/07 - Not responded to date. Unknown if request was forwarded.

**TABLE 3
People Contacted As Part of Report**

Location	Company	Contact Name/ Title	Contact Method	Comments
State Government Agencies (cont'd)				
Colorado	State of Colorado	Bill York-Fern Mine Inspector	Email	Provided summary of mines with refuge chambers in Colorado.
California	Cal/OSHA	Stephen Hart Principal Engineer Cal/OSHA Mining and Tunneling Unit	Email	Emailed me to indicate that there are no refuge chambers in the 5 operating underground mines in CA.
Delaware	Penn State University	Christopher Bise Chairman (Retired) Mining Engineering and Industrial Health and Safety Programs	Email Telephone	Provided contact information for the current Chairman of the Delaware Health and Safety Program.
Florida	Dept. of Environmental Protection	Ben Hart Manager Mine Safety Training Program	Email	Emailed to indicate that there are no underground mines in state.
Illinois	Dept. of Natural Resources	General Email Inquiry Address Mines and Minerals Unit	Email	1/31/07 - No response to date.
	Dept. of Natural Resources	Don McBride Mine Safety Training Division	Email	1/31/07 - No response to date.
	Dept. of Natural Resources	Michael Woods Manager Mine Safety Training Division	Email	1/31/07 - No response to date.
Idaho	Idaho	Web Page for Idaho Geological Survey	Email	Provided information on the operating underground mines in Idaho.
Kansas	State of Kansas	Lee Graham Coordinator Small Mine Safety Program	Email	1/31/07 - Not responded to date. Unknown if request was forwarded.
		Harold Stone Mine Inspector	Email	He did not have any information on what mines contain refuge chambers.
Louisiana	Office of Conservation	General Email Inquiry Address Injection and Mining Division	Email	1/31/07 - Not responded to date. Unknown if request was forwarded.

TABLE 3
People Contacted As Part of Report

Location	Company	Contact Name/ Title	Contact Method	Comments
State Government Agencies (cont'd)				
Louisiana (cont'd)	Dept. of Natural Resources	Dale Bergquist Office of Conservation	Email	1/31/07 - Not responded to date. Unknown if request was forwarded.
	MSHA	Willard Graham MSHA	Email	Indicated that there are no mines with refuge chambers in state.
Maine	Dept. of Labor	Steven Greeley Supervisor Occupational Health and Safety Program	Email	Emailed indicating they have no underground mines in Maine.
Maryland	Dept. of Environment	Al Hooker Mining Permitting Section	Telephone	Was not aware of any refuge chambers in their mines. He referred me to Maryland's MSHA Field Office.
Minnesota	Dept. of Natural Resources	Peter Clevensine Manager of Engineering Division of Land and Minerals	Email	1/31/07 - No response to date.
	Dept. of Natural Resources	Jeanne Mittelstadt Supervisor Division of Land and Minerals	Email	1/31/07 - No response to date.
Mississippi		Web Page Information		There are no underground mines in state.
Missouri	Dept. of Labor and Industrial Relations	Steve Dunn Assistant Director Division of Labor Standards Mine and Cave Safety	Email	No information on refuge chambers. Provided MSHA Field Office contacts.
	Department of Labor	Chris Catlett Chief Bureau of Safety Division of Employment Relations	Email	Provided Ron Unscheid as an appropriate contact.
Montana	Bureau of Mines	Robin McColloch Bureau of Mines	Email	Provided information on the three mines that contain chambers.
	State of Montana	Ron Unscheid State of Montana	Telephone	Indicated that the state does not inspect underground mines.
	Univ. of Nebraska, Kearney	Rod Jobman Mine Safety and Health Program Nebraska Safety Center	Email	1/31/07 - Not responded to date. Unknown if request was forwarded.

TABLE 3
People Contacted As Part of Report

Location	Company	Contact Name/ Title	Contact Method	Comments
State Government Agencies (cont'd) Nevada	Nevada Bureau of Mines and Geology	General Email Inquiry Address	Email	1/31/07 - Not responded to date. Unknown if request was forwarded.
	Commission of Mineral Resources	General Email Inquiry Address Division of Minerals	Email	1/31/07 - Not responded to date. Unknown if request was forwarded.
	Nevada Bureau of Mines and Geology	David Davis Geologic Information Specialist	Email	Provided links and contacts for information related to refuge chambers.
	State of Nevada	Doug Dreisner State of Nevada	Email	The main companies operating underground mines would be Newmont Mining Corp., Barrick Gold, and Queenstake. Contact them for additional information. Also contact John Brown of NV Mining Assoc.
	New Mexico Tech	Rebecca Boam State Mine Inspector (former)	Email Telephone (attempted)	Provided a summary of the 4 mines in New Mexico that have chambers.
New Mexico	New Mexico Tech	Chris Hefner State Mine Inspector	Telephone	Provided detailed information on mines with refuges in New Mexico.
New York	Department of Labor	Program Manager Division of Safety and Health	Email	No knowledge of underground mine refuge chambers in NY.
North Carolina	Dept. of Labor	William Gerringer Chief, Mine & Quarry Bureau	Email	Indicated that there are no underground mines in state.
	Division of Land Resources	Floyd Williams State Mining Specialist	Email	Indicated that there are no underground mines in state.
North Dakota	State Land Dept.	Rick Larson Minerals Management	Email	Uncertain if there were any underground mines in state. Provided contact information.

**TABLE 3
People Contacted As Part of Report**

Location	Company	Contact Name/ Title	Contact Method	Comments
State Government Agencies (cont'd) Oregon	Oregon Dept. of Geology and Mineral Industries	Gary Lynch Assistant Director of Regulation Mineral Land Regulation and Reclamation Program	Email	1/31/07 - Not responded to date. Unknown if request was forwarded.
	Oregon Dept. of Geology and Mineral Industries	Lina Ma Geologist	Email	1/31/07 - Not responded to date. Unknown if request was forwarded.
	Oregon Dept. of Geology and Mineral Industries	Vicki McConnell State Geologist	Email	1/31/07 - Not responded to date. Unknown if request was forwarded.
	Dept. Of Natural Resources	Robert Broecker Mine Inspector	Email	1/31/07 - Not responded to date. Unknown if request was forwarded.
	Dept. Of Natural Resources	Mel Byers Mine Inspector	Email	1/31/07 - Not responded to date. Unknown if request was forwarded.
	Dept. Of Natural Resources	James Edgar Mine Inspector	Email	1/31/07 - Not responded to date. Unknown if request was forwarded.
	Dept. Of Natural Resources	Charlie Hutton Mine Inspector	Email	1/31/07 - Not responded to date. Unknown if request was forwarded.
	Dept. Of Natural Resources	Fred Kidd Mine Inspector	Email	1/31/07 - Not responded to date. Unknown if request was forwarded.
	Dept. Of Natural Resources	Jerry Luyster Mine Inspector	Email	1/31/07 - Not responded to date. Unknown if request was forwarded.
	Dept. Of Natural Resources	Steve McKee Mine Inspector	Email	1/31/07 - Not responded to date. Unknown if request was forwarded.
Ohio	Dept. Of Natural Resources	Mike Pannepucci Mine Inspector	Email	Referred me to his supervisors.
	Dept. Of Natural Resources	Harold Plance Mine Inspector	Email	Referred me to his supervisors.

TABLE 3
People Contacted As Part of Report

Location	Company	Contact Name/ Title	Contact Method	Comments
State Government Agencies (cont'd)				
Ohio (cont'd)	Dept. Of Natural Resources	Greg Plumly Mine Inspector	Email	Referred me to his supervisors.
	Dept. Of Natural Resources	Alan Solitis Mine Inspector	Email	1/31/07 - Not responded to date. Unknown if request was forwarded.
	Dept. Of Natural Resources	Rudy Romshak Mine Inspector	Email	1/31/07 - Not responded to date. Unknown if request was forwarded.
	Dept. Of Natural Resources	Mike Reese Mine Inspector	Email	1/31/07 - Not responded to date. Unknown if request was forwarded.
	Dept. Of Natural Resources	Timothy Renneker Mine Inspector	Email	Referred me to his supervisors.
	Dept. Of Natural Resources	Jerry Stewart Mine Inspector	Email	1/31/07 - Not responded to date. Unknown if request was forwarded.
	Dept. Of Natural Resources	John Ziants Mine Inspector	Email	Indicated that he was unaware of any refuge chambers in the underground mines of Ohio (both coal and metal/non metal).
	Dept. Of Natural Resources	Brian Goepfert OK Field Office	Email	There is one underground mine in state and it has no refuge chambers.
	Dept. Of Natural Resources	Matthew Bertovich Division Chief Program Dev. & Tech. Services	Email	No refuge chamber in PA mines.
	Dept. Of Natural Resources	Christopher Bise Chairman (Retired) Mining Engineering and Industrial Health and Safety Programs	Email Telephone	Provided contact information for PA mine inspectors.
Oklahoma	Bureau of Deep Mine Safety	Paul Hummel Bureau of Deep Mine Safety	Email	1/31/07 - Not responded to date. Unknown if request was forwarded.
	Dept. of Environmental Protection	Joel Pontorero Mining Manager Greensburg District	Email	No knowledge of underground mine refuge chambers in PA. Referred to another contact.
Pennsylvania	Bureau of Deep Mine Safety	Paul Hummel Bureau of Deep Mine Safety	Email	1/31/07 - Not responded to date. Unknown if request was forwarded.
	Dept. of Environmental Protection	Joel Pontorero Mining Manager Greensburg District	Email	No knowledge of underground mine refuge chambers in PA. Referred to another contact.

**TABLE 3
People Contacted As Part of Report**

Location	Company	Contact Name/ Title	Contact Method	Comments
State Government Agencies (cont'd)				
Pennsylvania (cont'd)	Bureau of Deep Mine Safety	Joe Scaffoni Bureau of Deep Mine Safety	Email Telephone	No knowledge of underground mine refuge chambers in PA.
	Dept. of Environmental Protection	Michael Smith Mine Manager Moshannon District Dept. of Environmental Protection	Email	No knowledge of underground mine refuge chambers in PA. Referred to another contact.
South Dakota	Dept. of Environment and Natural Resources	Mike Cepak Natural Resources Engineering Director	Email	No longer any underground mines in state.
	Dept. of Environment and Natural Resources	Robert Townsend Natural Resources Minerals and Mining Program	Email	1/31/07 - Not responded to date. Unknown if request was forwarded.
Tennessee	Dept. of Labor and Workforce Development	Cade Sexton Director Division of Mines	Email	No coal mines in state contain mine refuge chambers.
Utah	Dept. of Natural Resources	Peter Hess Mining Engineer Coal Regulatory Program Division of Oil, Gas and Mining	Email	Referred to Jim Springer, Public Information Officer.
	Dept. of Natural Resources	Mark Mesch Program Administrator Abandoned Mine Reclamation Division of Oil, Gas and Mining	Email	Provided a link to Utah Geology and Mining web page.
	Dept. of Natural Resources	Jim Springer Public Information Officer	Email	Not involved in mine safety. Provided contact information for mine safety personnel.

TABLE 3
People Contacted As Part of Report

Location	Company	Contact Name/ Title	Contact Method	Comments
State Government Agencies (cont'd) Virginia	Division of Mines, VA Dept. of Mines, Minerals & Energy	General Email Inquiry Address Division of Mines	Email	1/31/07 - Not responded to date. Unknown if request was forwarded.
	Dept. of Mines, Minerals & Energy	Carroll Green Supervisor Division of Mines	Email	No refuge chamber in VA mines.
	Dept. of Natural Resources	General Email Inquiry Address	Email	1/31/07 - Not responded to date. Unknown if request was forwarded.
Washington	Dept. of Natural Resources	Dave Norman Mine Inspector	Email	Indicated that the Pend Oreille Mine (Pb-Zn) is the only underground mine in WA and is operated by Teck Cominco. Provided contact person (Dave Godlewski).
	State Inspector of Mines	Don Stauffenberg State Inspector of Mines	Email	Indicated that Gerybull petroleum has refuge chamber and provided company contact.
Wyoming	<i>Wyoming Department of Employment</i>	<i>Terry Adcock State Inspector of Mines</i>	<i>Email</i>	<i>6/21/07 - NTTC emails Mr. Adcock asking for information on mines with chambers in Wyoming.</i>
	Mining Associations			
Colorado	Colorado Mining Association	Company web page general information email contact.	Email	Asked if they would provide information about underground mines and refuge chambers within Colorado. No reply received.
	Nevada Mining Association	John Brown	Email Telephone	Indicated that he would send an email to association members asking for them to respond to my request for information.
Utah	Utah Mining Association	General email inquiry address Utah Mining Association	Email	1/31/07 - Not responded to date. Unknown if request was forwarded.
	Utah Mining Association	David Litvin President	Email	Forwarded email request to Ralph Sanich.
	Utah Mining Association	Ralph Sanich Title Unknown	Email	Indicated that he was unaware of any refuge chambers in Utah.

**TABLE 3
People Contacted As Part of Report**

Location	Company	Contact Name/ Title	Contact Method	Comments
Industry Contacts Alaska	Kennecott Greens Creek Mining Company	Caroline Cave Health and Safety Superintendent Greens Creek Mining Company	Email	Emailed on 1/30/07.
	Mystery Creek Resources, Inc. Nixon Fork Mine	William Burnett Mine Manager	Email	Indicated that Nixon Fork Mine does not have a refuge chamber.
	Saint Andrew Goldfields Nixon Fork Mine	Paul Jones	Email	Not responded to date.
	Tech Cominco American	Dave Godlewski VP, E&PA Teck Cominco American	Email	Emailed description on 1/16/07.
	Teck-Pogo, Inc	Karl Hanneman Pogo Gold Mine	Email	Not responded to date.
	Resolution Copper Mining LLC	Mike J. Wegleitner, Manager of H&S Cementation USA Inc.	Telephone	Called on 1/30/07. Left Message.
	Resolution Copper Ming LLC	Bill White Safety Superintendent	Email	Emailed on 1/11/07. Not responded to date.
	National King Coal, LLC	Trent Peterson King Coal Mine Hesperus, CO	Email	Forwarded my request to appropriate people in company to answer inquiry.
	National King Coal, LLC	Dan Redetzke Mine Engineer King Coal Mine Hesperus, CO	Email	Provided information on refuge chambers.
	Arizona	Resolution Copper Mining LLC	Mike J. Wegleitner, Manager of H&S Cementation USA Inc.	Telephone
Resolution Copper Ming LLC				
Colorado	National King Coal, LLC	Trent Peterson King Coal Mine Hesperus, CO	Email	Forwarded my request to appropriate people in company to answer inquiry.

TABLE 3
People Contacted As Part of Report

Location	Company	Contact Name/ Title	Contact Method	Comments
Industry Contacts (cont'd) Colorado (cont'd)	Phelps Dodge Corporation and Climax Molybdenum Company	Chris Rose Henderson Mine Empire, CO	Email Telephone	MSHA has been in contact with Mr. Rose. Mr. Rose indicated that they have 4 chambers. Is in the process of compiling specific information. 7/23/07 - NTTC contacted Mr. Rose via telephone. Mr. Rose indicated that he would be happy to provide the information pending approval from his corporate office. NTTC sends an email summarizing the reason for the study and what type of information is requested. 8/17/07, 8/27/07, and 8/30/07 - Continued correspondence with Mr. Rose related to information gathering. 9/5/07 - Mr. Rose provides information. 1/30/07 - Provided information about their chamber.
	Twenty Mile Coal Company	Dianna Ponikvar-Scott Safety Manager Foidel Creek Mine	Telephone	
	Cotter Corporation	Gus Javiotis	Email Telephone	1/24/07 - MSHA emailed chamber inquiry email. 2/1/07 - MSHA called Mr. Javiotis and left message. 7/18/07 - NTTC emailed chamber inquiry email. 8/15/07 - Attempted contact via telephone, NTTC request forwarded to Glen Williams.
	Cotter Corporation	Glen Williams	Telephone	8/15/07 through 8/17/07 - NTTC and Mr. Williams exchange telephone messages. 8/22/07 - NTTC speaks with Mr. Williams. He requests an email to be forwarded requesting the specifics of our request. NTTC sends email. 8/29/07 - Continued correspondence with Mr. Williams. Information on refuge chambers provided.
	Mount Royal Ventures LLC	Matt Collins Mine Manager	Telephone Email	MSHA spoke with Matt Collins on telephone and sent a request for refuge chamber information email on 3/9/07. 7/18/07 - NTTC sends an email containing specifics of request. 8/15/07 through 8/17/07 - Exchanged telephone messages with Mr. Collins relating to information request. 8/22/07 - Matt Collins indicated that he will forward answers to email questionnaire. 8/23/07 - Refuge chamber information provided.

TABLE 3
People Contacted As Part of Report

Location	Company	Contact Name/ Title	Contact Method	Comments
Kentucky	Rogers Group	Ed Elliot Safety Supervisor Jefferson County Stone	Telephone	Rogers Group does not have any refuge chambers at this time. They have not had them in the past. They feel that using SCsRs is adequate for escape purposes in a hardrock mine. However, they have been looking into the possibility of using refuge chambers.
	Vulcan Materials	Bill Huffman Safety Supervisor Richmond Road	Telephone	Indicated that they no longer use a refuge chamber as it was only temporary while an escapeway was out of service. Provided information on the chamber that was used.
	Hecla Mining Company	Company web page general information email contact.	Email	Emailed information request to company on 12/18/06. They have two underground mines in US: 1. Lucky Friday Mine, Coeur D'alene, ID 2. Greens Creek, Admiralty Island, AK Provided information on mine refuge chambers.
Idaho	Hecla Mining Company	Jim Angle Safety Coordinator Lucky Friday Mine	Email Telephone	
	Hecla Mining Company	John Jordan Chief Engineer Lucky Friday Mine	Telephone	Provided some information on Hecla Mining chambers. Also indicated that I should speak with Jim Phips (Stillwater Mine) and Dee Bray (East Boulder Mine), and Jim Angle (Hecla Mining).
	New Jersey Mining	Company web page general information email contact.	Email	Asked if they had operating underground mines with refuge chambers. Email sent On 12/18/06.
	New Jersey Mining Co. Golden Chest Mine	Grant Brackebusch, P.E.	Email	Provided information on their refuge chamber. 8/17/07 - Emailed Mr. Brackebusch asking for additional information on the chamber (including location and construction specifications). No additional information received to date.
	Placer Mining Corporation	Robert Hopper President Bunker Hill Mine	Telephone	Spoke with Mr. Hopper and he indicated that he would like his MSHA Boise Office contact Ron Jacobsen to provide confirmation of our efforts before providing chamber information. MSHA (Mr. Jacobsen) confirms our efforts with Mr. Hopper. 2/07 Attempt contact with Mr. Hopper. 8/14/07 Mr. Hopper provided information on their built-in chamber.

TABLE 3
People Contacted As Part of Report

Location	Company	Contact Name/ Title	Contact Method	Comments
Idaho <i>(cont'd)</i>	<i>U.S. Silver - Idaho, Inc.</i>	Dave Gray Safety Director Galena Mine	Email Telephone	<i>1/29/07 - NTTC speaks with Mr. Gray. He indicates that he would prefer NTTC to forward an email containing specifics of refuge chamber inquiry. NTTC sends email. 7/26/07 - NTTC sends a reminder email requesting information. 8/15/07 - NTTC calls Mr. Gray and leaves a reminder message. 8/30/07 - NTTC sends a reminder email. 9/8/07 - No information received to date.</i>
	US Silver - Idaho Inc.	Mark Hartman President/Operations Manager Galena Mine	Telephone	Provided me with David Gray (Safety Supervisor) as the appropriate contact.
	Sterling Mining Company	Daniel Groves Safety Supervisor Sunshine Mine	Telephone	Provided information on their refuge chambers.
	Kansas	Lyons Salt Company	Steve Kadel President and General Manager Lyons Salt Company	Email
Missouri	Independence Salt Company	Jim Varda Safety	Telephone	Indicated in a call with MSHA that they do not have a safe haven in their mining operations.
	<i>Hutchinson Salt Company</i>	<i>Max Liby Mine Manager</i>	<i>Email</i>	<i>Provided information on refuge chambers to MSHA.</i>
	Doe Run Mines Buick Mine	Dennis Murphy Manager, Safety & Environmental Doe Run Mines	Email	Provided information on the refuge chambers in their 6 mines.
Montana	<i>Martin Marietta Parkville Mine</i>	<i>David Hawley David.Hawley@martinmarietta.com</i>	<i>Email</i>	<i>Indicated that they have one DPOS. Emailed him asking for specifics. 7/26/07 - NTTC sends a reminder email in July requesting specifics to DPOS. 8/30/07 - Emailed him additional request for information. 9/8/07 - No information received to date.</i>
	Montana Tech	General Inquiry	Email	Provided contact information.

**TABLE 3
People Contacted As Part of Report**

Location	Company	Contact Name/ Title	Contact Method	Comments
Industry Contacts (cont'd) Montana (cont'd)	Stillwater Mining Company	Dee Bray Safety Manager	Email Telephone	Mr. Bray indicated that he would meet with the other Stillwater safety personnel and put a summary email together and forward to the NTTC. 1/31/07 Have not received information.
	Stillwater Mining Company	John Leak Safety Coordinator and Emergency Response Coordinator, Stillwater Mining Company	Email Telephone	I was forwarded to him by either Dee Brae or James Phips. He is to provide me with information on Stillwaters refuge chambers.
Nevada	Barrick Gold Corporation	Gregory Lang President Barrick, North America	Email	1/31/07 - Not responded to date.
	Barrick Gold Corporation	Vincent Borg Senior Vice President of Communications Barrick Corporate	Email	6/21/07 - Sent him email asking for information on chambers in their mines. James Rau of MineARC indicated that they had purchased chamber for their Goldstrike mine.
	Barrick Goldstrike Mines Inc.	Ken Groves Underground Rescue Coordinator/Trainer Safety and Health Div.	Email	6/07 - NTTC corresponds with Mr. Groves re. mine refuge request.
	Barrick Gold Corporation	Bruce Huber Director, Safety & Health Barrick Gold Corporation	Email	7/5/07 - Mr. Huber emails mine refuge information.
	Bonanza Exp. Inc. Cooper Stone	Joe Kircher Vice President and Chief Operating Officer	Email	1/31/07 - Not responded to date. 7/18/07 - NTTC emails Mr. Kircher with a questionnaire. 8/15/07 - NTTC calls Bonanza Explorations and receptionist informs that they were not interested in participating. 8/30/07 - NTTC emails final request for information to Mr. Kircher.
	DEA, Inc	Matt Burwell General Manager DEA, Inc.	Email Telephone	Provided information on the portable refuge chambers they manufacture and companies that have purchased them.

TABLE 3
People Contacted As Part of Report

Location	Company	Contact Name/ Title	Contact Method	Comments
Nevada (cont'd)	Newmont Mining Corporation	Bill Howell Refuge Chamber Oversight Newmont Mining Corporation	Email Telephone	Provided total number of portable refuge chamber they have and indicated that he would email NTTC specifics.
	Queenstake Resources USA, Inc	Brent Chamberlain Human Resources Manager Jerritt Canyon Mine	Email Telephone	Provided description of their refuge chambers and usage.
	Intrepid Potash NM LLC, Carlsbad Intrepid East	Johnny Rodriguez, Safety Manager, Intrepid Potash NM LLC Johnny.Rodriguez@intrepidpotash.com	Email	NTTC sends email on 1/11/07. No response as of 1/30/06.
	Intrepid Potash NM LLC, Carlsbad Intrepid East	Alex Tamm Junior Mine Engineer	Email	2/27/07 - Provides email summary of mine refuge chambers.
Tennessee	BHP Billiton San Juan Coal Company	Sustainable Development Contact from BHP Billiton Webpage	Email	7/17/07 - NTTC sends email requesting contact information for San Juan Coal Company Safety Officer.
	BHP Billiton San Juan Coal Company	David Hales Safety Officer	Email Telephone	7/24/07 - NTTC contacts via telephone. Mr. Hales indicates that they have shelters and asked to receive an email containing specific questions. 8/29/07 - Mr. Hales provides email containing mine refuge information.
	East Tennessee Zinc Company	Dennis Hillman	Email Telephone	7/26/07 NTTC telephones Mr. Hillman. He requested that we send an email request and he would respond. NTTC sends email. 8/17/07 and 8/30/07 - NTTC sends a reminder email. 9/8/07 - No information received to date.
Texas	United Salt Company	Ben Straka General Manager Hockley Mine	Email Telephone	Mr. Straka indicates that he would prefer that we obtain information on their chambers from Gary Gomez, Safety Officer, MSHA District Office.

**TABLE 3
People Contacted As Part of Report**

Location	Company	Contact Name/ Title	Contact Method	Comments	
Industry Contacts (cont'd) Utah	Utah Southeast Applied Technology Campus	Dale Evans Chairman Southeast Applied Technology College	Email	No knowledge of a mine with chamber. Provided Utah Mining Association contact information.	
	Utah Southeast Applied Technology Campus	Miles Nelson Campus President Southeast Applied Technology College	Email	No knowledge of a mine with chamber. Provided Utah Mining Association contact information.	
	Western Energy Training Center	Steven Burge Chairman	Email	1/31/07 - Not responded to date.	
	Kennecott Copper	Chantae Lessard External Affairs	Email	6/21/07 - Sent email asking for information on refuge chambers reportedly purchased from MineARC (James Rau).	
	Kennecott Copper	Stephen McLaughlin Underground Safety Engineer KUCC Resource Development	Email	6/28/07 - Mr. McLaughlin responded to mine refuge inquiry email sent to Ms. Lessard. Provided information on their refuge chambers.	
	Calcite Explorations	Drew Downs Owner	Email Telephone	1/24/07 - MSHA sends refuge chamber questionnaire email to Drew Downs and follows up with a telephone call on 2/1/07. Mr. Downs indicates that he would send mine refuge information to MSHA. 7/2/07 - No information provided to date. 7/19/07 NTTC sends email inquiry to Drew Downs. 8/14/07 - Mr. Downs indicates for NTTC to contact Reggie Portillo.	
	Calcite Explorations	Reggie Portillo Miner	Telephone	Contact information provided by Drew Downs. 8/14/07 - Mr. Portillo supplies information on their former built-in refuge chamber.	
	Vermont	Vermont Quarry Corporation Danby Quarry	Web Page General Inquiry email address	Email	9/8/07 - No response to date.

**TABLE 3
People Contacted As Part of Report**

Location	Company	Contact Name/ Title	Contact Method	Comments		
Industry Contacts (cont'd)	Teck Cominco American's Pend Oreille Mine	Dave Godlewski Vice President, E&PA Tech Cominco American Leonard Urtso President/General Manager	Email	1/16/07 - Indicated that he is collecting information on mine refuges. NTTC receives summary email same day.		
				6/21/07 - NTTC calls Mr. Urtso email asking for information on who has purchased their chambers (they partnered with ChemBio Shelter to build the Life Shelter). Ed Roscioli (of ChemBio Shelter) indicates that International Coal Group had purchased 35 of their units and suggests that we contact Mr. Urtso.		
West Virginia	A. L. Lee Corporation	Edward Roscioli CEO	In person	4/07 - Mr. Roscioli states that International Coal Group had purchased 30 ChemBio Shelter inflatable refuge chambers. Indicates that we should contact Leonard Urtso for specifics.		
				Mr. Weiser indicates that they have portable refuge chambers. He will forward the specifications for these shelters to MSHA who will provide to NTTC. 7/19/07 - NTTC emails Mr. Wieser mine refuge questionnaire. 7/19/07 - Mr. Wieser responds with a description of chambers.		
				1/19/07 - MSHA emails FMC general inquiry address a refuge chamber questionnaire email. Mr. Steenberg responds via telephone to state that they do not have any refuge chambers in their mine.		
				1/19/07 MSHA calls Mr. Adcock and leaves message. 1/25/07 - Mr. Adcock returns call and leaves message. 7/19/07 - NTTC calls Mr. Adcock's number and was informed that he no longer worked for OCI Wyoming. Was told to call Roger Hoops.		
				7/19/07 - NTTC called Roger Hoops and leaves message.		
Wyoming	Greybull Petroleum, LLC Greybull Field Project	Jim Wieser Greybull Petroleum	Email			
				FMC Corporation	Email Telephone	1/19/07 - MSHA emails FMC general inquiry address a refuge chamber questionnaire email. Mr. Steenberg responds via telephone to state that they do not have any refuge chambers in their mine.
				OCI Wyoming LP		1/19/07 MSHA calls Mr. Adcock and leaves message. 1/25/07 - Mr. Adcock returns call and leaves message. 7/19/07 - NTTC calls Mr. Adcock's number and was informed that he no longer worked for OCI Wyoming. Was told to call Roger Hoops.
				OCI Wyoming LP		7/19/07 - NTTC called Roger Hoops and leaves message.
				OCI Wyoming LP		7/19/07 - NTTC called Roger Hoops and leaves message.

TABLE 3
People Contacted As Part of Report

Location	Company	Contact Name/ Title	Contact Method	Comments
Wyoming (cont'd)	OCI Wyoming LP	Terry Leigh	Telephone	7/24/07 - Mr. Leigh leaves a message asking NTTC to email him with the request for refuge chamber information. They would be happy to provide us with information. 7/24/07 - NTTC sends inquiry email. 8/17/07 - NTTC sends a reminder email. 8/30/07 - NTTC sends a reminder email. 9/8/07 - No information received to date.
	General Chemicals Soda Ash	David Graham General Chemicals Mine	Telephone Email	MSHA speaks with Mr. Graham and indicates that NTTC will forward him a questionnaire. 7/19/07 - NTTC emails Mr. Graham a refuge chamber questionnaire. 8/21/07 - NTTC receives information.
	General Chemicals Soda Ash	Dustin McGillvray Industrial Hygiene/Safety Engineer	Email	8/21/07 - Mr. McGillvray provides emails with information on refuge chambers.
	Solvay Chemicals Inc.	Curtis Nelson Solvay Chemicals	Email	MSHA sent email on 1/30/07. 7/19/07 - NTTC sent a second email questionnaire to Mr. Nelson.
	Solvay Chemicals Inc.	Rowdy Heiser	Telephone Mail	7/24/07 - Mr. Heiser provides information on their designated staging area in a letter dated 31 July 2007.

Attachment A

**Barrick Goldstrike Refuge Chamber
Summary and Pictures**



The purpose of this document is to answer the following questions posed by NIOSH concerning underground refuge chambers:

"If this or any other underground mine in the US that has refuge chambers."

Barrick Goldstrike Mines Inc. currently has two underground, metal/nonmetal mines on the Goldstrike property, being the Meikle and Rodeo mines. Each mine has refuge chambers. Information concerning built in refuge chambers will apply to both mines. The Rodeo mine is currently in the process of replacing two built-in refuges with portable refuges designed by Mine Arc Systems.

"The type and specifications of the refuge chambers within the mine including:"

number of chambers

The Meikle Mine currently employs seven refuge chambers; the Rodeo Mine currently employs four refuge chambers.

Type of chambers (portable or built-in)

Meikle 925; Rodeo 4270 and 3920 levels portable; all other chambers are built in.

Location of Chambers

Meikle: 925, 1075, 1225, 1450, 1675, 3885 South Griffin, 4190 Griffin; Rodeo: 4270, 4100, 3920, 3620.

Pictures or diagrams of chambers

Built-in Refuges at the Meikle and Rodeo Mines



Airlock



O2 Bottles



Page phone, land line, water, manometer



Monitoring systems, storage box

Portable Refuges at Rodeo



12 Man Refuge



Control Panel



Air Conditioner Unit



Air Scrubbers, exterior Air Con unit



Control Unit with CO₂/CO scrubber



Oxygen bottles

All underground refuge chambers are equipped with air locks, mine phones, landline telephones, sealing compound, chemical toilets, potable water, first aid kits, manometers, mine air, and water. Through our underground control system, we are able to monitor the temperature, humidity, and oxygen levels inside the chamber.

The Mine Arc refuges are capable of all the above functions, as well as scrubbing both carbon monoxide and carbon dioxide out of the interior breathing air, and are provided with air conditioning units and oxygen candles.

Each refuge, whether portable or built-in, is supplied to support 12 miners.

The built-in refuges are approximately 15'x15'x30', ground support with 8' friction bolts and 12' swellex bolts, along with welded wire mesh panels, and covered with shotcrete.

Information concerning construction of the Mine Arc refuges can be found at www.minearc.com

The built-in refuges at the Rodeo mine have been used one time, following a compressor fire in the Lower Rodeo. The miners were in refuge for nine hours.

Ken Groves
Barrick Goldstrike Mines Inc.
Safety and Health Division
Underground Rescue Coordinator/Trainer
Work: 775-778-8975
Cell: 775-934-1623
Email: kgroves@barrick.com

Attachment B

**BHP Billiton Refuge Chamber
Summary and Pictures**

Response Email From: David Hales
Company: BHP Billiton

RE: Refuge chamber specifications in their San Juan Coal Mine. Mr. Hales responses are provided in blue.

Date Received: 25 July 2007

Mr. Hales:

Thank you for your time to discuss BHP Billiton's escape shelters today by telephone. As discussed, the National Technology Transfer Center (NTTC) has been tasked by the United States National Institute of Occupational Safety and Health (NIOSH) to obtain information and specifications on the refuge chambers (places of safety, escape shelters, safe havens, safe areas, etc.) located in United States mines.

You indicated that BHP Billiton's San Juan Coal Mine contains 4 portable and 6 built-in escape shelters. The specific refuge chamber information and details we are seeking includes the following:

- number of chambers in each of your US mines

BHP Billiton has just one underground mine in the US. That one is at San Juan Coal Company and is known as San Juan South. At San Juan South we have constructed 6 semi-permanent shelters in our mine. Considered semi-permanent because the majority will at some point be consumed by the longwall gob.

- types of chamber (portable or built-in) in each mine

We currently have two shelters constructed in the Mains. We also have 4 portable shelters deployed at the mine. One portable shelter located on each working section and one used as a spare and stored underground. The longwall gateroads have a shelter constructed at intervals not to exceed 6000 feet. Typically two for the headgate and two in the tailgate.

- location of chambers and reasoning for placement

Constructed shelters are located at intervals not to exceed 6000 feet. This number matches the distances identified for SCSR spacing. Original plans were to store the SCSR units inside the structure to provide a fresh air location for miners to change out to a fresh SCSR device, communicate with the surface, rehydrate, rest and make their plans to travel on to the next shelter. New MSHA regulations prohibit storing the SCSR devices inside the shelters now because the walls are not rated at 100 psi, something we cannot do nor do we believe is necessary.

- pictures or engineering drawings of chambers

There are no engineered drawings of the constructed shelters. These are located in the crosscuts between two entries and are accomplished by the use of two walls made of solid concrete block and hitched in place with the use of paksetter bags. The shelters are located out of the line of anticipated blast forces to improve their ability to survive a blast. The portable shelters are made by Kennedy and drawings would need to come from their shop.

I'll send some photos of each type in a separate email.

- construction specifications (materials, size, occupancy)

The portable shelters are of steel construction with a designed capacity of 20 persons. The supplies in the portable shelters are intended to last 100 hrs.

The constructed shelters average 18 ft wide, 10 ft high and are up to 35 ft long. Each shelter is supplied with air via a borehole to the surface. A communication cable is maintained in that borehole as well. Emergency supplies are maintained at a minimum to provide supplies for 20 persons for 100 hrs. Additional food, water, medical supplies, etc. can be lowered down then boreholes if necessary.

- communication systems

The shelters are provided with two-wire mine phone systems. One connected to the mine system and one routed directly up the hole. We have two other communication systems that have at least some functionality in the shelters, our leaky feeder radio system and our PED system.

- supplies (water, food, blankets, first aid, lighting, oxygen, air, etc)

All shelters have this equipment. Lighting capacity for when the cap lamps fail is provided by chemical light sticks. The portable shelters have tanks of compressed air for purging the shelter and oxygen tanks for extended stays. The constructed shelters are ventilated continuously by the mine fan. Should that fan fail, we have portable blower fans and generators to continue to provide air at a minimum of 90 CFM.

- air/water purifying systems

The portable shelters utilize a lithium hydroxide system for CO₂ scrubbing. The constructed shelters are ventilated via the mine system and have no purifying system. Potable water supplies are provided in each shelter. No water purification systems are utilized.

- sanitation facilities

Shelters have toilet bags and disposal containers.

- monitoring equipment

Supplies of stain tubes are maintained in the shelters. Nearly every mine carries a multi-gas detector and spare batteries are maintained in the shelters for emergency use.

- Length the chamber can be occupied

Air calculations indicate the constructed shelters could sustain in excess of 20 persons indefinitely. The portable shelters are designed to last 100 hrs and can be attached to a borehole for extending their use.

- Has chamber been used in emergency/what was outcome of use.

Shelters have only been utilized in escape drill activities.

Escape Shelter Photos

Exterior View Constructed Shelter



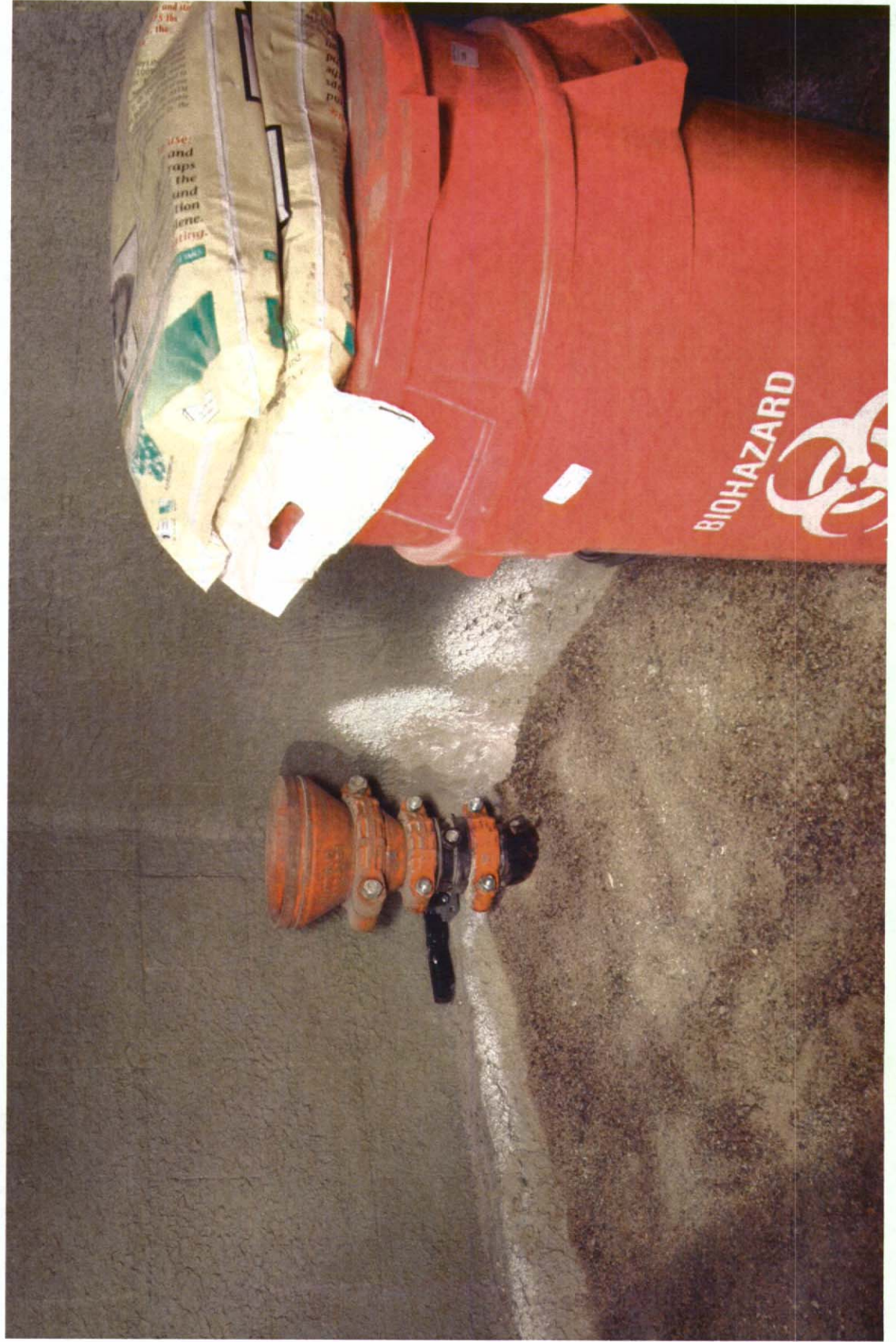
Internal View Constructed Shelter



- Example of Supplies Stored In
● Constructed Shelter



Toilet Facilities



Kennedy Shelter Portable



- Interior of Kennedy Shelter
(20 Person)



Attachment C

**Climax Molybdenum Refuge Chamber
Summary and Pictures**

Henderson Mine
P.O. Box 68
Empire, CO 80438
Phone (303) 569-3221
Fax (303) 569-2830

September 5, 2007

Malcom Webster
Technology Specialist
National Technology Transfer Center
316 Washington Avenue
Wheeling, WV 26003

Dear Mr. Webster:

I am writing in response to your request for information on the refuge chambers that are in use at Climax Molybdenum Company's Henderson Mine in Empire Colorado. You requested the following information:

- number of chambers
- types of chamber (portable or built-in) in the mine
- location of chambers and reasoning for placement
- pictures or engineering drawings of chambers
- construction specifications (materials, size, occupancy)
- communication systems
- supplies (water, food, blankets, first aid, lighting, oxygen, air, etc)
- air/water purifying systems
- sanitation facilities
- monitoring equipment
- length the chamber can be occupied
- whether chamber been used in emergency, and the outcome of use

In response to your request, Henderson submits the following information. Please contact me at 303-569-3221 x1341 or at Christopher_Rose@FMI.com with any questions that you may have.

Number and Location of Refuge Chambers:

The Henderson Mine currently maintains five refuge chambers on five separate mine levels. We have selected these locations due to their close proximity to large concentrations of miners and distance from the caving process. Henderson's mining method is panel caving; refuge chambers are located a sufficient distance from the cave to ensure long term stability.

They are located on the following levels (measured in feet above sea level):

- 7700: previous production level; now support operations, offices, exploration drilling, training facilities, mobile maintenance shop
- 7500: maintenance shops; pumping and dewatering facilities
- 7210: current production level, development activities, exploration drilling
- 7175: mobile maintenance shop
- 7065: haulage level, crusher, conveyor

Construction of Refuge Chambers:

All five active refuge chambers are built-in construction, developed in mined excavations. Ground is supported with rock bolts, wire mesh, shotcrete, and either concreted bulkheads or concrete block bulkheads. Three are dead-end rooms containing one access door. Two include access to a secondary escapeway. All refuge chambers have hard-piped compressed air and fresh water. Refer to the attached drawings for sizes and other details.

Supplies:

Each refuge chamber is supplied with the following emergency materials:

- stopping material
- hand tools
- wedges
- duct tape
- rags
- first aid supplies
- blanket
- water (minimum of 6 gallons)
- Meals Ready to Eat (MREs; 50 "family size")
- multi-gas monitors (O₂, CO, LEL)
- locker for secure storage of the above supplies (knock-off lock)
- portable toilets, toilet paper, privacy screen for the toilets
- oxygen cylinders (3 at approximately 600 ft³) and regulator
- emergency procedures manual

Communications:

Each refuge chamber has a land line phone, a battery powered Gaitronics phone, and in most cases, a computer for communications. Henderson also uses a leaky feeder radio system for communications between employees in work areas underground; this system also provides communication between the surface and underground.

Occupancy:

Henderson refuge chambers are generally designed to accommodate up to 50 miners under emergency conditions. The length that each could be occupied would depend on the nature of the emergency and the actual number of people using the facility. If compressed air and water lines were uninterrupted, the length of time that they could be occupied would be limited only by food supplies. If compressed air were interrupted, supplemental oxygen cylinders would provide breathable air for approximately 48 hours; more with fewer miners. If water were interrupted, bottled water would last at least 48 hours. Considering the locations of the refuge chambers, the non-combustibility of our host rock, and the careful control of fuel sources in the mine, it is highly unlikely that these facilities would be needed for more than 48 hours.

Usage:

Henderson's refuge chambers have been used during emergency evacuation drills and, in a few cases, as a precaution while evaluating a potential problem. They have never been used under conditions where miners were required to seal themselves in or use any supplies stored for emergency.

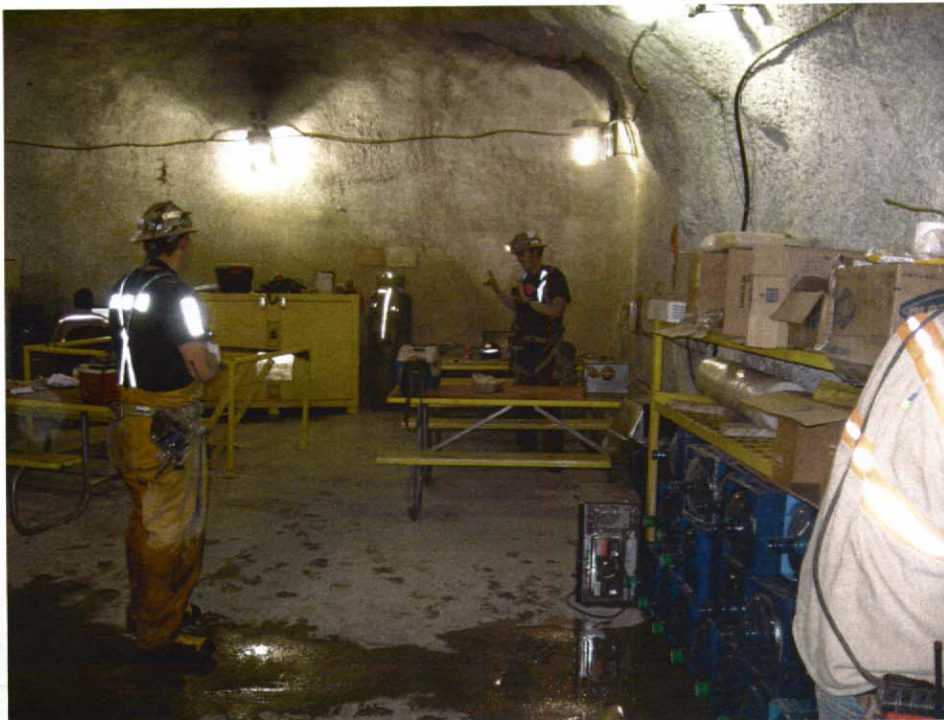
Sincerely,



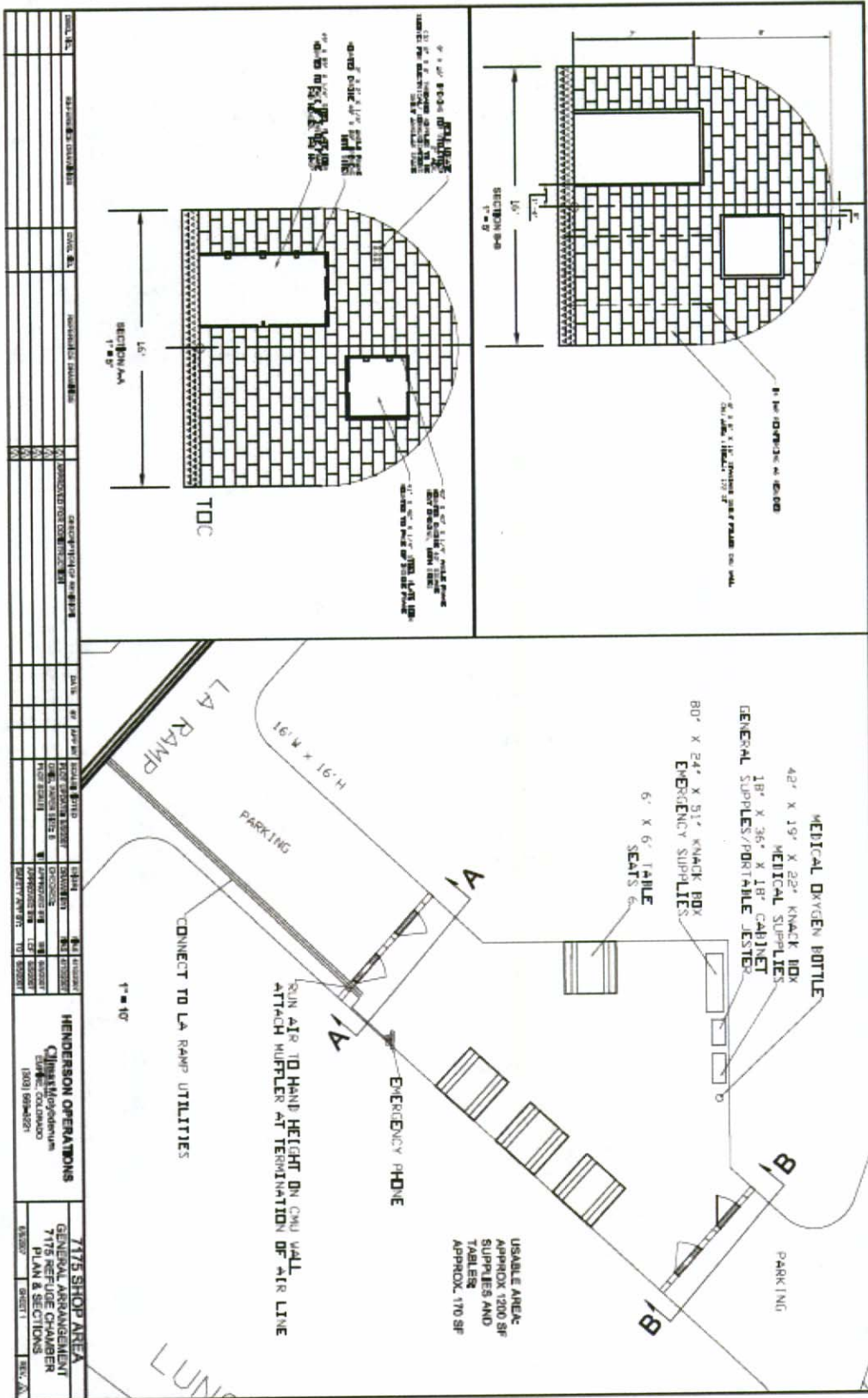
Christopher L. Rose, MS, CIH
Health and Safety Manager



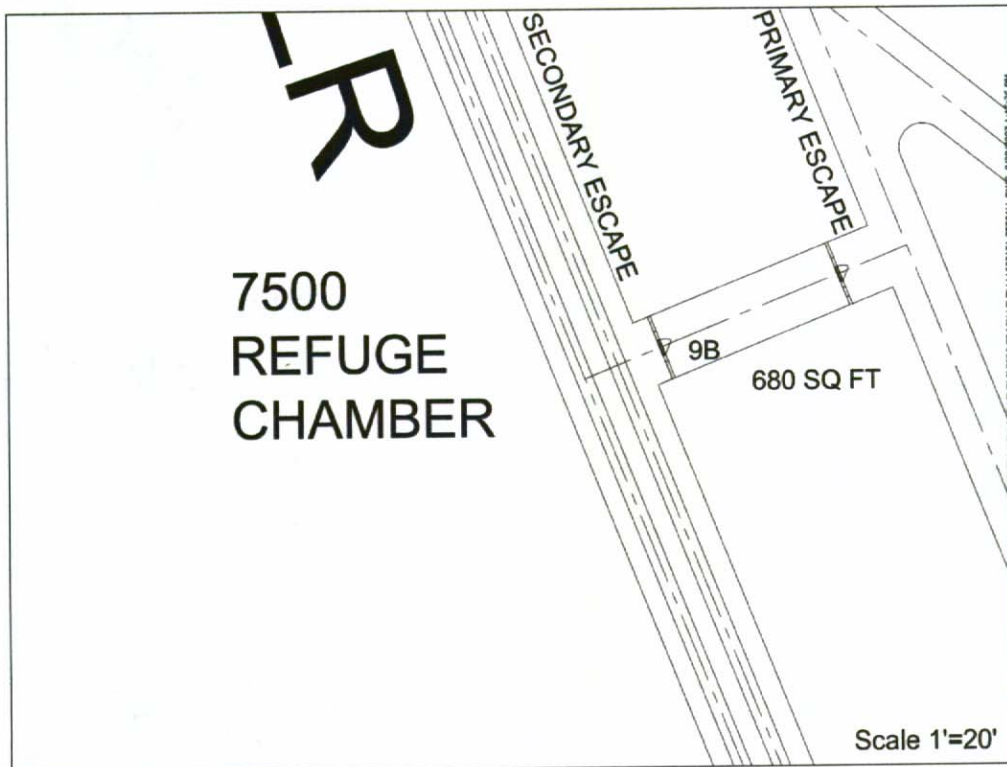
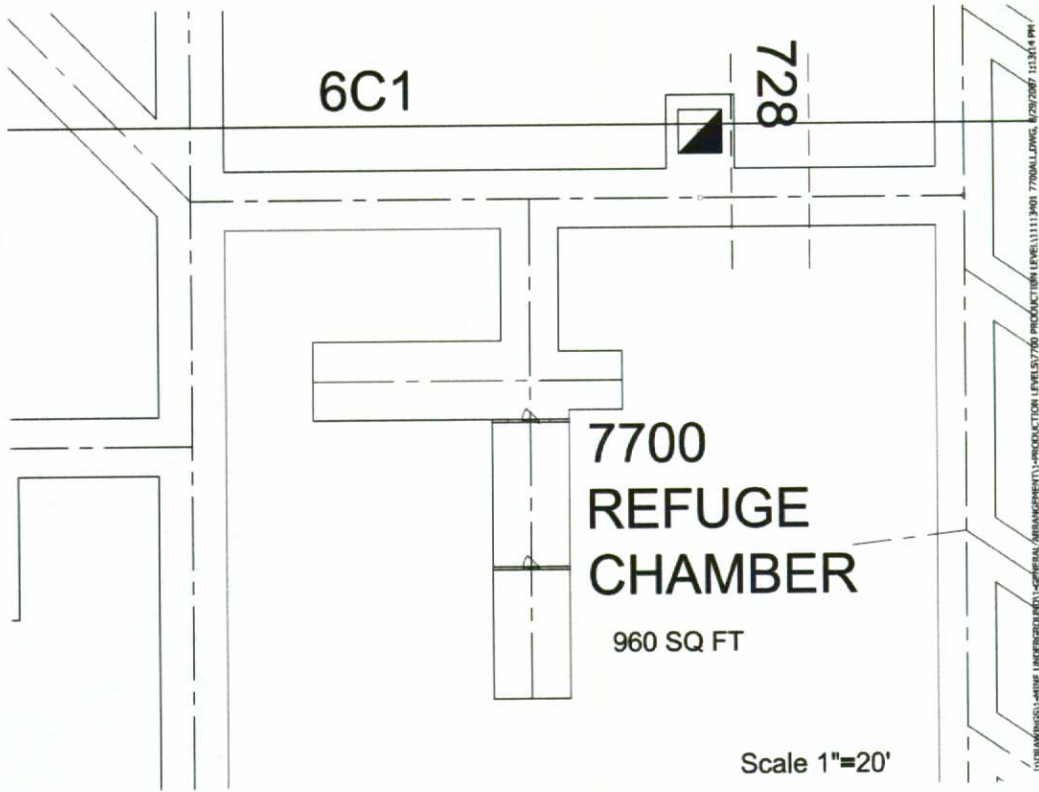
7065 Refuge Chamber



7210 Refuge Chamber



7175 Refuge Chamber, our newest, has the most detailed drawing available. Drawings for the other four are on the following pages. These have similar construction and equipment. Scale indicated on drawings is incorrect.



Attachment D

**General Chemicals Refuge Chamber
Summary and Pictures**

#6 Shaft Refuge Chamber Information

Of Chambers: 1

Type of Chamber: Permanent built in chamber

Location and Reasoning of Placement: Located in fresh air next to the #6 intake airshaft. This chamber is located in the general vicinity of 75% of our active workings.

Pictures or diagrams of chambers: see attached.

Construction specifications (materials, size, occupancy): Both ends are constructed of reinforced metal stopping material which is foamed to ensure that it is gas tight and the sides are trona (pillars). 18.5' wide x 132' long x 9.5' tall (23,200 cubic feet).

Communication systems: Gai-Tronics Corp. Permissible dial / page phones and leaky feeder radio system.

Supplies (water, food, blankets, first aid, lighting): Bottled water (60 gallons) and water line, blankets, first aid supplies (bandages, antibiotic ointment, eye wash, analgesics, antiseptic wipes, gauze, triangular bandages, etc.), hand tools, stopping materials, foam packs to foam mandrels/stoppings, scaling bar.

Air/water systems: Have compressed air lines and water lines piped directly into the chamber. The compressed air lines come from the surface down #6 shaft so they force fresh air into the chamber via an air compressor. The water lines also come from the surface down #6 shaft.

Sanitation: Porta potties

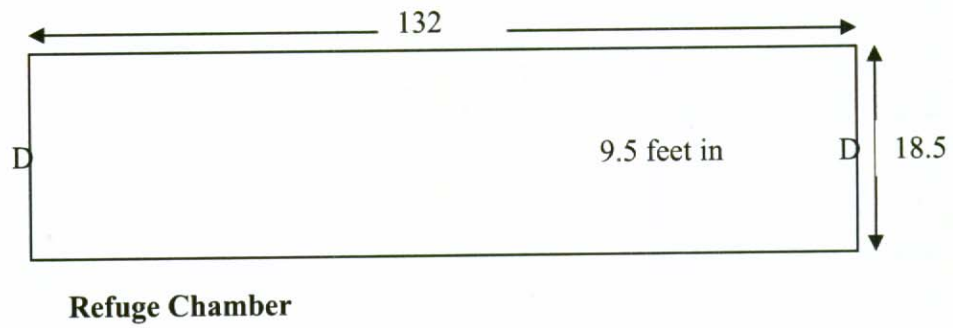
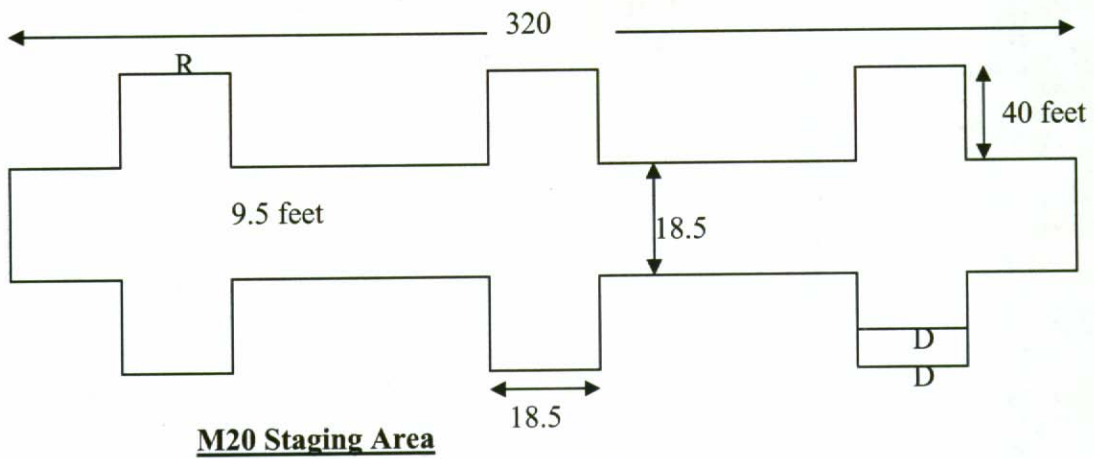
Monitoring equipment: Foremen carry Industrial Scientific ITX multi-gas meters that monitor for methane, CO, and Oxygen. We also have drager bellows pump with oxygen, carbon monoxide, ammonia, and carbon dioxide tubes.

Has chamber been used in emergency: No

M20 Staging Area Information

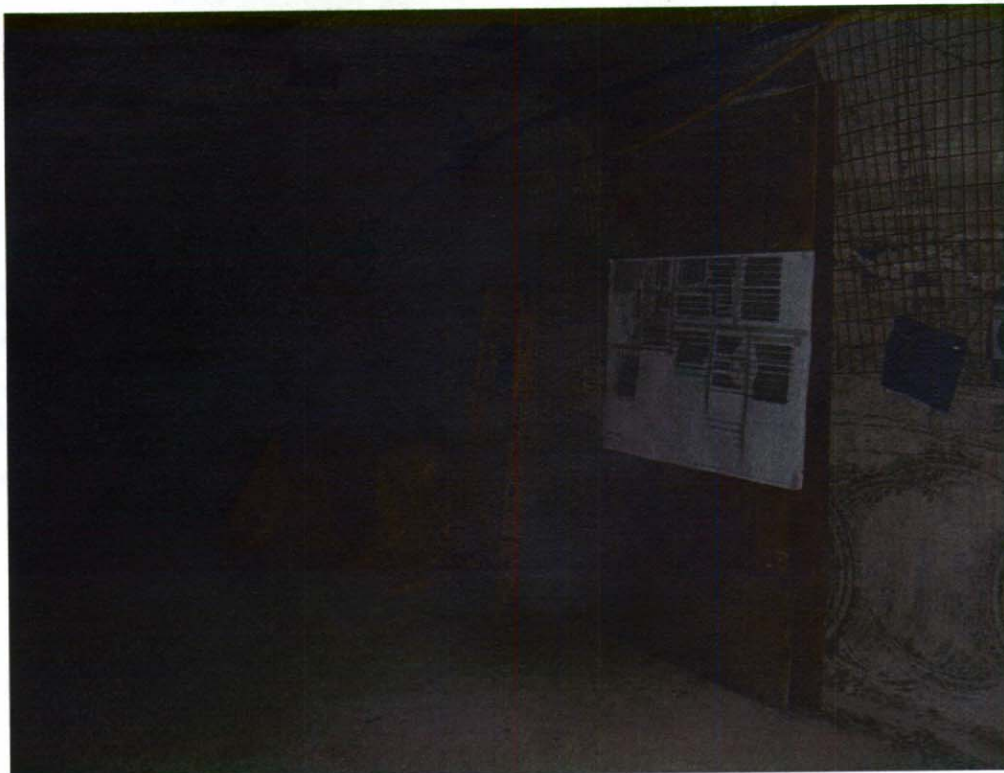
We also have a "staging area" in the vicinity of the other 25% of our active workings. This staging area consists of an enclosed area of approximately 100,000 cubic feet. This area is stocked with first aid supplies, suitable stopping materials, foam packs, porta potties, bottled water, hand tools, Gai-Tronics Corp. permissible dial / page phone and leaky feeder radio system, drager bellows pump and tubes for oxygen, carbon dioxide, ammonia, and carbon monoxide, as well as lithium hydroxide curtains for CO₂. We have a bore hole location surveyed on the surface for drilling a borehole to supply food, water, and air. This borehole is also marked within the staging area. This staging area has adequate air and supplies to sustain 20 employees for 6.5 days.

#6 Shaft Refuge Chamber and M20 Staging Area Diagrams



LEGEND

R = Regulator



#6 Shaft Map & Supplies



#6 Shaft Refuge Entry



#6 Shaft Stopping (Inside)



#6 Shaft Stopping (South)



#6 Shaft Tools & Supplies



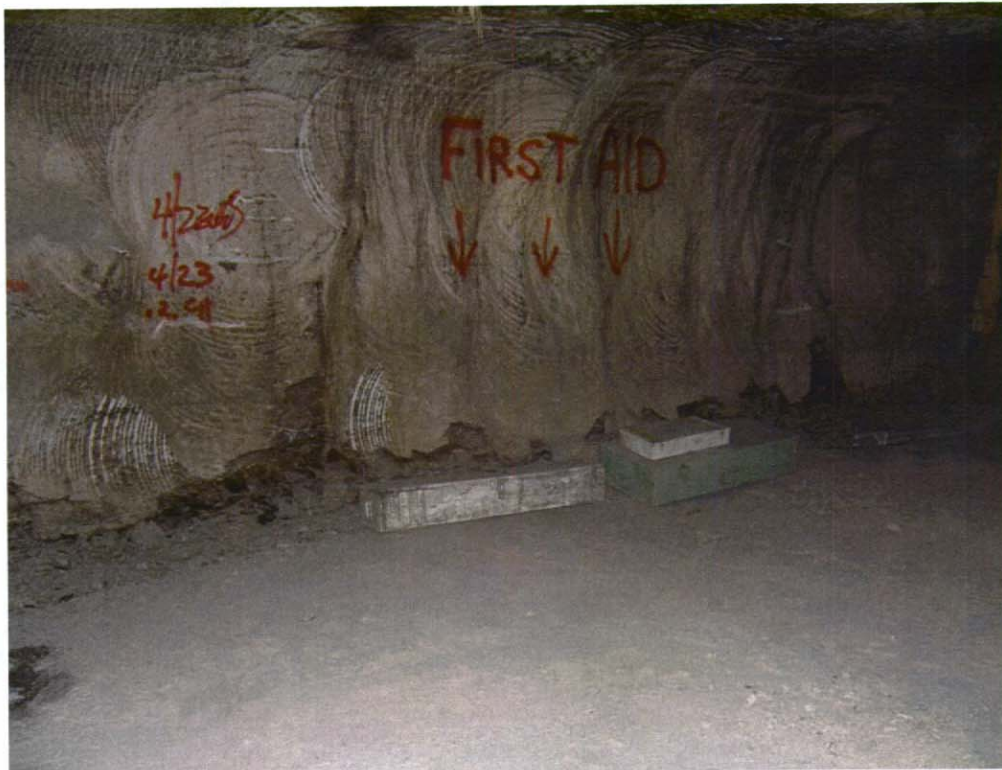
#6 Shaft Water



Air lock to M20



Entry to M20



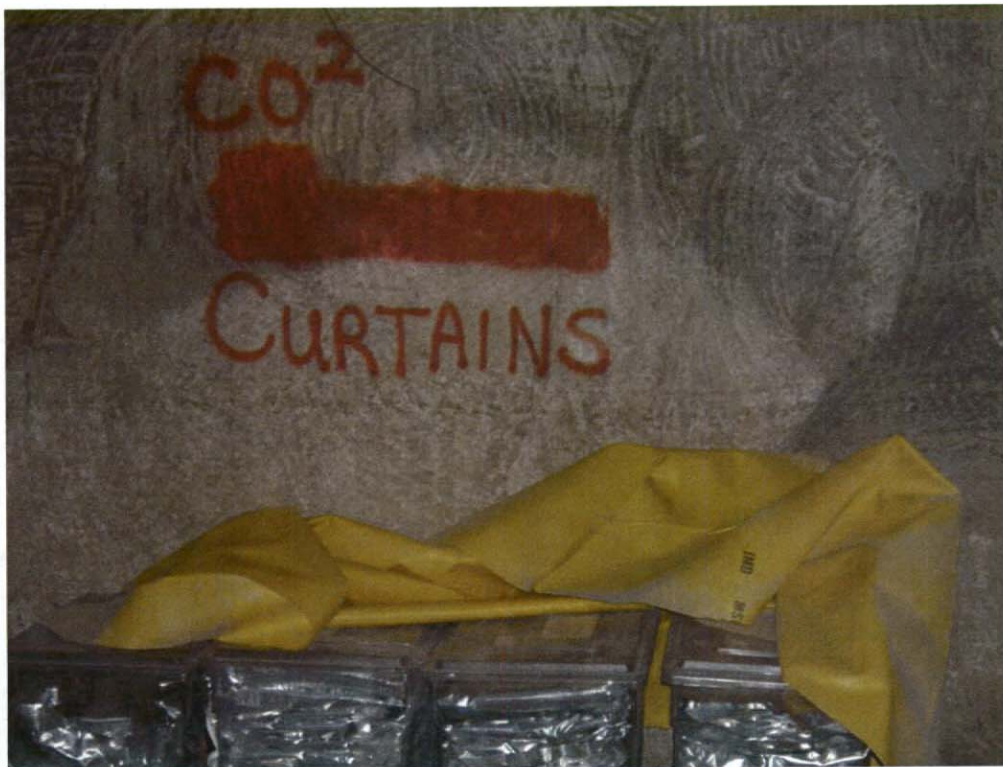
M20 1st Aid Supplies



M20 Entry from inside



M20 Borehole location



M20 LiOH Curtains



M20 LiOH Curtains 2



M20 Mine Map



M20 Mine Regulator



M20 Toilet Area



M20 Toilets



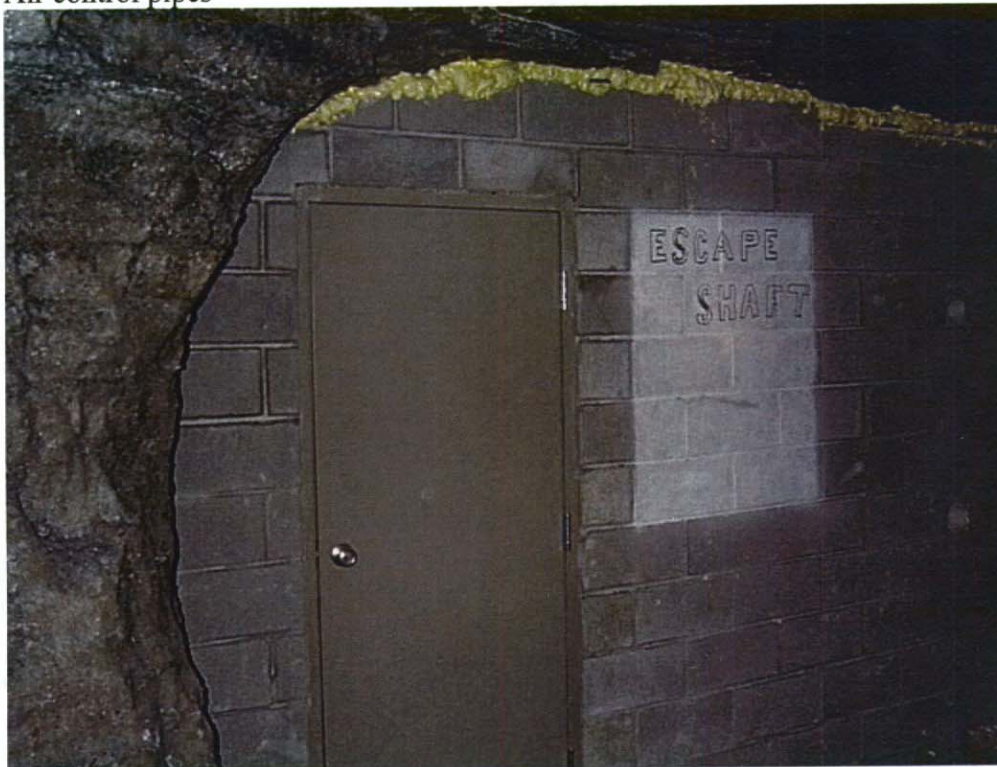
M20 Water

Attachment E

**Hutchinson Salt Company
Refuge Chamber Pictures**



Air control pipes



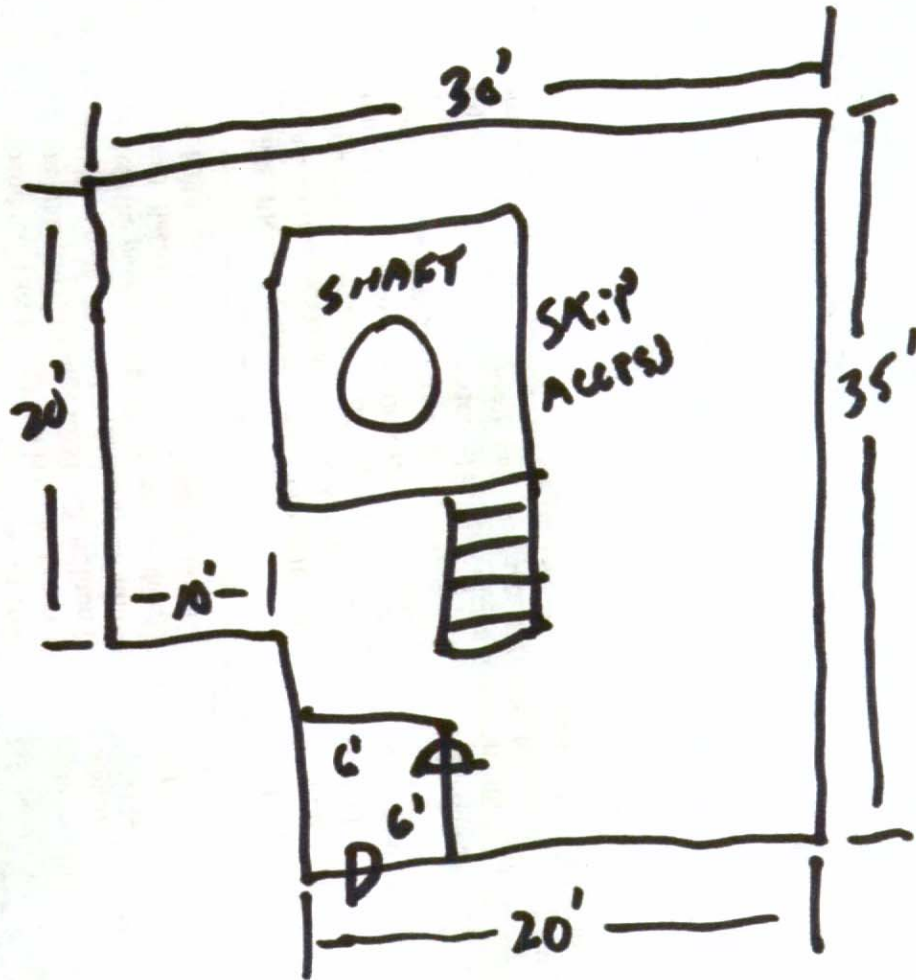
Front door



Front to airlock



Inside airlock



Refuge map



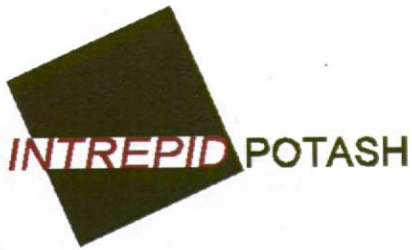
Stairs to escape pod



Upperlevel

Attachment F

**Intrepid Potash Refuge Chamber
Summary and Pictures**



Intrepid Potash – New Mexico, LLC

210 Red Cloud Road / P.O. Box 101
Carlsbad, NM 88220

Alex Tamm - Junior Mine Engineer
Phone: 505-234-3810
Fax: 505-887-0929
e-mail: alex.tamm@intrepidpotash.com

To: Malcom Webster – Technology Specialist
National Technology Transfer Center
316 Washington Avenue
Wheeling, WV 26003

Mr. Webster,

In response to your January 12, 2007 request for information about our West Mine and East Mine refuge chambers, this document has been prepared with the most current information possible. I hope that this answers all of your questions and assists with the NTTC's research project. If you have further questions or are unclear about something in the document, please do not hesitate to contact me.

Sincerely,
Alex Tamm
Intrepid Potash – New Mexico, LLC

Enclosures: ten (10) page document

- Are there other mines with refuge chambers?

Yes. Intrepid has four mining properties in this area: West, East, North, and HB Potash. However, only the West Mine and East Mine are operating and have personnel underground. Data on the refuge chambers for the inactive HB Potash and North Mine properties is not readily available and most certainly any lists of contents are outdated.

- Types of chambers in each mine.

Both the East Mine and West Mine refuge chambers are built-in, being areas cut out of the ore with a continuous miner.

- Location of refuge chambers in each mine.

East Mine: Located ~1,500 ft travel distance from utility hoist (primary escape point) in the main shop area of the mine. New Mexico State Plane Coordinates (of door) = 712,398 ft E / 547,080 ft N. Please see figure 1 for a general mine map of area.

West Mine: Located ~400 ft travel distance from production hoist (secondary escape point) near the production shaft area of the mine. New Mexico State Plane Coordinates (of door) = 663,319 ft E / 542,639 ft N. Please see figure 4 for a general mine map of area.

- Engineering drawings and/or pictures of each refuge chamber

The following figures can be found at the end of this document.

Figure 1 – General mine map showing East Mine refuge chamber (and dimensions).

Figure 2 – Photograph looking into East Mine refuge chamber from door.

Figure 3 – Photograph of steel bulkhead and East Mine refuge chamber door from outside.

Figure 4 – General mine map showing West Mine refuge chamber (no dimensions).

Figure 5 – Drawing showing West Mine refuge chamber dimensions.

Figure 6 – Photograph of steel bulkhead and West Mine refuge chamber door from outside.

Figure 7 – Photograph looking at West Mine refuge chamber door from inside chamber.

- Has a refuge chamber been used and if so, what were the results?

Fortunately a refuge chamber has not had to be used at either the Intrepid East Mine or West Mine.

- Specifications of refuge chambers including:

1. Construction materials, size, and occupancy

East Mine: Chamber area is driven into pillar; walls, back, and floor are made of potash/salt. All bulkheads, doors, and regulators are made of steel. Average width is 27 ft with an average height of 7 ft. The main entrance is a ~6ft x 6ft door on the south end of the refuge chamber and a secondary entrance/exit of an adjustable 3ft x 4ft regulator on the north side of the chamber. Total area is approximately 5,330ft² with an average height of 7ft for an approximate volume of 37,310 ft³.

West Mine: Chamber area is driven into pillar; walls, back, and floor are made of potash/salt. The single door is made of steel. As seen in figure 5, the chamber has a width of 31.5 ft, length of 58.0 ft. With an average height of 7 ft and area of 1,827 ft², this refuge chamber has an approximate volume of 12,789 ft³.

2. Contents of chamber (food and water supplies, first aid, oxygen/air, blankets, etc.)

Table 1: East Mine

Quantity	Measurement	Item
2	17.5 gallon can	Drinking Water
12	Roll	Toilet paper
2	18 lbs can	Crackers
2	25 lbs can	Crackers
4	Each	Flashlight
4	Each	12v cell Battery
2	Each	Hammer
6	Each	Shovel
1	Each	Axe
2	Boxes	1.5v 'D'-cell Battery
1	Each	Drager Gas Tester
1	Each	Hilti Powder Actuated Nail Gun
1	Box	Nails
3	Box	Powder Shells for Hilti Gun
1	Roll	MSHA Black Tape
1	Can	CRC Power Lube Oil
1	Tube	CO Drager Pump Tube
1	Tube	H ₂ S Drager Pump Tube
1	Tube	CO ₂ Drager Pump Tube
20	4' x 8' Sheet	Plywood
1	Roll	Brattice (for blankets)
1	Bundle	6" x 8" Wood Blocks
2	Each	SKIV Sanitation Kit
15	Bottle	Oxygen
2	Each	MSA First Aid Cabinets

1	25 kg can	Sodium Hydroxide
1	Each	20lb Fire Extinguisher

This refuge chamber also has multiple wooden benches, a compressed air line and water line (both running from surface), and mine page phone.

Table 2: West Mine

Quantity	Measurement	Item
1	Bundle	Wooden blocks
1	Bundle	Wooden wedges
1	Each	Shovel
1	Each	Hand Saw
1	Each	4 pound hammer
1	Each	Pick Hammer
1	Box	Foam to seal door.
1	Each	20 lb. fire extinguisher
1	Each	Mine map and evacuation plan.
1	Each	Cabinet of first aid supplies.
4	Each	Blankets
1	Each	Oxygen detector battery operated, with six spare batteries.
1	Each	Drager hand pump
1	Box	Carbon dioxide tubes for drager pump.
1	Box	Carbon monoxide tubes for drager pump.
1	Box	Nitrogen dioxide tubes for drager pump.
1	Each	Powder actuated nail gun.
1	Box	Box of clips.
2	Box	Powder charges for nail gun.
4	Barrel	17 ½ gallon barrel of water
2	Box	Medical kits.
3	Box	Cracker survival supplies.
1	Box	Toilet paper.
3	5 gallon jug	Limepak (soda lime) CO ₂ Absorbent
7	Each	Honey pots
12	Each	Bottles of Compressed Air (300 ft ³)

This refuge chamber also has multiple wooden benches, a compressed air line and water line (both running from surface), and a mine page phone.

3. Air purifying systems

East Mine: Fifteen bottles of compressed air, one compressed air line (from surface), one 25 kg can of sodium hydroxide.

West Mine: Twelve bottles of oxygen, one compressed air line (from surface), four 5 gallon containers of Limepak (soda lime).

4. Communication system

East Mine: One standard MSHA permissible mine phone.

West Mine: One standard MSHA permissible mine phone.

5. Sanitation facilities

East Mine: 2 Civil Defense SK IV sanitation kits with privacy shelters. One fresh water line from the surface.

West Mine: 7 honey pots, 1 box of toilet paper, and one fresh water line from the surface.

6. Monitoring Equipment

East Mine: 1 Drager hand pump gas detector (with associated tubes).

West Mine: 1 battery powered oxygen detector, 1 Drager hand pump gas detector (with associated tubes).

- **Duration of chamber occupancy in time of emergency**

The refuge chamber at each mine has a compressed air line and fresh water line running to it, thus making CO₂ asphyxiation the limiting factor in the best case scenario. If these lines are assumed to be broken then the following applies:

East Mine: 35 people for 72 hours (which is the maximum number of people who will be underground if there is only one working shaft).

West Mine: 35 people for 45 hours.

The East Mine has a defined occupancy in the accepted petition for modification (which allows the refuge chamber to be treated as a secondary escape-point in the event that one of the shafts is down and crews are underground making repairs). A check calculation was run on the East Mine refuge chamber and also on the West Mine refuge chamber to give occupancy times for equivalent loads. The results can be found below in table 3. The following assumptions were made for the calculations:

1. Compressed air bottles hold 300ft³ of air (with 21% O₂) each
2. Sodium Hydroxide absorbs CO₂ in a 3/4 ratio (lbs CO₂/lbs LimePak)

3. No more than 80 people will be in the refuge chamber and each person will use an average of 0.01 cfm of O₂ and generate 0.0075 cfm of CO₂.
4. Minimum allowable O₂ content is 19.5% and maximum allowable CO₂ content is 0.5%.
5. Initial O₂ content is 21% and CO₂ content is 0.03%.
6. The average person needs 0.5 gallons of water per day
7. Food will not be a survival-limiting factor (survival crackers will be sufficient to sustain life longer than other limiting factors).

Table 3. Occupancy load and durations for Intrepid's West Mine and East Mine refuge chambers.

WEST MINE

No. People	Hours		
	Limiting Factor		
	Oxygen Depletion (if compressed air line is broken)	CO ₂	Water assuming 0.5 gallon/person/day (if water line is broken)
5	316	3,566	672
10	158	1,783	336
15	105	1,189	224
20	79	891	168
25	63	713	134
30	53	594	112
35	45	509	96
40	39	446	84
45	35	396	75
50	32	357	67
55	29	324	61
60	26	297	56
65	24	274	52
70	23	255	48
75	21	238	45
80	20	223	42

EAST MINE

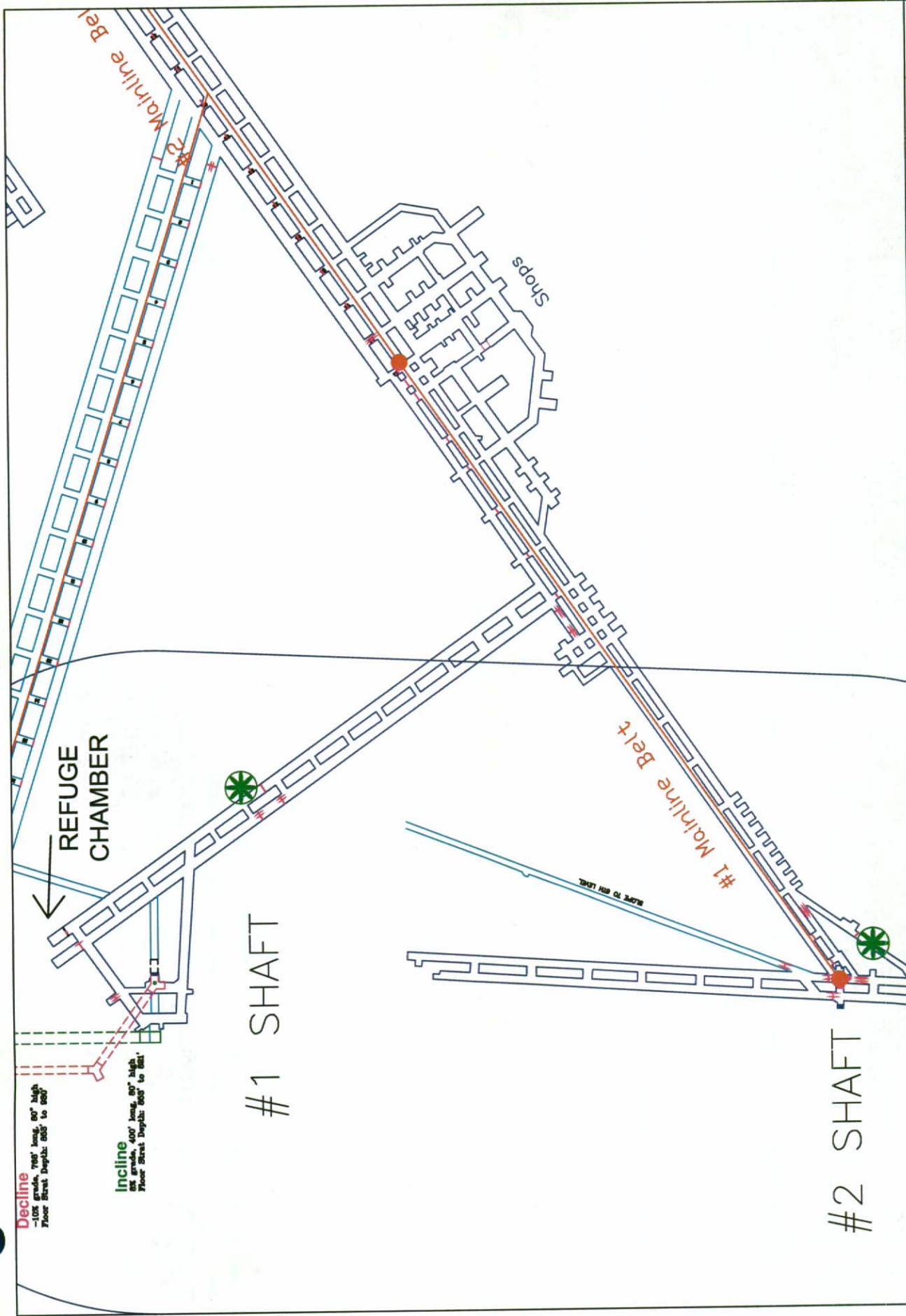
No. People	Hours		
	Limiting Factor		
	Oxygen Depletion (if compressed air line is broken)	CO ₂	Water assuming 0.5 gallon/person/day (if water line is broken)
5	502	8,446	672
10	251	4,223	336
15	167	2,815	224
20	125	2,111	168
25	100	1,689	134
30	84	1,408	112
35	72	1,207	96
40	63	1,056	84
45	56	938	75
50	50	845	67
55	46	768	61
60	42	704	56
65	39	650	52
70	36	603	48
75	33	563	45
80	31	528	42



Figure 2. View of East Mine refuge chamber from entrance.



Figure 3. East Mine refuge chamber door (and metal bulkhead) from outside.



MINE LEGEND

Figure 4. West Mine Refuge Chamber Location



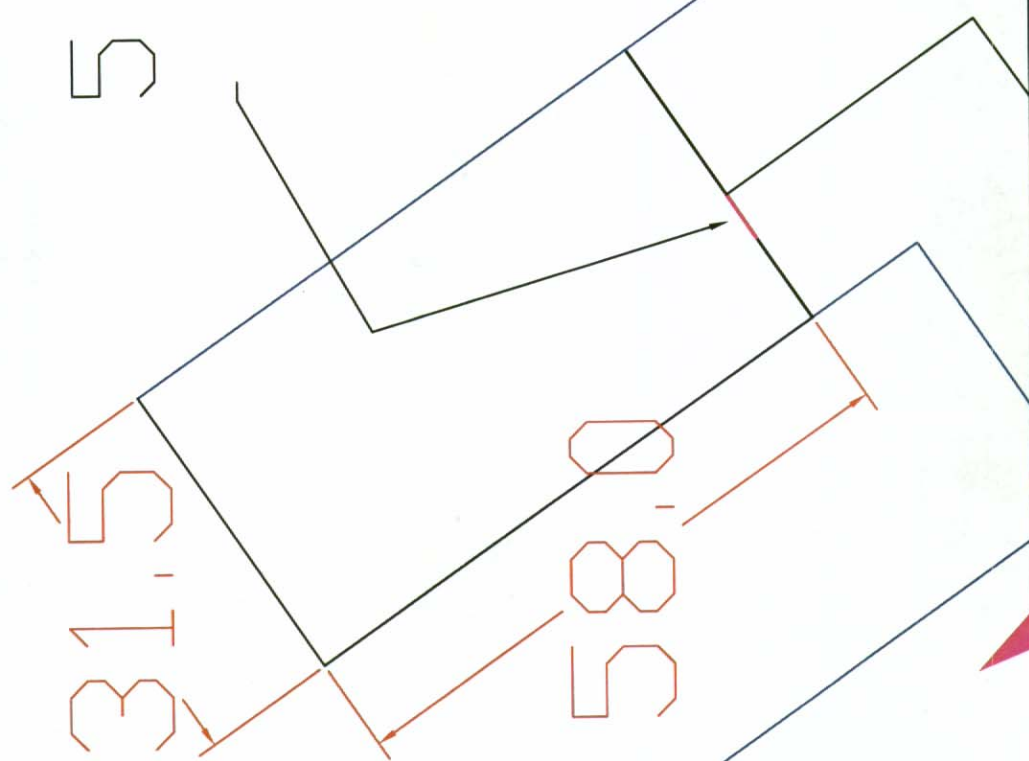
DRAWN BY: ENGINEERING
 REVISOR BY:
 CHECKED BY:
 DATE: FEB 2007

SCALE:
 DATE:
 AUTOCAD FILE:

MINE ENGINEERING
 DEPARTMENT
 DRAWING NO:
 WEST MINE



31.5
58.0
5 foot-wide
door



MINE LEGEND

Figure 5. West Mine Refuge Chamber
Dimensions



DRAWN BY: ENGINEERING
REVISED BY:
CHECKED BY:
DATE: FEB 2007

SCALE:
DATE:
AUTOCAD
FILE:

MINE ENGINEERING
DEPARTMENT
DRAWING NO:
WEST MINE REFUGE
CHAMBER





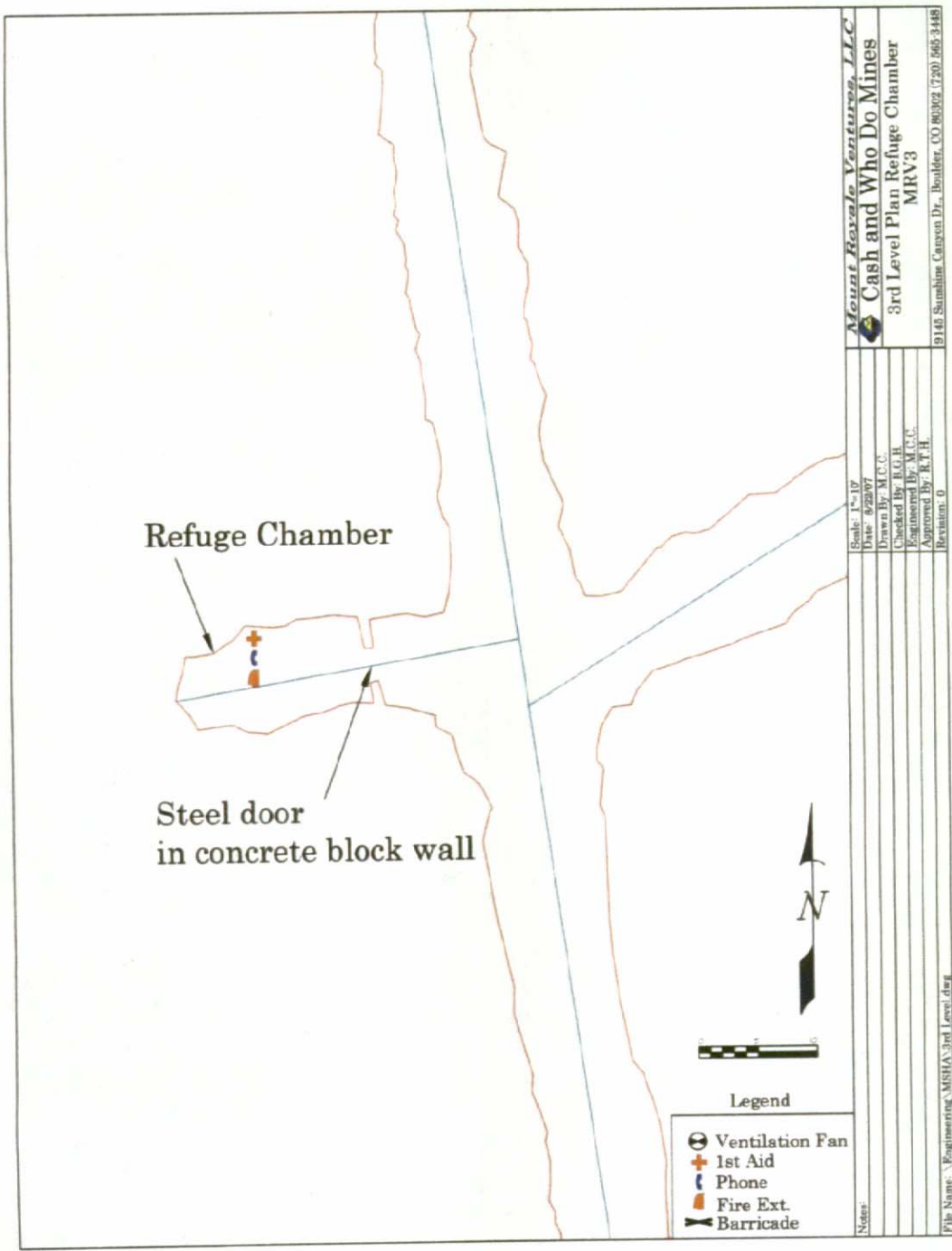
Figure 6. West Mine refuge chamber door (and metal bulkhead) from outside.



Figure 7. West Mine refuge chamber door from inside the chamber (headlights of mantrip visible through open door).

Attachment G

**Mount Royale Ventures Refuge Chamber
Map, Summary, and Pictures**



Refuge Chamber

Steel door
in concrete block wall

- Legend
- Ventilation Fan
 - 1st Aid
 - Phone
 - Fire Ext.
 - Barricade

Mount Royal Ventures, LLC Cash and Who Do Mines 3rd Level Plan Refuge Chamber MRV3	
Scale: 1" = 10'	Drawn By: M.C.C.
Date: 8/22/07	Checked By: R.G.H.
	Engineered By: M.C.C.
	Approved By: R.T.H.
	Revision: 0
File Name: \Engineering\MSHA\3rd Level.dwg	
19145 Sunshin Canyon Dr., Boulder, CO 80302 (720) 565-3448	

Mount Royale Ventures, LLC

9145 Sunshine Canyon Dr.

Boulder, CO 80302

Telephone: 720 565-3448

Fax: 720 565-3497

August 22, 2007

Mr. Malcolm Webster
Technology Specialist
National Technology Transfer Center
316 Washington Avenue
Wheeling, WV 26003

Dear Mr. Webster,

Mount Royale Ventures, LLC (MRV) operates the Cash and Who Do Mines near Gold Hill, Colorado under MSHA ID#05-03884. MRV would like to provide the following response to your inquiry regarding refuge chambers at our operation:

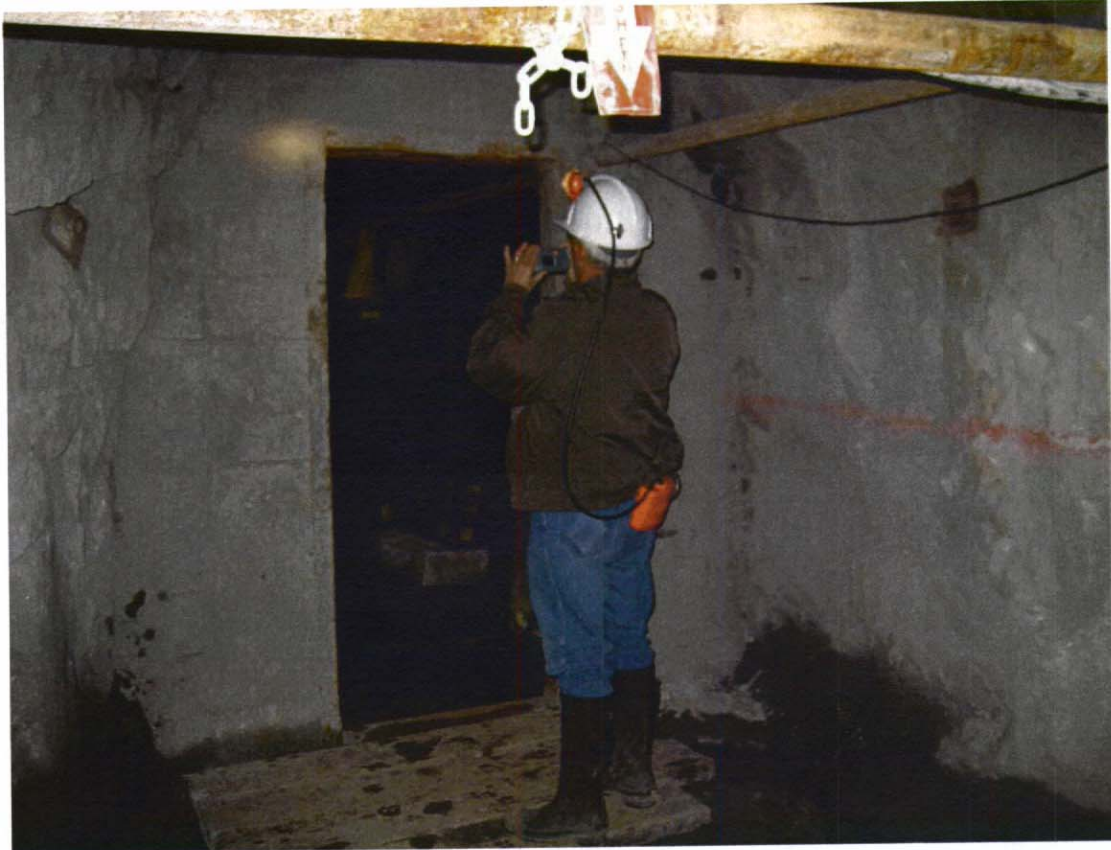
- 1) The Cash Mine DOES have a refuge chamber. This refuge was constructed in 2005, in compliance with a direct mandate from the MSHA Denver Field Office. At that time, MRV had one, 345 foot adit, with two, 20 foot cut-outs. MRV was directed to install a refuge chamber at that time, far earlier than we would have liked and at a less than optimum location. At the present time, MRV is operating on only one level, with approximately 1875 feet of drift. We have approximately 5 stopes above that level, with approximately 350 feet of sublevel drifting. In all, we operate a very small mine. At no point is a miner greater than 15 minutes from surface via three (3) separate accesses: the main portal, our short secondary escapeway at MRV1 and our main-secondary escapeway. The efficacy of the existing refuge chamber is questionable, at best. There are better locations underground for us to have constructed a refuge chamber, and there remains the question of the need for a refuge at our site.
- 2) The type and specifications of the refuge chamber within the mine included the following:
 - a. (1) Refuge chamber
 - b. Built-in chamber (small drift size virtually eliminates the possibility of a portable unit).
 - c. The chamber is located at 290 feet from the portal of the MRV Adit (3rd Level of the historic Cash Mine). The reasoning for placement included the directive from MSHA field office personnel, the availability of space underground, cost effectiveness of developing in vein versus in waste. MRV would have preferred to place the refuge further into the mine where a permanent refuge area would serve multiple purposes and be more effective.
 - d. Please see attached 3rd Level Plan, Refuge Detail and photo.

- e. The chamber is a dead-end, 8' x 8' drift that has been isolated from the mine workings by the construction of a concrete block wall at 16 feet from the face. The block used was 8" x 8" concrete block, filled with poured concrete as high as possible (within about 1 foot from the back of the drift). A steel angle/channel frame was installed as the wall was built. The frame holds a plate steel door (3/8") with a dead-bolt style closing device. The door is approximately 6'-6" by 36". The refuge was designed to handle the entire underground crew of the mine (6-8 persons) comfortably seated, standing or reclining.
- f. The chamber houses a mine phone. The phone is a 12 volt, battery powered pager phone (Gaitronics, Femco, MSA or equivalent).
- g. Supplies within the chamber consist of 10-gallons of fresh water, extensive first-aid kit, backboard/stretchers, some small hand tools, duct tape, spray foam (fire rated), brattice cloth, bench and a 5# ABC fire extinguisher. No food is stored as the chamber is near surface and subject to pilfering by rodents.
- h. No air or water purifying systems are located in the chamber. Compressed air is available via the mine's compressed air system (2" metal pipe from 4" plastic pipe).
- i. No sanitation facilities are located in the chamber. The chamber does have a drain to the mine ditch.
- j. No monitoring equipment is located in the chamber.
- k. The chamber has never been used. The site has never experienced a mine emergency.

Please feel free to contact us for further information.

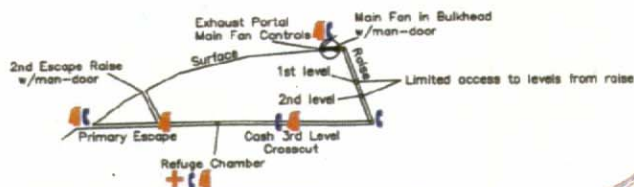
Best Regards,

Matt Collins
General Manager

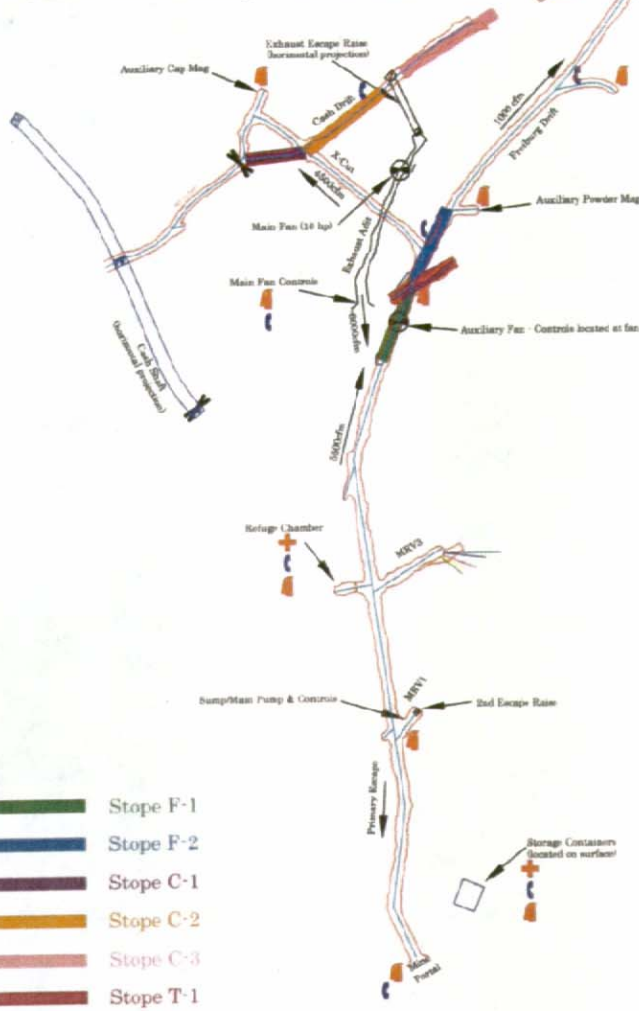


IMG0274

Air volume-flow shown is minimum
 No underground shops, compressors, air doors,
 fire doors, stoppings, regulators, oil or gas wells, etc.



Mine X-Section Looking NW (Not to Scale)



Mount Royale Ventures, LLC	
Cash and Who Do Mines	
3rd Level Plan w/ Escape Raises	
Ventilation, Escape and Evac.	
9145 Sunshine Canyon Dr., Boulder, CO 80302 (720) 445-3148	
Scale: 1" = 100'	Date: 2/23/09
Drawn By: M.C.C.	Checked By: E.G.B.
Engineered By: M.C.C.	Approved By: R.T.H.
Revision: 6	
File Name: \Engineering\MSHA\3rd Level.dwg	

Mr. Merrifield,

Mount Royale Ventures, LLC (MRV), the operator of the Cash and Who Do Mines and the Gold Hill Mill have received the P07-04 Program Information Bulletin regarding CFR30-57.11050. Currently, MRV is in compliance with this regulation; however there is one issue which MSHA has failed to address.

Specifically, at what distance from surface does an underground mine need to provide a refuge chamber when a second escapeway is not available? A possible scenario, (which many operators experience) would be that a drift being developed from surface to access an orebody would not have a secondary escape available during development. According to the regulations, as soon as miners crossed from surface to underground, even at a minimal distance of ten (10) feet, there would be a need for a refuge chamber. This is extremely impractical. For small drift sizes and small operators, this lack of clarity could cause extreme consternation and conflict between operators and MSHA.

Following directive from the Rocky Mountain District – Denver Field Office, MRV was required to install a refuge chamber at a distance of 240 feet from the portal. This met the requirements of Part 57.11050, but was a hotly contested issue between the Field Office and MRV due to the lack of distance specification. The Field Office was of the opinion that a refuge chamber should have been located much closer to surface. For cost and effectiveness, MRV desired that the refuge be located further underground.

In the Information section of the Bulletin, the last sentence: *“This means that mine areas awaiting the establishment of a second escapeway or areas of exploration or development must have at least one escapeway and one method of refuge if miners cannot reach the surface by two separate escapeways”* (italics added) does little to address the scenario which I present here.

One method of determination would be to apply the “30 minute” rule (57.11050.b) (i.e. a mine would be in compliance without a refuge if and only if the miners could reach the surface within 30 minutes).

With today’s current high metal prices it is not unreasonable to expect that this issue will become very common for smaller underground metal mines, especially those rehabilitating existing mine workings. MRV is aware of several operators facing this very issue in Colorado.

Thank you for your response.

Mr. Merrifield,

Thank you for your response.

Our answer is appreciated. I believe, however, that we (operators) lack explicit guidance for scenarios similar to that which I presented.

The problem that I see with this information is that we have an ambiguous site-specificity regarding refuge placement. How should an operator proceed? Is this an engineering or policy decision? Who at MSHA would determine the adequacy of refuge chamber placement, and how?

I am certainly not trying to cause or further a dispute. Based on my experience at the Cash Mine (MRV's operation in Boulder, CO) the input we received when discussing this with the Field office seemed to be very ambiguous; beyond a verbal instruction that at about 240 feet underground, during development, we were instructed to install a refuge in a type VI, non gassy metal mine, with Rock Mass Rating (RMR) and Rock Quality Designations (RQD) in the upper 9's (and numerical respectively). MRV complied and constructed a refuge, which exists today, in good faith and with safety at the forefront of our concern, but even today we continue to have questions regarding the "letter of the law" and the real efficacy of this instruction. Our small operation has less than 2000 feet of active workings and at no point is a miner beyond fifteen (15) minutes from surface, (more likely five (5) minutes).

Again, MRV is in full compliance of this statute. I am not trying to revisit this issue at our operation, merely trying to gain some clarity for other operations which will certainly face this issue.

To state the remaining underlying question: How should an operator proceed in determining the location or installation of a refuge, and in what manner will an operator receive MSHA approval? Would Escape and Evacuation Plan (CFR30-Part 57.11053) approval encompass this issue? Again, the "letter of the law" could force an operator to be in violation of this statute as soon as a portal is established and miners enter under a brow "a method of refuge shall be provided while a second opening to the surface is being developed". (CFR30-Part 57.11050)

I apologize if it seems that I am beating this issue to death, but absent thorough guidance, operators face avoidable violations, or worse – the injury or fatality of miners. I believe that the importance of issue is amplified for smaller operators.

Thank you for your additional guidance. MRV believes that the safety of our personnel is the highest of our priorities. We appreciate MSHA's role in that, and the assistance which you and your coworkers provide.

-----Original Message-----

From: Merrifield, Dal H - MSHA 'Merrifield.Dal@DOL.GOV>

Sent: Mar 30, 2007 7:54 AM

To: Matt Collins goldhillmines@earthlink.net>

Cc: York-Feirn, Bill (CDN) 'bill.york-feirn@state.co.us>

engmines@hotmail.com, SSanderson@coloradomining.org,

goldhillmineman@yahoo.com, Hooker, Irvin T - MSHA 'Hooker.Irvin@DOL.GOV>

Qntana, Felix A - MSHA " Qntana.Felix@DOL.GOV>

Subject: REPolicy Information Bulletin P07-04

>

Mr. Collins:

>

Thank you for your letter regarding the P07-04 Program Information Bulletin (PIB) addressing CFR30-57.11050.

>

You ask Specifically, at what distance from surface does an underground mine need to provide a refuge chamber when a second escapeway is not available?"

>

The Mine Safety and Health Administration (MSHA) believes that at metal and nonmetal underground mines when the second opening to the surface is being developed the placement of the refuge chamber must be determined by the circumstances and degree of risk that miners are exposed to. The diverse mining geologies, mining methods, and mine development plans for underground metal and nonmetal mines require an assessment of the risks the miners are exposed to. The determination of the location for a refuge chamber is to be based on potential hazard exposure and providing the most benefit to miners in the event the refuge chamber is needed.

>

When a second opening to the surface is being developed a method of refuge must be provided. MSHA realizes that some underground metal and nonmetal mines may have conditions which safely allow the refuge chamber to be located as far as 30 minutes from the surface. But the determination of the location of a required refuge chamber is specific to a mine and the conditions and circumstances at that mine. While the second opening is being developed conditions may required the refuge area to be less than 30 minutes travel from the workplaces; but the refuge chamber must be located where the employee can reach it within 30 minutes.

>

Sincerely,

>

Dal Merrifield

Attachment H

**National King Coal Refuge
Chamber Pictures**



View 2 of chamber interior



View of chamber entry door



View of chamber interior



View of open chamber entry door



View of supply storage

Attachment I

**Solvay Chemicals Refuge
Chamber Summary**



SOLVAY CHEMICALS

INTEROX, FLUORIDES & MINERALS

July 31, 2007

Malcolm Webster
Technology Specialist
National Technology Transfer Center
316 Washington Avenue
Wheeling, WV 26003

Dear Mr. Webster,

The following information has been prepared by Solvay Chemicals, Inc. in response to the request of information regarding refuge chambers by the National Technology Transfer Center. As expressed during previous phone conversations, it is important to note that Solvay Chemicals does not have established refuge chambers within existing mining operations per the definition of the Mine Safety and Health Administration. Solvay Chemicals has established a "Staging Area" within the east portion of the mine as an added component of the overall mine emergency disaster management system. In addition, Solvay Chemicals, Inc. maintains two or more separate, properly maintained escapeways which provides employees with a means to the surface within one hour from his or her place of work.

Specific to your request, the following information is related directly to the designated staging area currently located within the mine. The staging area is located on the 2 South Sub Main between 11 and 12 crosscut. The staging area is located within a previously mined area. The staging area is located in this area due to being in close proximity of active mining panels to the southeast and southwest. The staging area is also located along both a primary and secondary escapeway. The staging area is equipped with the following equipment and supplies:

- Airlocks which minimize contamination with the normal mine atmosphere in the event of an emergency
- Fully equipped first aid kit
- Portable chemical toilet
- Potable water
- Permissible page phone
- Compressed breathable oxygen cylinders
- Ten additional SCSR's
- Foam Packs and curtain materials
- Miscellaneous hand tools and,
- Chemical lights.

Solvay Chemicals, Inc.
400 County Road 85, Green River, Wyoming 82935
P.O. Box 1167, Green River, Wyoming 82935
Tel: 307.875.6500 FAX: 307.872.6510
www.solvaychemicals.us



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SOLVAY CHEMICALS

INTEROX, FLUORIDES & MINERALS

Also, the location of the staging area has been marked on the surface in the event it becomes necessary to drill into the area from the surface during an emergency.

In addition to the staging area, Solvay Chemicals has also employed the following additional emergency response measures, equipment and supplies.

1. All production panels as well as the shaft bottom are equipped with Automated External Defibrillator (AED).
2. Real time monitoring systems for methane and carbon monoxide.
3. Communication systems comprised of dial phones, leeky feeder radios and permissible paging systems.
4. Solvay Chemicals, Inc. maintains two complete mine rescue teams which routinely undergo advanced training in the area of mine rescue.
5. A fully equipped underground ambulance in addition to the first aid supplies maintained throughout the mine.
6. Solvay Chemicals, Inc. has also installed SCSR's (Self-Contained Self-Rescuers) in all active mining panels and along main entries throughout the mine. We are currently in the process of replacing and upgrading all SCSR's underground. The cost of this replacement is \$100,000.

In summary, I am hopeful that you find the information provided to you by Solvay Chemicals beneficial towards your research project. If you should have any further questions, please contact me.

Sincerely,

Rowdy Heiser
Safety Superintendent

Attachment J

**St. Lawrence Zinc, Balmat No.4 Mine Refuge Chamber
Presentation**

REFUGES CHAMBERS

ST.LAWRENCE ZINC CO., LLC

BALMAT MINE NO. 4 & MILL

MINE ID NO. 30-01185

NEW YORK

CHARACTERISTICS

There are seven refuge chambers in place, five permanent and two portable located at:

- 2 @ 2500 feet level – 1 permanent, 1 portable**
- 2 @ 3100 feet level – permanent**
- 1 @ 3500 feet level – permanent**
- 1 @ 3700 feet level – permanent**
- 1 @ 3900 feet level – portable**
- A refuge chamber is under construction at the 4000 feet level**

Two vertical shafts provide access for the mine.

The #2 shaft has a landing at the 2100 level and the #4 shaft has a landing at the 3100 level. There are drivable entries from the 4000 level to each shaft landing.

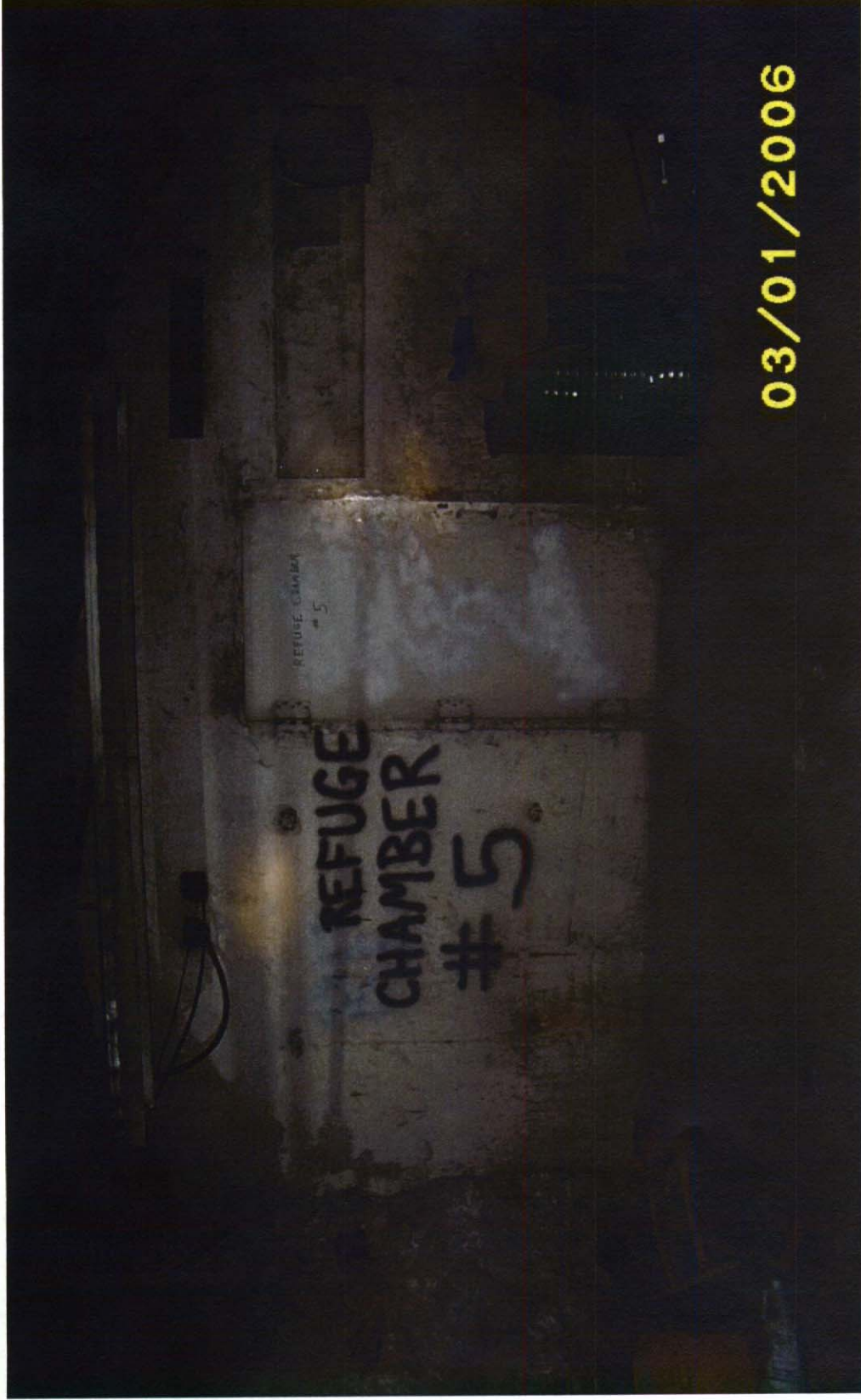
The distance from the work areas to the refuge areas varies from 700 to 1000 feet.

Each refuge chamber is provided with potable water lines and air lines. Additional bottled water is stored in each chamber.

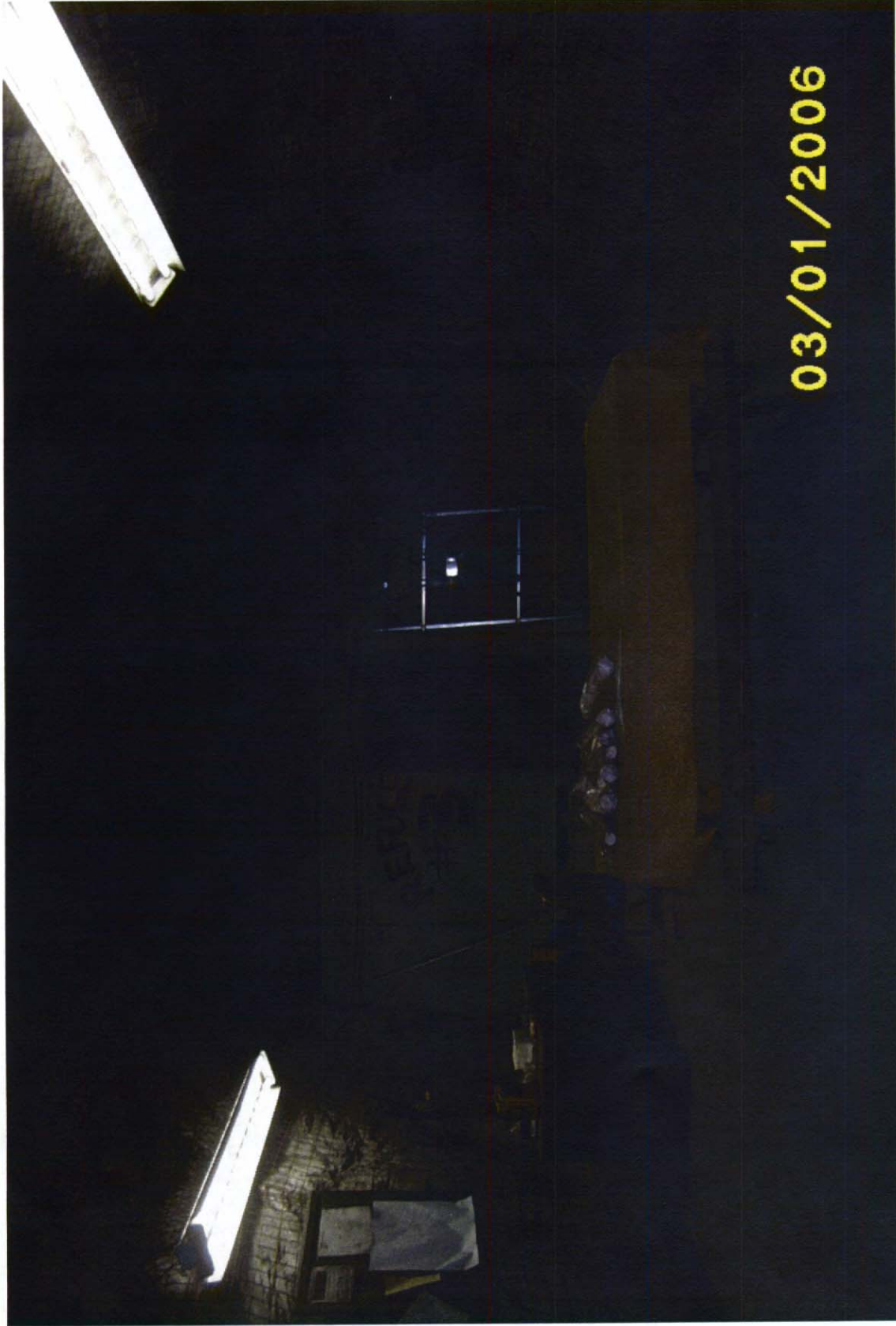
Communications are provided to each chamber by wired pager phones.

Each chamber is provided with toilet facilities and first aid supplies.

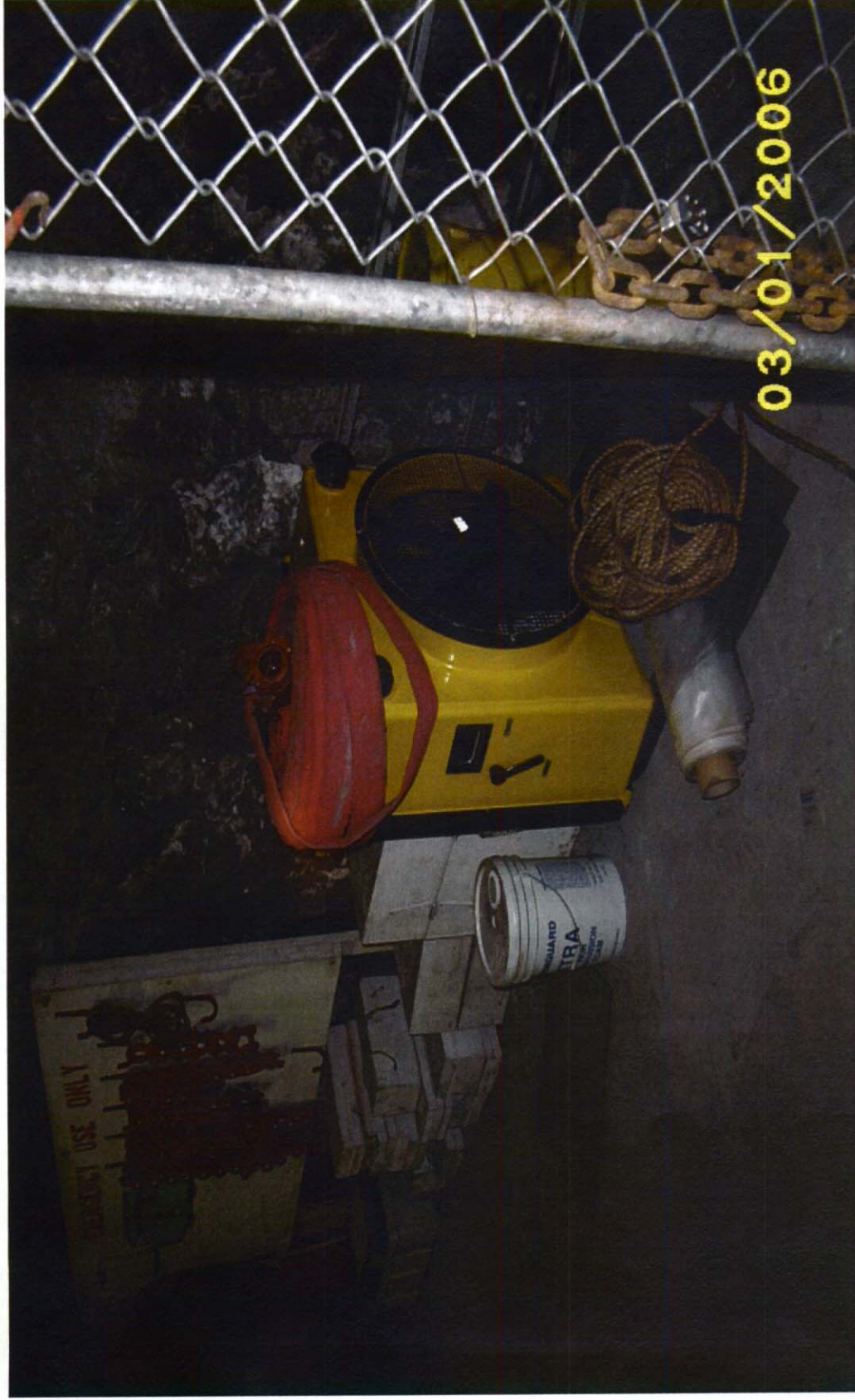
Additional tools and materials are stored for sealing purposes



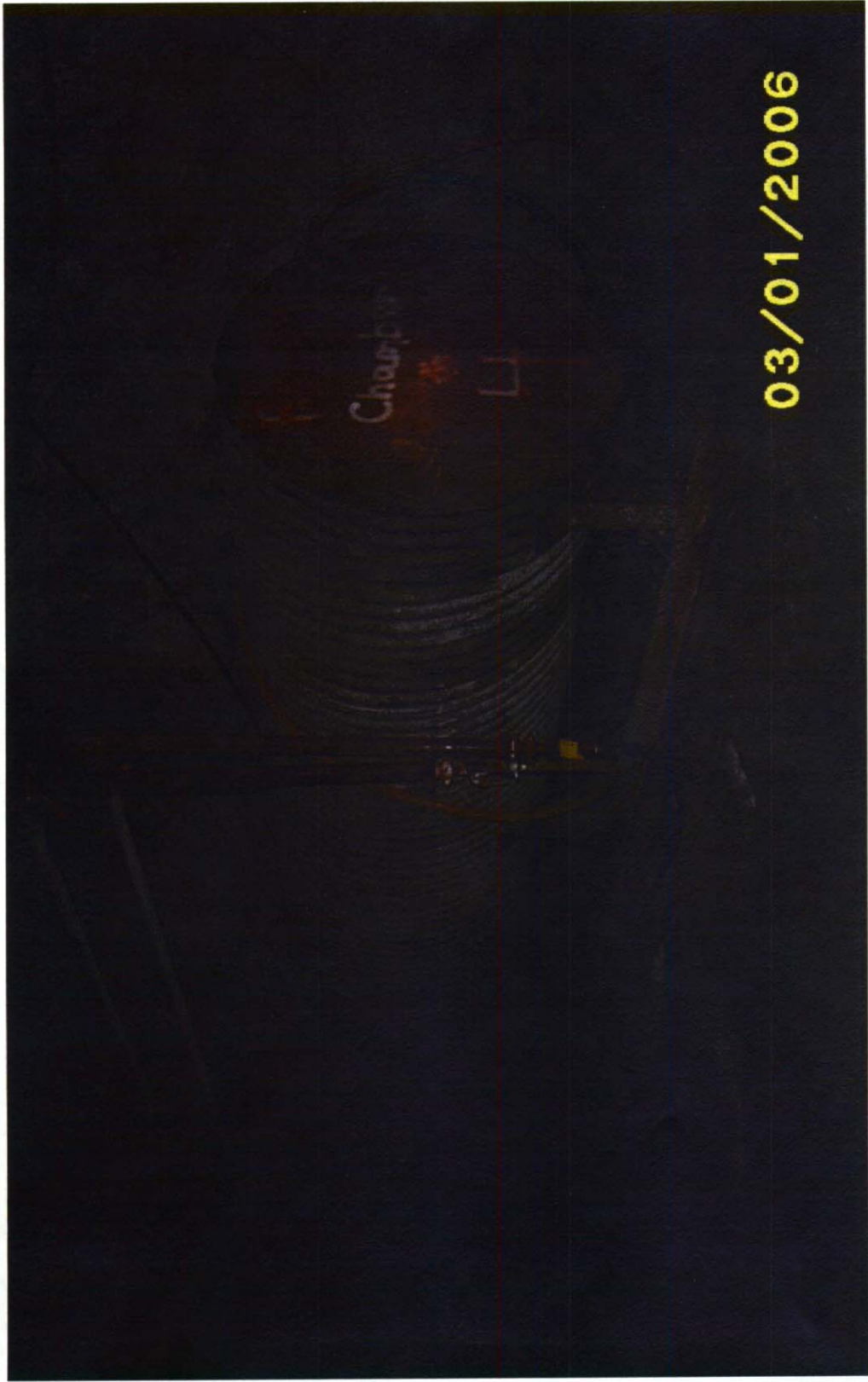
Permanent refuge chamber at the 2500 level.



Inside view of permanent refuge chamber



Additional emergency supplies stored in permanent refuge chambers



Portable refuge chamber



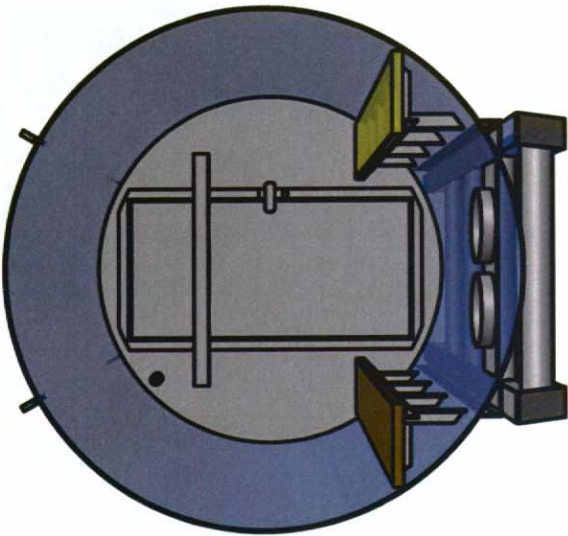
Inside view of portable refuge chamber

Attachment K

**DEA Inc. Round Portable Refuge Chamber
Drawing and Pictures**

PART NUMBER AS FOLLOWS:

RC 72 - LENGTH(") 96



VARIOUS SIZES AND OPTIONS ARE AVAILABLE UPON REQUEST.

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PHONE: (775) 777-3170
FAX: (775) 777-3172

E-MAIL: cad@deainc.net

MODEL	DATE	INITIALS
JJA	1/23/2004	JJA
DRAWING	DATE	INITIALS
JJG	1/31/2006	JJG
CHECKED	DATE	INITIALS
CUSTOMER	DATE	INITIALS

SCALE: N.T.S.

SHEET 1 OF 1

DESCRIPTION	REFUGE CHAMBER
PART/DRAWING #	RC72-96 -
REVISION	
DRAWING TYPE	PRESENTATION DRAWING



A

A

B

B



Front view of round chamber



Side view 2 of round chamber

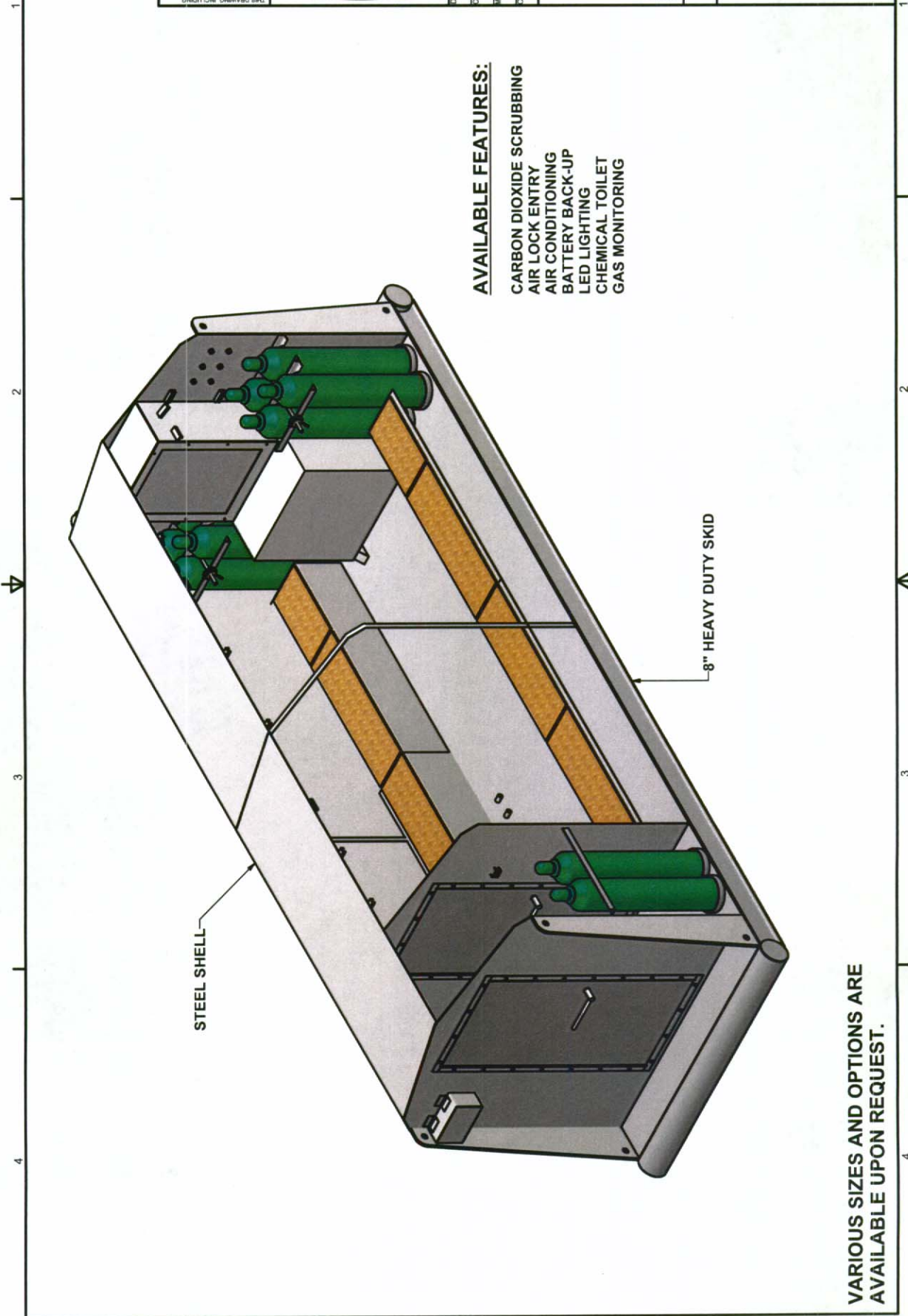


Side view of round chamber

Attachment L

**DEA Inc. 16-Man Portable Refuge Chamber
Drawing and Pictures**

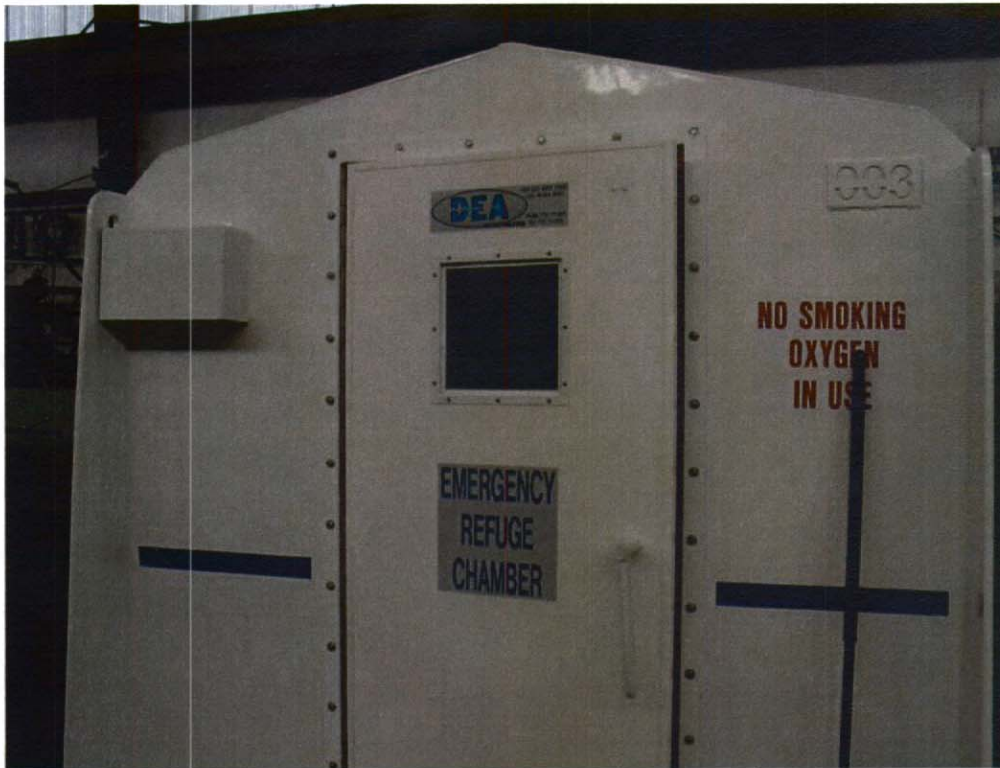
JOB #		SHEET 1 OF 1		DRAWING FILE NAME		ISOMETRIC VIEW PARTS		DRAWING TYPE		PRESENTATION DRAWING	
CUSTOMER DATE		CHECKED BY DATE		DATE APPROXIMATE		MODEL FILE NAME		PART/DRAWING #		REVISION	
INITIALS		INITIALS		INITIALS		INITIALS		INITIALS		INITIALS	
DRAWING DATE		JUG		12/4/2006		E-MAIL: jgoftried@deainc.net		PHONE: (775) 777-3172		FAX: (775) 777-3172	
5260 EAST IDAHO STREET		ELKO, NEVADA 89801		DEA INCORPORATED		DEA INCORPORATED		DEA INCORPORATED		DEA INCORPORATED	



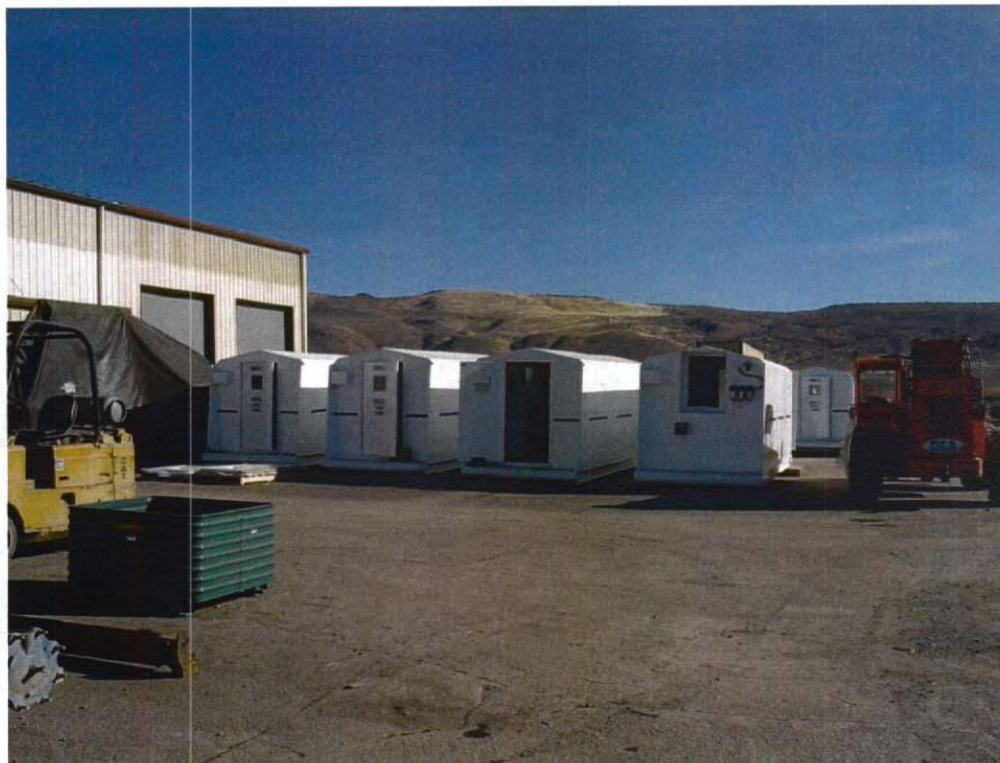
AVAILABLE FEATURES:

- CARBON DIOXIDE SCRUBBING
- AIR LOCK ENTRY
- AIR CONDITIONING
- BATTERY BACK-UP
- LED LIGHTING
- CHEMICAL TOILET
- GAS MONITORING

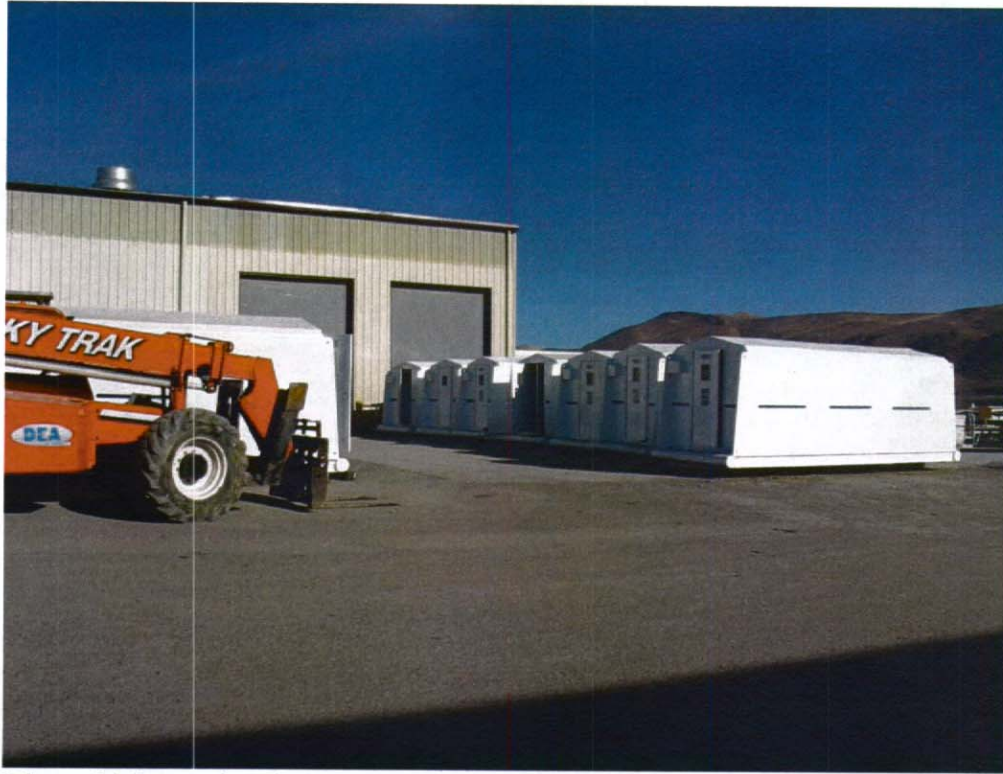
VARIOUS SIZES AND OPTIONS ARE AVAILABLE UPON REQUEST.



Door view of 16 man chamber



Front view of 16 man chamber



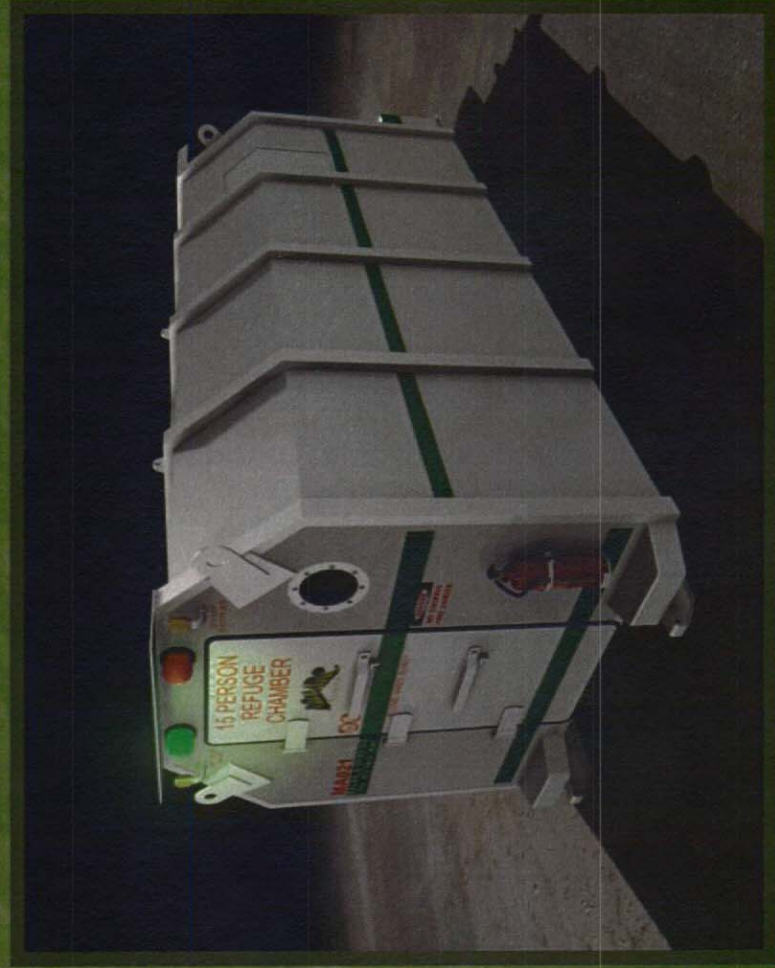
View of 16 man chamber

Attachment M

**MineArc Portable Refuge Chamber
Summary Presentation**



Underground Refuge Chambers



Company Overview

- MineARC Systems is involved in providing solutions to underground safety requirements specialising in the mining and tunnelling industry
- They are the world's leading developer and manufacturer of underground Refuge Chambers and have pioneered the carbon monoxide scrubbing system for underground use.



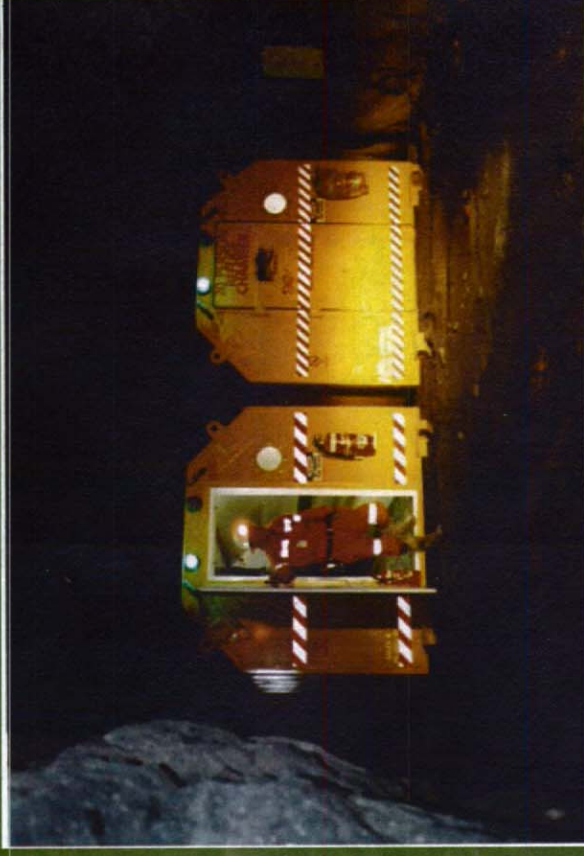
Features & Benefits

- Three Separate Systems of Air Supply
- Carbon Monoxide and Carbon Dioxide Scrubbing
- Air Conditioning System
- Full Battery Backup on all Systems
- Totally Stand Alone for 36 Hours



Applications

- Underground Mining
- Tunnelling
- Nuclear Waste Facilities
- Offshore Oil Platforms



MineARC Systems Refuge Chambers are installed in Underground Metalliferous Mines throughout Australia as well as Mines and Tunnels in Ireland, Indonesia, New Zealand and Turkey.



The Chamber

The chamber is a purpose built Steel Chamber designed to minimise the flow of air either into or out of the chamber once the door and air valves are sealed.



The Chamber

- Constructed of 5mm steel plate fitted with a skid base and towing and lifting points.
- Painted internally with non toxic inorganic paint and externally in industrial grade enamel.
- Escape Hatch
- Viewing Portal
- Internal & External Fire Extinguishers

Air Conditioning System

Refuge chambers must be cooled because the occupants themselves produce heat and as the heat accumulates it becomes a serious problem.

Heat build up also occurs during the scrubbing of the air.

An Air Conditioning Unit is therefore a life preserving necessity in a Refuge Chamber.

Air Conditioning System

- Air conditioning of the chamber is supplied by a split system air conditioning unit operated by Mines Power under normal conditions.
- Once the mine power fails a battery back up system will automatically run the unit.



Scrubbing System

- The CO₂ and CO Scrubbing system is in a self-contained unit designed to clean air in confined spaces where human life needs to be supported over a period of time, such as in Mine Refuge Chambers.
- The purpose is to remove the Carbon Dioxide (CO₂) and Carbon Monoxide (CO) from the air in the Chamber, reducing the risk of Carbon Dioxide and Monoxide poisoning, which can result in loss of life

Air Systems

The chamber is fitted with three separate breathing air supply systems:

- Filtered and silenced Compressed Mine Air
- Medical Oxygen Cylinders
- Oxygen Candle



Gas Detection System

- A Gas Sampling Pump Kit is provided with the chamber to test the Oxygen (O₂), Carbon Dioxide (CO₂) and Carbon Monoxide (CO) levels inside the Chamber. Testing the air is only required when using the Oxygen Candle or the Medical Grade Oxygen Bottles.

Electrical Systems

- The MineARC chamber is connected to an external 240-volt ac supply.
- The electrical system incorporates battery backup so that the chamber continues to operate normally even when Mine Power is interrupted.

Contact Us

For more information please see our website at
www.minearc.com.au

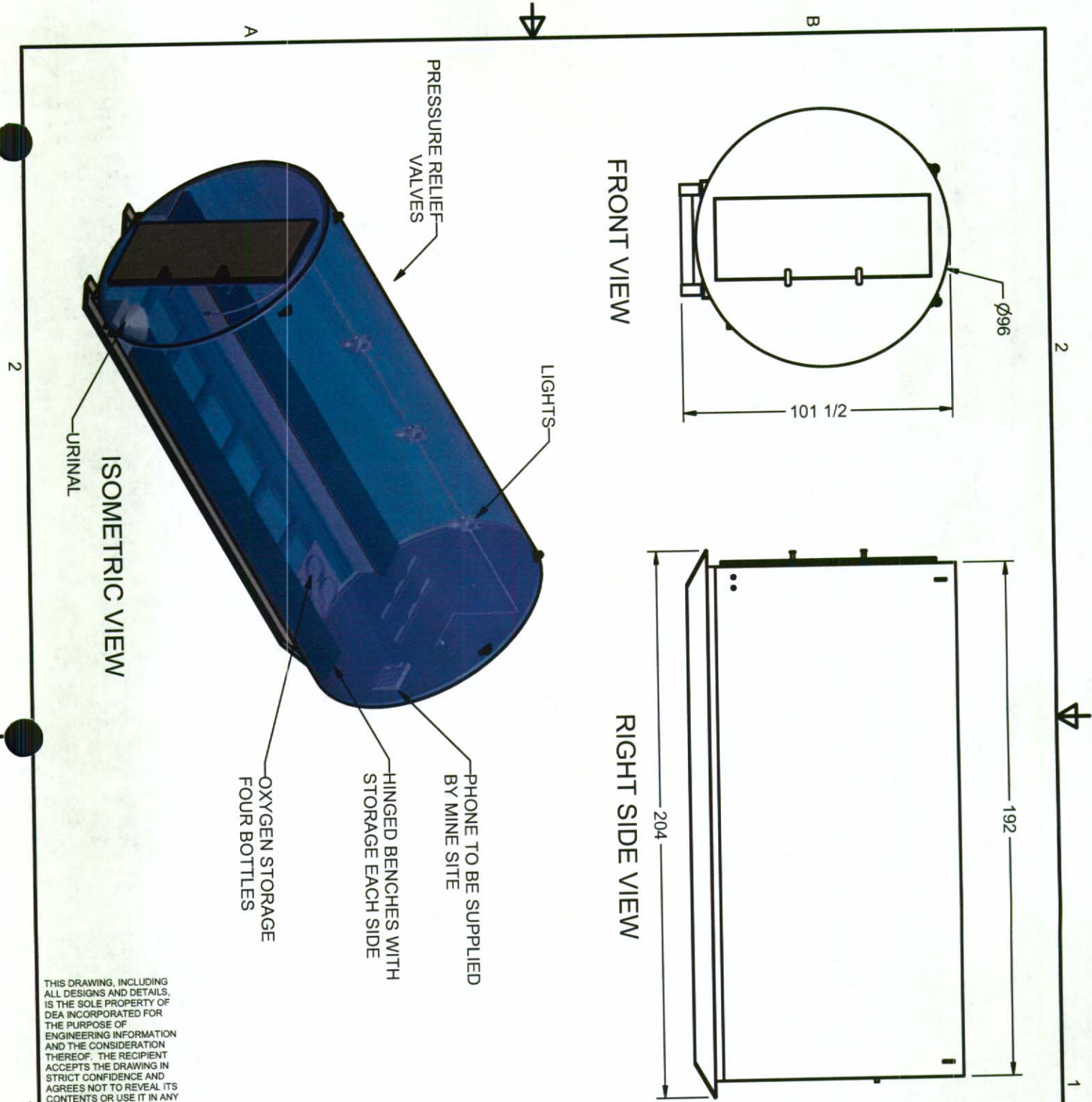
Or for a copy of our animated CD email us
info@minearc.com.au

Contact us at:
MineARC Systems
274 Welshpool Road
WELSHPOOL WA 6106
AUSTRALIA
Tel: +61 8 9333 4966
Fax: +61 80 9333 4900






Attachment N

**Rock Well Petroleum
Portable Refuge Chamber Diagram**



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NEWMONT REFUGE CHAMBER		JOB #: 2382			
		SHEET 1 OF 1			
PART/DRAWING #	REVISION	 	MODEL FILENAME	CUSTOMER DATE	INITIALS
RC 96X192	-		RC96x192/00-Refuge Chamber Assembly.dwg	2/20/2006	
DESCRIPTION		SIZE	DRAWING FILENAME	CHECKED DATE	INITIALS
REFUGE CHAMBER ASSEMBLY		A	RC96x192/00-Refuge Chamber Assembly.dwg	2/20/2006	
DRAWING TYPE			DRAWING DATE	DATE	INITIALS
ESTIMATE DRAWING			JUG	2/20/2006	
			DATE		
			DATE		
			DATE		
			DATE		

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