

Safety and Health Practices in the U.S. Salt Mines

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ABSTRACT

The U.S. Department of Labor, Mine Safety and Health Administration is responsible for setting and enforcing the standards under the Federal Mine Safety and Health Act of 1977. The purpose of these standards is the protection of life, the promotion of health and safety, and the prevention of accidents. A healthy and safe working environment can best be achieved by the joint efforts of the operator, labor, and government. This paper will only discuss the portion of the U.S. Government's efforts and responsibilities in administrating and enforcing the safety and health standards. These standards have direct impact on the operation of salt mines. Based on accident and injury experience, various types of changes have been made and safe practices have been implemented to improve safety and health at salt mine operations. The safety and health records of U.S. salt mines have shown significant improvement through the years and the salt industry can be proud of the achievement. The agency has set as a goal zero fatalities by the year 2000; however, there remain areas that need attention and improvement. With all the parties working diligently together, this goal will be reachable.

INTRODUCTION

The primary mission of the Mine Safety and Health Administration (MSHA) is to initiate and sustain a safe and healthy working environment throughout all U.S. metal and non-metal mines and coal mines. The main thrust of the mission translates directly to enforcing compliance with the provisions of the Federal Mine Safety and Health Act of 1977. In addition, it involves working with and assisting the mineral industry in a common effort to improve the mine working environment. MSHA continually develops new and up-to-date standards that achieve a higher degree of protection for miners. MSHA also assists mine operators in solving particularly troublesome health and safety problems. The education and training functions provide informational programs to advise the mining community of safe work procedures (Anon. 1977a).

The safety and health practices in the U.S. salt mines must be in compliance with the established mandatory safety and health standards, under the Code of Federal Regulations Title 30, Subchapter N: Metal and Nonmetal Mine Safety and Health, Part 56 Safety and Health Standards — Surface Metal and Non-metal Mines and, Part 57 Safety and Health Standards — Underground Metal and Non-metal Mines.

Salt mine activities include both surface and underground mines located in the U.S.A. They cover the following states: Arizona, California, Illinois, Kansas, Louisiana, Michigan, Nevada, Florida, Indiana, Iowa, Minnesota, Missouri, Nebraska, New Mexico, New York, Ohio, Oklahoma, Texas and Utah. The mandated safety and health inspections are required four times and two times per year for underground and surface mines, respectively. The requirement of the reporting injuries and days lost due to injury, gives us data which clearly illustrates the major problem areas which may need attention and additional joint safety efforts by both the industry and the government.

The type of mining methods involved are evaporated, brine and underground (room and pillar and benching) operations. Each mining method inherently has some particular hazardous areas which are associated with its activities. The major areas which develop serious incidents and cause changes of the standards, based on the accidents, investigation results, and technical evaluation, will be discussed in detail. The underground salt mines in the U.S. employs two mining methods based on the types of deposit. For salt domes, room and pillars, the benching method (Figs. 1 and 2) was utilized. For bedded formation, the room and pillar method was the prac-

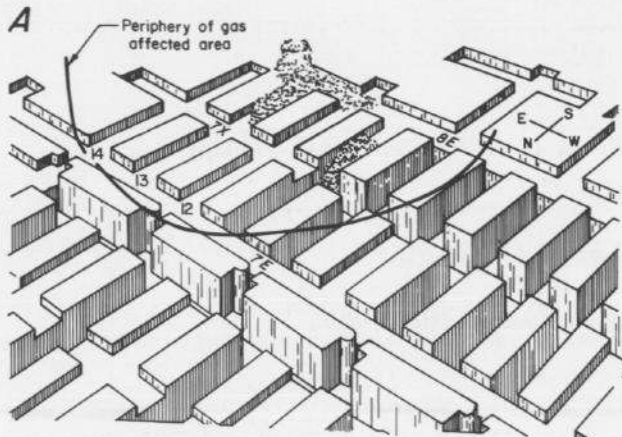


Fig. 1. Belle Isle Mine.

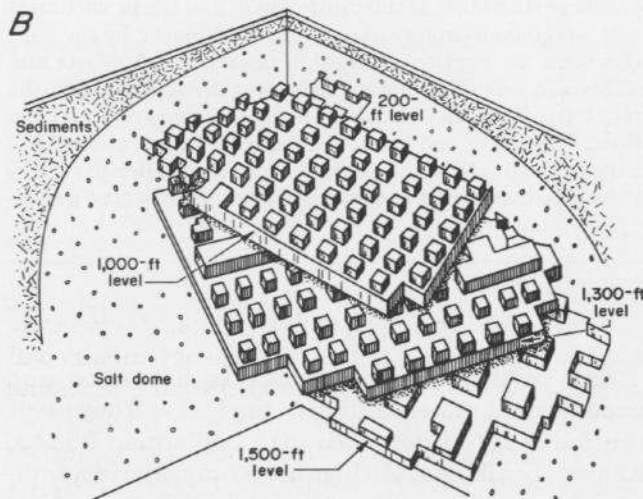


Fig. 2. Jefferson Island Mine.

tice. The major safety and health concern for these mining methods can be evaluated as follows:

1. During planning stage: (a) Surface layout; (b) Shaft location and design; (c) Mine layout; (d) Ground control and ventilation plan.

2. During development stage: (a) Surface installation; (b) Shaft sinking; (c) Refuge chamber; (d) Safety program and training; (e) Equipment; (f) Ground control and ventilation plan implementation.

3. During production stage: (a) Ground control; (b) Ventilation; (c) Power distribution; (d) Equipment; (e) Blasting; (f) Safety program and training; (g) Emergency plan.

Safety and health can only be provided when all the parties involved take it seriously and work together diligently. The standards and inspection can only provide the basic guideline and protection. Those working at the mine site day in and day out have to be constantly on the alert for any unusual

events or conditions. Mining is a dynamic operation. The change of conditions could occur rapidly whenever new face and cuts are developed and new equipment is introduced. A safe and healthy working environment without disruption by any unpleasant event which could cause production stoppage or delay should also be a profitable operation.

SAFETY AND HEALTH PRACTICES

The safety and health practices can be identified as follows:

1. Company safety and health program
2. Union safety and health program
3. State safety and health program
4. Federal safety and health program

All programs should be carried out in the same spirit to provide a safe and healthy working environment and protection of the nation's miners. The mandate for safety and health standards is based on the Federal Metal and Nonmetallic Mine Safety Act and the Federal Mine Safety and Health Act of 1977, Public Law 91-73, by the U.S. Congress.

In the Act, the following areas have been defined. Under Title 1 (U.S. Dept. of Labor, Mine Safety and Health Administration, 1977):

- Section 101: Mandatory safety and health standard
- Section 102: Advisory committee
- Section 103: Inspections, investigations and record keeping
- Section 104: Citation and orders
- Section 105: Procedure for enforcement
- Section 106: Judicial review
- Section 107: Procedures to counteract dangerous conditions

- Section 108: Injunctions
- Section 109: Posting orders and decisions
- Section 110: Penalties
- Section 112: Administrative provisions
- Section 113: The Federal Mine Safety and Health Review Commission

- Section 114: Authorization of appropriations
- Section 115: Mandatory health and safety training

The safety and health standards promulgated by the U.S. Department of Labor, Mine Safety and Health Administration, in dealing with safety and health issues are under the Code of Federal Regulation 30. The standards cover very broad areas including both coal, metal and nonmetal mine safety and health, and all related areas as follows (Anon., 1991):

- Subchapter A, Part 1: Official emblem
- Subchapter B, Part 5-36: Testing, evaluation, and approval of mining products
- Subchapter G, Part 40-45: Filing and other administrative requirements

Subchapter H, Part 47-49: Education and training
 Subchapter M, Part 50: Accidents, injuries, illnesses, employment and production in mines

Subchapter N: Metal and nonmetal mine safety and health

Part 56: Safety and health standards — surface-metal and nonmetal mines

Part 57: Safety and health standards — underground-metal and nonmetal mines

Subchapter O, Part 70-90: Coal mine safety and health

Subchapter P, Part 100: Civil penalties for violations of the Federal Mine Safety and Health Act of 1977

Subchapter Q, Part 104: Pattern of violations

The success of providing a safe and healthful working environment can only be achieved by careful mine planning, adequate training of personnel, constant awareness of safety and health requirements, inspections and enforcement.

MANDATORY TRAINING

In the U.S., mandatory training is required under Part 48 and can be detailed as follows:

Part 48.6

Under Part 48.6 the training of newly-employed experienced miners is considered. This training shall include the following:

1. Instruction to work environment.
2. Mandatory health and safety standards.
3. Authority and responsibility of supervisors and miners' representatives.
4. Entering and leaving the mine; transportation; communication.
5. Mine map; escapeways; emergency evacuation; barricading.
6. Roof or ground control and ventilation plans.
7. Hazard recognition.
8. Self-rescue and respiratory devices.
9. Other courses as may be required by the District Manager based on circumstances and conditions at the mine.

Part 48.7

Under Part 48.7 the training of miners assigned to a task in which they have had no previous experience is considered, namely:

1. Health and safety aspects and safe operating procedures for work tasks, equipment and machinery.
2. (i) Supervised practice during non-production.
 (ii) Supervised operation during production.
3. New or modified machines and equipment.
4. Such other courses as may be required by the

District Manager based on circumstances and conditions at the mine.

Part 48.8

Under Part 48.8 the annual refresher training of miners is considered. Each miner shall receive a minimum of eight hours of annual refresher training. The program shall include the following courses of instruction:

1. Mandatory health and safety standards.
2. Transportation controls and communication systems.
3. Barricading.
4. Roof or ground control and ventilation plans.
5. First aid.
6. Electrical hazards.
7. Prevention of accidents.
8. Self-rescue and respiratory.
9. Explosives.
10. Mine gases.
11. Health.
12. Such other courses as may be required by the District Manager based on circumstances and conditions at the mine.

Part 48.25

Under Part 48.25 the training of miners working at surface mines is considered. Each new miner shall receive no less than 24 hours of training, including the following courses:

1. Instruction in the statutory rights of miners and their representatives under the Act; authority and responsibility of supervisors.
2. Self-rescue and respiratory devices.
3. Transportation controls and communication systems.
4. Introduction to work environment.
5. Escape and emergency evacuation plans; fire warning and fire fighting.
6. Ground control; working in areas of highwalls, water hazards, pits and spoil banks; illumination and night work.
7. Health.
8. Hazard recognition.
9. Electrical hazards.
10. First aid.
11. Explosives.
12. Health and safety aspects of the tasks to which the new miner will be assigned.
13. Such other courses as may be required by the District Manager based on circumstances and conditions at the mines.

Part 48.26

Under Part 48.26 the training of newly employed

experienced miners; shall prelude the following:

1. Introduction to work environment.
2. Mandatory health and safety standards.
3. Authority and responsibility of supervisors and miners' representatives.
4. Transportation controls and communication systems.
5. Escape and emergency evacuation plans; fire warning and fire fighting.
6. Ground controls; working in areas of highwalls, water hazards, pit and spoil banks; illumination and night work.
7. Hazard recognition.
8. Such other courses as may be required by the District Manager based on circumstances and conditions at the mine.

Part 48.27

Under Part 48.27 the training of miners assigned to a task on which they have had no previous experience; shall include the following:

1. Health and safety aspects and safe operating procedures for work tasks, equipment, or machinery.
2. (i) Supervised practice during nonproduction.
(ii) Supervised operation during production.
3. New or modified machines and equipment.
4. Such other courses as may be required by the District Manager based on circumstances and conditions at the mines.

Part 48.28

Under Part 48.28 the annual refresher training of miners shall include the following:

1. Mandatory health and safety standards.

2. Transportation controls and communication systems.

3. Escape and emergency evacuation plans; fire warning and fire fighting.

4. Ground control; working in areas of highwalls, water hazards, pits and spoil banks; illumination and night work.

5. First aid.

6. Electrical hazards.

7. Prevention of accidents.

8. Health.

9. Explosives

10. Self-rescue and respiratory devices.

11. Such other courses as may be required by the District Manager based on circumstances and conditions at the mine.

MINING ACCIDENTS

General

Data such as total days lost, total days lost due to types of injuries, total number of injuries, and total number of injuries with respect to surface and underground mines, as shown on Figures 3-6, has been required of mine operators since 1975. Figures indicated the areas where safety and health problems occurred in underground and surface operations. Tables 1 and 2 identify the cause of injuries based on each accident class. The data clearly indicated three major results, the fatal/non-fatal days lost and no days lost have reduced drastically since the effective date of the 1977 Act. The decline is very significant after two years of vigorous effort by the industry and the government. Based on the accident class; the

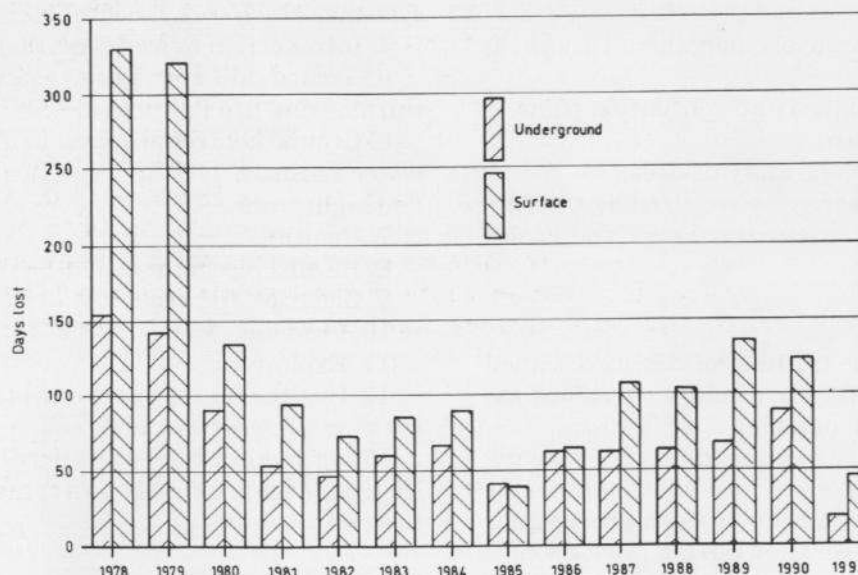


Fig. 3. Metal and nonmetal injury data for salt mines — totals.

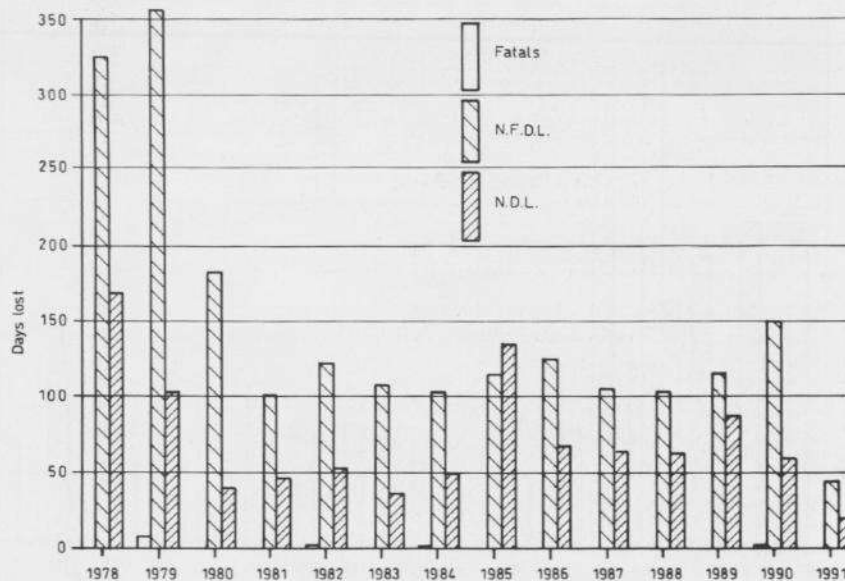


Fig. 4. Metal and nonmetal injury data for salt mines — summary totals.

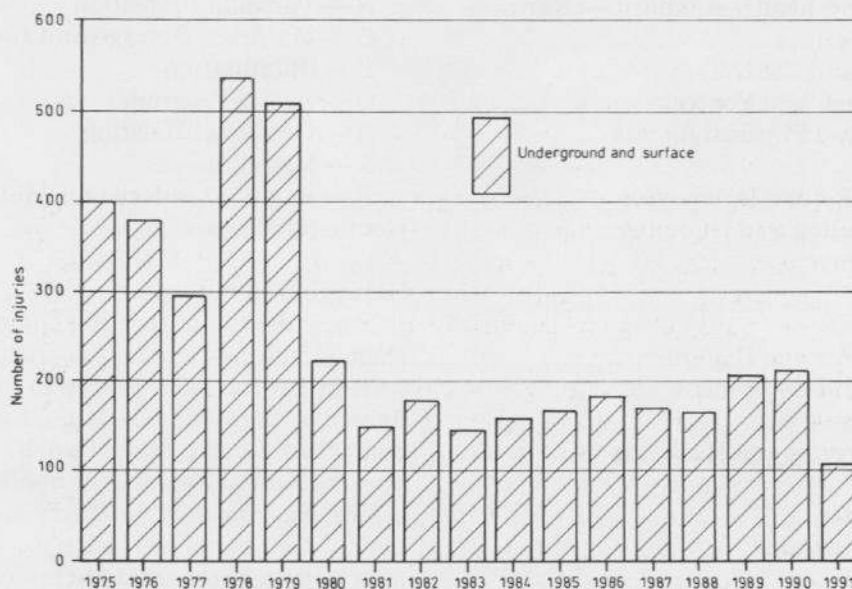


Fig. 5. Number of injuries for salt mines — total accidents for all classes.

handling material, hand tools, powered haulage, machinery, slip or falls of a person, these five classes continue to contribute to the majority of the reported injuries, but compared to the total number of injuries for 1978, 1979 and 1991, the reduction from over 500 per year to approximately 100 per year, is a significant improvement and the salt mine industry can be proud. From 1981 to 1991, the numbers are low, and they have been consistent. The Assistant Secretary of MSHA has set the goal for zero fatalities by the year 2000 for the mining industry in general, the salt

mine industry has contributed greatly toward that goal but there is still room for additional improvement in order to provide an even healthier and safer working environment.

Safety and health standards

The safety and health standards, under Parts 56 and 57, are promulgated in dealing with surface and underground metal and nonmetal mines, respectively. The following are the areas which have to be addressed.

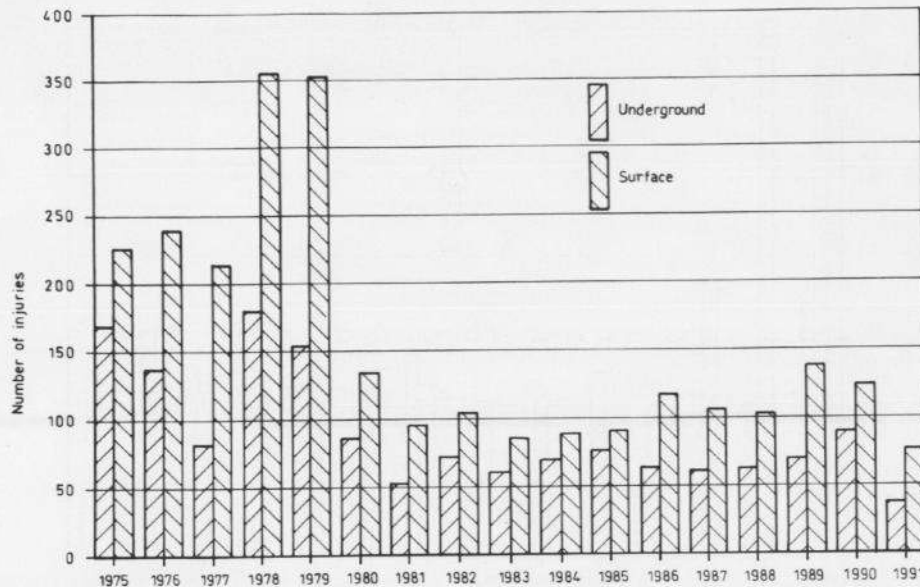


Fig. 6. Number of injuries for salt mines — total all classes; surface and underground.

Part 56: Safety and health standard — Surface-metal and nonmetal mines

Subpart B — Ground Control

- C — Fire Prevention and Control
- D — Air Quality and Physical Agents
- E — Explosives
- F — Drilling and Rotary Jet Piercing
- H — Loading, Hauling and Dumping
- I — Aerial Tramways
- J — Travelways
- K — Electricity
- L — Compressed Air and Boilers
- M — Machinery and Equipment
- N — Personal Protection
- O — Materials Storage and Handling
- P — Illumination
- Q — Safety Program
- R — Personnel Hoisting
- S — Miscellaneous

Part 57: Safety and health standard — Underground-metal and nonmetal mines

Subpart B — Ground Control

- C — Fire Prevention and Control
- D — Air Quality, Radiation and Physical Agent
- E — Explosives
- F — Drilling and Rotary Jet Piercing
- G — Ventilation
- H — Loading, Hauling and Dumping
- I — Aerial Tramways
- J — Travelways and Escapeways
- K — Electricity
- L — Compressed Air and Boilers
- M — Machinery and Equipment

N — Personal Protection

O — Materials Storage and Handling

P — Illumination

Q — Safety Program

R — Personnel Hoisting

S — Miscellaneous

T — Safety Standards for Methane in Metal and Nonmetal Mines

Salt mine accidents

Since 1977, due to a few major accidents, major changes in safety and health practices have occurred.

1. In 1979, a mine explosion disaster occurred on June 8 at the Belle Isle Mine, Cargill, Incorporated near Franklin, St. Mary Parish, Louisiana. An outburst of flammable gases and salt occurred following a face blast in 8 Main Entry East at about 23.00 hours, and a gas explosion occurred in the mine approximately ten minutes later. At the time of the explosion, twenty-two people were in the mine. Ten people were on the upper level and twelve people were on the lower level. Seventeen people were rescued and five people died as a result of the explosion.

2. Reported incidents of blow-out released a large quantity of methane which caused the gas inundation of the mine.

3. Water inundation occurred on November 20, 1980, at the Jefferson Island Mine, Diamond Crystal Salt Company, New Iberia, Louisiana. Because mine emergency evacuation procedures were immediately followed, there were no injuries or loss of life. This mine inundation meant the loss of the mine, the loss of employment for the miners, and a substantial financial loss to all concerned.

TABLE 1

Number of injuries in underground salt mines by accident class

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	Total
Electrical	1	0	0	3	0	4	3	2	2	2	0	0	1	0	0	0	0	18
Exploding vessels	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	3
Fall/slide of material	7	8	9	5	2	1	0	0	0	0	1	0	0	0	0	1	0	34
Fall of roof	2	4	0	3	4	4	2	1	2	2	2	1	1	0	5	7	1	41
Handling material	49	45	16	40	45	23	11	22	22	26	18	22	17	18	21	21	12	428
Hand tools	12	6	6	27	14	12	8	8	5	14	11	5	7	13	10	12	8	178
Non-powered haulage	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	2
Powered haulage	18	10	8	24	22	11	8	16	7	8	6	9	9	8	8	16	4	192
Fire	1	0	0	1	0	0	0	0	0	1	1	0	0	0	1	0	0	5
Entrapment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fall of face/highwall	5	3	1	3	3	0	1	3	0	1	0	0	0	0	1	0	0	21
Explosives	2	1	0	0	0	3	0	0	0	0	0	3	0	0	0	0	0	9
Hoisting	0	0	0	0	1	0	1	5	1	1	1	1	0	0	1	2	1	15
Ignition of gas or dust	0	1	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0	12
Machinery	20	10	6	30	16	7	6	8	9	5	14	8	14	10	5	15	3	186
Slip or fall of person	19	25	16	27	28	18	8	7	11	6	12	14	8	10	15	10	4	238
Step/kneel on object	6	8	3	3	2	7	3	0	2	1	4	3	2	3	1	3	1	52
Strike/bump object	12	5	6	3	2	0	2	0	0	1	0	0	0	1	0	0	0	32
Other	17	12	10	10	3	1	1	1	0	1	3	0	3	0	2	1	0	65

TABLE 2

Number of injuries in surface salt mines by accident

	1975	1976	1977	1978	1979	1980	1981	1982	1983	1934	1985	1986	1987	1988	1989	1990	1991	Total
Electrical	4	0	2	3	2	0	0	3	0	0	0	0	0	0	1	0	1	16
Exploding vessels	0	0	0	1	0	1	1	0	1	0	0	0	0	0	0	1	2	7
Fall/slide of material	8	4	6	4	1	2	0	0	0	0	0	0	0	0	0	0	0	25
Fall of roof	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Handling material	82	118	78	167	195	75	37	43	42	43	50	63	53	45	69	58	40	1258
Hand tools	8	15	18	32	17	9	16	12	6	10	10	12	11	11	16	21	8	232
Non-powered haulage	4	0	0	2	3	1	2	1	1	1	1	2	0	0	1	2	0	21
Powered haulage	21	12	15	29	28	17	6	6	7	8	8	5	9	15	9	5	4	204
Fire	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	2
Entrapment	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	2
Fall of face/highwall	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Explosives	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hoisting	0	0	0	5	2	0	2	1	0	0	0	0	0	0	0	2	0	12
Ignition of gas or dust	4	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	6
Machinery	18	17	14	29	33	7	15	8	10	14	10	5	2	4	20	10	8	224
Slip or fall of person	41	40	52	54	56	22	15	26	17	12	11	26	28	24	14	18	8	464
Step/kneel on object	9	3	6	14	7	2	2	3	0	1	0	3	0	1	1	1	0	53
Strike/bump object	12	13	6	9	4	0	0	2	1	0	2	1	3	1	1	0	0	55
Other	16	19	17	7	5	1	0	1	1	1	0	3	2	3	7	4	2	89

Changes in safety practices

Because of the above-mentioned incidents, the following are major changes of safety practices in the salt mines in the U.S.A operations.

1. New regulations were promulgated under Subpart T: Safety Standards for Methane in Metal and Nonmetal Mines, on July 1, 1987, to protect people against the hazards of methane gas and dust containing volatile matter. For domal salt mine, Part 57.22003(a-2) (Anon., 1977).

Category II applies to domal salt mines where the history of the mine or geological area indicates the occurrence of or the potential for an outburst. Category II is divided into subcategories, II-A and II-B as follows:

(i) Subcategory II-A applies to domal salt mines where an outburst reportable under 57.22004(c-1) (Anon., 1977).

An outburst that results in 0.25% or more methane in the mine atmosphere has occurred.

(ii) Subcategory II-B applies to domal salt mines where an outburst reportable under 57.22004(c-1) (Anon., 1977) has not occurred, but which has the potential for an outburst based on the history of the mine or geological area in which the mine is located.

2. Because of the change in the category, the following changes occurred in the following areas:

- 55.22102: Smoking (IIA)
- 57.22103: Open flame (IIA)
- 57.22201: Mechanical ventilation (IIA and IIB)
- 57.22202: Main fan (IIA)
- 57.22204: Main fan operation and inspection (IIA)
- 57.22205: Doors on main fan (IIA)
- 57.22206: Main ventilation failure (IIA)
- 57.22207: Booster fan (IIA)
- 57.22208: Auxiliary fans (IIA)
- 57.22212: Air flow (IIA)
- 57.22214: Changes and ventilation (IIA)
- 57.22215: Separation of intake and return (IIA)
- 57.22219: Seals and stoppings (IIA)
- 57.22220: Air passing unsealed areas (IIA)
- 57.22221: Overcast and undercast construction (IIA)
- 57.22222: Ventilation material (IIA)
- 57.22227: Approved testing devices (IIA and IIB)
- 57.22228: Pre-shift examination (IIA)
- 57.22231: Action at 0.25% methane (IIB)
- 57.22232: Action at 0.5% methane (IIA and IIB)
- 57.22235: Action at 1.0% methane (IIA and IIB)
- 57.22238: Action at 2.0% methane (IIB)
- 57.22301: Atmospheric monitoring systems (IIA)
- 57.22304: Approved equipment (IIA)
- 57.22307: Methane monitors (IIA)
- 57.22311: Electrical cable (IIA)
- 57.22312: Distribution box (IIA)
- 57.22501: Personal electric lamps (IIA and IIB)

57.22603: Blasting from the surface (IIA)

57.22604: Blasting from the surface (IIB)

The most important change is 57.22603 and 22604.

22603: (a) All development, production, and bench rounds shall be initiated from the surface after all persons are out of the mine. Persons shall not enter the mine until the mine has been ventilated for at least 15 minutes and the ventilating air has passed over the blast area and through at least one atmospheric monitoring sensor.

(b) If the monitoring system indicates that methane in the mine is less than 0.5%, competent persons may enter the mine to test for methane in all blast areas.

(c) If the monitoring system indicates that methane in the mine is 0.5% or more, the mine shall be ventilated and persons shall not enter the mine until the monitoring system indicates that methane in the mine is less than 0.5%.

(d) If the monitoring system is inoperable or malfunctions, the mine shall be ventilated for at least 45 minutes and the mine power shall be de-energized before persons enter the mine. Only competent persons necessary to test for methane may enter the mine until the methane in the mine is less than 0.5%.

(e) Vehicles used for transportation when examining the mine shall be approved by MSHA under the applicable requirements of 30 CFR parts 18 through 36. Vehicles shall not be used to examine the mine if the monitoring system is inoperable or has malfunctioned.

22604: All development, production, and bench rounds shall be initiated from the surface after all persons are out of the mine. Persons other than those designated by the mine operator to make methane tests shall not enter the mine until all blast areas have been tested for methane.

There is no absolute accurate scientific method to detect and predict the blowout and take preventive measures. By changing the safe blasting procedures, the miners' safety can be assured.

3. The other important change is the requirement of approved permissible equipment and monitoring systems, once the mine is classified as gassy. By providing safe mining equipment and an early warning system, the possibility of contamination of the mine atmosphere by methane could be detected early and the likelihood of fire or explosion caused by the methane can be eliminated. The safety of the miners can also be assured.

The success of the change can be correlated with the injury data for the past ten years. The joint effort by the industry, labor, and government have proved

that by working closely together a safe and healthy working environment can be provided.

Mine accident evaluation

Based on the results of the Jefferson Island incident, there was no loss of life. The contributing factor can be attributed to all the miners' fast reaction and familiarity with the emergency evacuation plan. Under the 57.11050, "Escapeways and Refuges," every mine shall have two or more separate, properly maintained escapeways to the surface from the lowest levels which are so positioned that damage to one shall not lessen the effectiveness of the others. A method of refuge shall be provided while a second opening to the surface is being developed.

Under 57.4361, "Underground Evacuation Drills" and 57.11053, "Escape and Evacuation Plan," the proper planning and exercise had been carried out at Jefferson Island when the emergency developed.

Diamond Crystal held the evacuation drills once every six months. The last drill, covering all underground personnel on each of the three daily work shifts was conducted on August 4-7, 1980. On November 17, three days before the inundation, the evacuation plan was reviewed during an underground safety meeting. The performance of Diamond Crystal's miners on the morning of November 20 speaks for the excellence of their evacuation plan and the training of the miners who followed it.

OTHER MSHA ACTIVITIES

In addition to the enforcement of the coal and metal and nonmetal mine safety and health standards, MSHA also has other major functions which contribute heavily in the mine safety and health in the U.S. It includes technical support, educational policy and development, assessments, standards, regulations and variances, Solicitor's office, administration and management.

Technical support provides engineering services to the enforcement in order to resolve difficult engineering problems, provide technical input for proposed new standards, improvement of existing standards, safety and health training, mining information related to the safety and health programs, and technical expertise in supporting legal activities.

The National Mine Health and Safety Academy is the only educational institute in the U.S. established

solely for mine safety and health education. The Academy provides training to both government and industry.

CONCLUSIONS

The number of injuries for the last 10 years has been low but all reportable injuries in different classes have been consistent. In order to reduce and eliminate these injuries, the agency has initiated the "Job Safety Analysis Program." By carefully evaluating each job task and establishing safe working procedures, with the information presented to the miners, a further improvement in a healthy and safe working environment can be expected. Naturally, the most important thing is the people. Everyone involved in these hazardous occupations has to work very hard jointly and take safety and health seriously by early planning, proper execution and continuing efforts to modify and improve. This hazardous occupation could provide a safe and healthy working environment for all involved.

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