SAND, GRAVEL, AND CRUSHED STONE ON-THE-JOB TRAINING MODULES

Module 19 - "Transportation, Use, and Storage of Explosives"

UNITED STATES DEPARTMENT OF LABOR
ELAINE L. CHAO
SECRETARY

MINE SAFETY AND HEALTH ADMINISTRATION
DAVE D. LAURISKI
ASSISTANT SECRETARY

Originally Published AUGUST 2000

INSTRUCTION GUIDE SERIES

MSHA IG 40

MODULE NUMBER 19
OF
INSTRUCTION GUIDE NUMBER 40

ON-THE-JOB TRAINING
FOR THE
SAND, GRAVEL, AND CRUSHED STONE INDUSTRY

TRANSPORTATION, USE, AND STORAGE OF EXPLOSIVES

This module describes basic job steps, potential hazards and accidents, and recommended safe job procedures for the transportation, use, and storage of explosives, blasting agents, primers, and detonators.

Loading and blasting is normally done by a blaster, but a blaster may be assisted during loading by a driller or a general laborer. No one should handle explosives or blasting agents unless they are under the direct supervision of an authorized person. Blasting operations must be under the direct control of authorized persons. In many states, an authorized person must hold state certification, such as a blaster's certificate, or shot- firer's papers.

Quarry blasting may involve the use of various types of explosives, blasting agents, primers, and detonators. Although there are specific procedures for the safe use of each type of

explosive and related products, the basic tasks can be categorized as storage, transportation, loading, and blasting.

STORAGE

Federal regulations require that detonators and explosives (other than blasting agents), be stored in magazines. The construction, location, inspection, and repair of a magazine is regulated by the Bureau of Alcohol, Tobacco, and Firearms. Appropriate regulations are found in 18CFR, as well as 30CFR.

Detonators provide the small, but powerful, explosion that initiates the blast. Detonating devices include blasting caps, detonating cord, and electrical detonators. Detonators must be stored in a separate magazine from explosives.

Magazines must be kept securely locked when unattended. Areas surrounding magazines, including blasting agent storage facilities, must be kept clear of trash, brush, and dry grass for a distance of not less than 25 feet.

Ammonium nitrate - fuel oil (ANFO) blasting agents must be physically separated from other explosives, safety fuse, or detonating cord that is stored in the same magazine; and, additionally, must be stored in such a manner that oil from the ANFO cannot contaminate the other materials.

Magazines must be posted with suitable danger signs, including “no smoking” signs. Signs must be located so that a bullet passing through any of the signs will not strike the magazines.

TRANSPORTATION

Explosives and detonating devices must be transported separately, or they must be separated by four inches of hardwood, or the equivalent, if they are transported in the same vehicle. Smoking, or carrying smoking materials, is prohibited.

Vehicles used to transport explosives, other than blasting agents, must have substantially constructed bodies with suitable sides and tailgates, and must not have any sparking metal exposed in the cargo space. Explosives must not be piled higher than the side or end enclosures.

Any vehicle containing explosives or detonators must be posted with proper warning signs. Other materials or supplies must not be hauled with the explosives or detonators. Only necessary persons may ride in vehicles containing explosives or detonators. Vehicles containing explosives or detonators must not be taken to a repair shop or garage for any purpose.

Because of potential danger, all explosive materials should be handled carefully. Never drop, or roughly handle, packages containing explosives. For example, when loading explosives into vehicles, never attempt to carry more explosives than can safely be handled, and never throw explosive materials into a vehicle. Once loaded, a vehicle must never be left

unattended.

When a vehicle containing explosives is parked, the brakes must be set, the engine must be shut off, and the wheels must be blocked securely against rolling.

The following safe job procedures will help to minimize incidents which could cause injuries and adversely affect production.

REQUIRED OR RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT:

HARD HAT, SAFETY SHOES, SAFETY GLASSES, GLOVES, HEARING PROTECTION

SEQUENCE OF BASIC JOB STEPS	POTENTIAL ACCIDENTS OR HAZARDS	RECOMMENDED SAFE JOB PROCEDURES
1. Pick up explosives.	1. A) Unmarked truck.	1. A) Place warning sign on truck.
	B) Material falling from truck.	B) Use tarp, or an enclosed truck.
	C) Sparking metal in truck.	C) Line bed of truck with plastic or wood, with no exposed nail heads.
	D) Fire.	D) Check fire extinguisher.
	E) Blasting caps in contact with explosives.	E) Place blasting caps in a separate wooden box.
2. Unload explosives.	2. A) Fire.	A) Keep explosives on the ground, and away from sources of heat. Do not allow any smoking.
	B) Impact.	B) Lower bags to the ground. Do not throw bags. Remove loose rock from highwalls.
3. Place blasting caps.	3. A) Stray electric currents.	A) Place caps at least 90 feet away from electric pumps, radios, walkie talkie, etc. Keep caps shunted.
	B) Lightning.	B) Listen to weather forecast. Clear area if a storm approaches.

SEQUENCE OF BASIC JOB STEPS	POTENTIAL ACCIDENTS OR HAZARDS	RECOMMENDED SAFE JOB PROCEDURES
	C) Impact from falling materials.	C) Remove loose rock from highwalls.
	D) Impact from vehicles.	D) Keep vehicles out of blasting area.
	E) Falling.	E) Keep away from highwalls. Avoid walking backwards.
4. Load holes.	4. A) Drilling.	A) Never drill and load at the same time. Complete drilling before loading holes. Never move drilling equipment, or any other equipment, across blasting area.
	B) Sparking materials.	B) Use wood, or other non-sparking material, for a punch and for tamping poles.
	C) Improperly loading holes.	C) Follow loading instructions of supervisor.
5. Preparing primer.	5. A) Not placing detonator securely in primer.	A) Put blasting cap through primer and out other side, and bring the cap in again from the other side. Make sure cap is enclosed in primer and cannot be pulled out.
	B) Detonation while lowering cap and primer into hole.	B) Put some blasting agent into the hole first, so cap does not settle into dust at bottom of hole. Do not force blasting cap and primer into hole. Do not redrill around loaded hole.

SEQUENCE OF BASIC JOB STEPS	POTENTIAL ACCIDENTS OR HAZARDS	RECOMMENDED SAFE JOB PROCEDURES
6. Clear blasting area and prepare for blasting.	6. A) Full bags of explosives left on blasting site.	6. A) Clear blasting area of all material before blasting.
7. Tie series together with circuit board.	7. A) Failure to properly tie series.	7. A) Wires should be tied together only at copper ends. Only blasters are to tie wires.
	B) Lost caps and explosives.	B) Keep accurate records.
8. Testing circuit continuity.	8. A) Inadequate wire.	8. A) Use 20 gauge copper wire. Use single wire. Do not reuse.
	B) Initiate from testing device.	B) Use only device made for testing blasting circuits.
9. Set off explosives.	9. A) People walking or driving into blasting area.	9. A) Clear area, post guards, and sound warning siren. Post and communicate blasting times.
	B) Employees struck by fly-rock.	B) Post guards at safe distances. Blasters must have adequate shelter. Use warning siren.
J) Inspect blast area.	10.A) Live explosives.	10.A) Supervisor should check for misfires, and handle appropriately.
	B) Falling rock.	B) Loose rock must be scaled.

GENERAL INFORMATION

This module is part of an Instruction Guide that was developed to assist the sand, gravel, and crushed stone industry in conducting effective on-the-job training (OJT) of new employees, or employees reassigned to different jobs. The use of training materials, such as this module, is an important part of an effective, systematic, OJT program.

This Instruction Guide uses a generic Job Safety Analysis (JSA) of jobs common to the industry. The JSA format facilitates uniform basic training in safe job procedures, while requiring only a minimum of time and effort on the part of the trainer. This material is generic to the industry; therefore, each company using this guide will need to tailor the material somewhat to fit their particular requirements. In some cases, the material must be general in nature, and will not include specific details of procedures or equipment that must be taught by the trainer.

Recommendations for an overall OJT program are contained in the Mine Safety and Health Administration (MSHA) guide: “Structuring Effective On-The-Job Training Programs”

TRAINING RECOMMENDATIONS

On-the-job training is usually best done by the employee’s immediate supervisor. If the supervisor relies on another employee to do certain parts of the training, the supervisor should be present to monitor the training. OJT is conducted at the actual job site, where the work will be done.

The supervisor/trainer should use the training materials (this module, or other materials) while the training is being done, to help ensure that all job steps are covered, and that no important safety precautions are omitted. Effective OJT should begin with an explanation (lecture and/or discussion) of the safe job procedure. The explanation should be followed by a hands-on demonstration of the proper job procedure. A good demonstration is, perhaps, the most important part of OJT. The demonstration is followed by supervised practice, during which the supervisor/trainer coaches (corrects and encourages) the employee, and evaluates when the employee is ready to do the job without direct supervision.

The first step - explaining the job to the employee - can be done in different ways. The supervisor/trainer and the employee can sit down and go through the training materials together. It may be advantageous to provide the employee with a copy of the training modules that are applicable to his/her job. The fact that most of the training is conducted at the job site does not preclude the use of a classroom, or a quiet office, for the first part of the training. Any general theory, or knowledge training, as well as the initial explanation of the job procedure, may be best done in an office/classroom setting; especially when noise levels, or other conditions at the job site, make communication difficult. A complete series of job steps could be presented through the use of slides developed at the mining operation.