
Regulations and Safe Practices



This blaster-training module was put together, under contract, with Federal funds provided by the Office of Technology Transfer, Western Regional Office, Office of Surface Mining, U.S. Department of the Interior, located in Denver, Colorado.

The module is an example of the technical assistance the Federal government furnishes States to assist them in meeting the requirements of the Surface Mining Control and Reclamation Act of 1977, upon which their State surface coal-mine regulating programs are based. In particular, the module was requested and will be used by the Sheridan District Office, Wyoming Department of Environmental Quality, Land Quality Division.

A word of caution: please note that **this module is not intended to stand alone, nor is it a self-training type module.** Rather, **the information the module provides MUST BE SUPPLEMENTED** by information given by a certified blasting instructor.

DISCLAIMER

The technologies described in the module are for information purposes only. The mention herein, of the technologies, companies, or any brand names, does not constitute endorsement by the U.S. Department of the Interior's Office of Surface Mining.

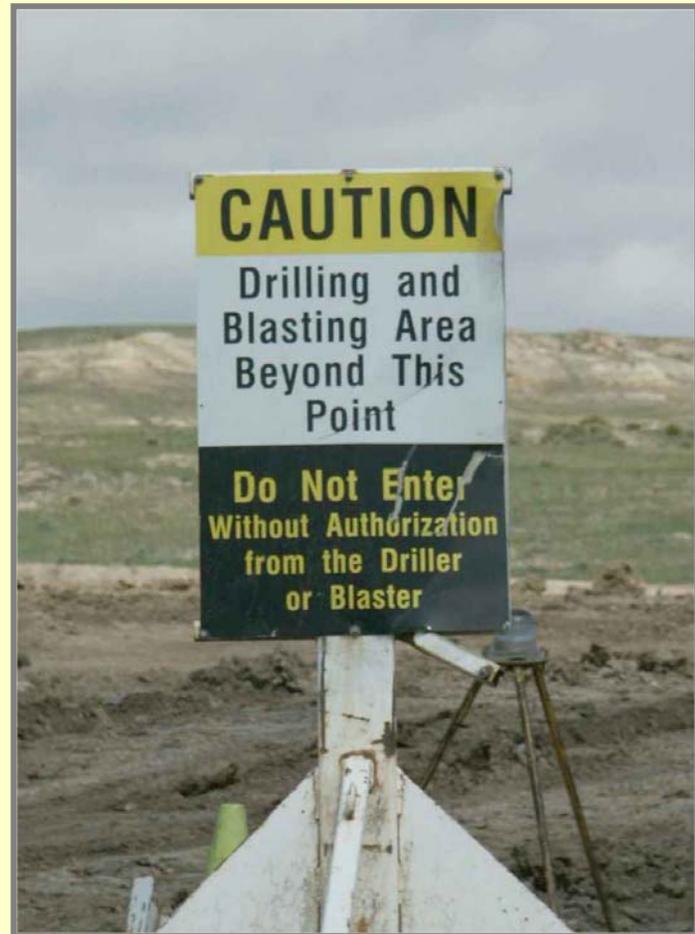
Regulations and Safe Practices

This module presents current blasting and related explosive regulations and identifies the regulatory agencies that enforce them.

Regulations in the mining-explosives industry relate to the:

- manufacture,
- transportation,
- storage, and
- use

of explosives. Blasters are responsible for knowing all applicable laws that affect the storage, transport, and use of explosives on their job sites. The module focuses on the storage and transport of explosives from magazines to such sites. The safety aspects of explosive handling and use are presented in other blaster-training modules.



Regulations and Safe Practices Overview

There are many regulations and guidelines that govern the manufacture, transportation, storage, and handling of explosives in the United States. These regulations and guidelines are intended to protect the public and to minimize the hazards of exposure to personnel working with them.

For any blasting operation, there may be up to four levels of regulation:

- Federal,
- State,
- County, and
- City.

Likewise, there may be several sources of safe recommended practices. In particular, entities with input regarding safe practices are:

Industry Explosives manufacturers
 Institute of Makers of
 Explosives (IME)

End users Company-specific standard operating procedures

On the Federal level, the responsibility to update and enforce explosives-related regulations rests with five government agencies, which are listed on the next slide. In addition, the IME, whose recommended safe practices are sponsored by all major explosive manufacturers in the United States and Canada, provides important explosives-related guidelines.



Federal Regulating Agencies and Other Organizations

FEDERAL AGENCIES

Department of Transportation (DOT)

Regulates the transportation of explosives on the highways, railways, and waterways, as well as by air.

www.dot.gov

Bureau of Alcohol, Tobacco, Firearms and Explosives (ATF)

Regulates the storage, importation, manufacture, distribution, onsite transportation, and use of explosive materials.

www.atf.treas.gov

Mine Safety and Health Administration (MSHA)

Regulates the storage, onsite transportation, and use of explosives in all mines. MSHA recognizes DOT and ATF regulations.

www.msha.gov

Occupational Health and Safety Administration (OSHA)

Regulates the use of explosives in general industry (other than mining).

www.osha.gov

Office of Surface Mining (OSM)

Regulates the environmental effects of surface and underground coal mining on Federal and Indian lands, as well as in States that do not have primacy or a coal regulatory program.

www.osmre.gov

OTHER ORGANIZATIONS

Institute of Makers of Explosives (IME)

Provides recommendations for the proper use, storage, and transportation of explosive materials.

www.ime.org

Agency Responsibility

manufacture

OSHA

packaging

ATF, DOT

storage

ATF, OSHA

ship to distributor

ATF, DOT

sold to user

ATF

coal mines

ATF, MSHA, OSM

metal mines,
quarries

ATF, MSHA

construction,
industrial

ATF, OSHA



Department of Transportation



CFR Title 49 Transportation of Explosives on Highways, Rail, Air, or Water

Chapter I, Parts 171-77 Chapter III, Part 397

DOT regulates the safe shipment of explosives under the auspices of Interstate commerce; “safe shipment” requires proper identification and packaging of, public protection from, and transportation vehicles for such explosives.



DOT defines various *classes of explosives* and requires a permit to transport hazardous materials for all shippers intending to transport explosives designated as class 1. (On January 1, 1991, DOT established the class-1 designation as an overarching hazardous-materials category defining [1] explosives that had formerly been designated either as Class A, B, or C, or as having “no applicable hazard” and [2] blasting agents.)

All explosives, including class-1 explosives, must be approved for transportation by DOT prior to transport. Class-1 explosives are divided according to the DOT hazardous-materials divisions described on the next slide. Detonators or primers with detonators must travel separate from division 1.1, 1.2, 1.3, and 1.5 materials.

DOT specifies that detonators must be separated by 24 inches, in transit, from detonating cord.

Department of Transportation

Classification of explosives under DOT hazardous-materials regulations

**Class name
prior to January 1, 1991**

Class-1 divisions

Class A



1.1 Mass explosive hazard (mass-detonating)

Class A or
Class B



1.2 Projection hazard (non-mass-detonating, but fragment-producing)

Class B



1.3 Fire hazard (mass fire)

Class C

1.4 Minor explosion hazard confined to the packaging (minor fire)

Blasting agent

1.5 Very insensitive explosives (blasting agents)

No applicable hazard



1.6 Extremely insensitive explosives

Bureau of Alcohol, Tobacco, Firearms and Explosives



ATF is charged with security in the importation, manufacture, distribution, and storage of explosives. The primary goal of ATF is to prevent explosives from being used by unauthorized persons. Recordkeeping and secure storage are key aspects of ATF regulations.

CFR Title 27 Commerce in Explosives

Chapter II, Part 555, Subparts D, G, and K

Subpart D

Licenses for manufacture or Interstate import and sales
Permits for users to acquire explosives for their own use in Interstate commerce

Subpart G

Records and reporting of all transactions

Subpart K

Storage, with respect to:

- quantity and storage restriction
- classes of explosives
- construction of magazines
- types and inspection of magazines; tables of separation distances
- housekeeping, repair of stores
- smoking and open flames

ATF: Licenses and Permits

The Safe Explosive Act (SEA), which was signed into law in November of 2002, authorizes ATF to require permits or licenses of all explosives users. If explosives are manufactured onsite for onsite use, an ATF license is required. Otherwise, an ATF user permit is necessary. Independent contractors using explosives at such permitted operations must have their own ATF license or permit and must otherwise be in compliance with SEA.

Companies involved in blasting that are renewing permits or licenses or applying for new permits or licenses must submit to ATF: (1) identifying information for all employees "authorized to possess explosive materials" (referred to by ATF as "employee-possessors") ; and (2) identifying information, plus fingerprints and photographs for each "responsible person."

In turn, ATF will conduct background checks on each listed "responsible person" and each listed "employee authorized to possess explosive materials to ensure that all employees and persons so identified are not "prohibited persons."

A "prohibited person" is one that is:

- Under the age of 21,
- An alien,
- Someone who has been dishonorably discharged from the military,
- A citizen of the United States who has renounced his or her citizenship,
- A convicted felon or fugitive,
- An unlawful user of marijuana or other depressant, stimulant, or narcotic drug, and/or
- A mental defective or someone who has been committed to a mental institution.

It is the responsibility of each mining, construction, or blasting company to determine who must be identified to ATF for background checks and clearances.

ATF: Licenses and Permits

ATF requires **employee-possessors** of explosives (including companies) to have either a license (in the case of onsite manufacture for onsite use) or a permit (in all other cases). Specifically, both persons who have “actual physical possession” (e.g., a blaster who is handling explosives for the purpose of production, shipping, transport, or use) and/or “constructive possession” (e.g., a supervisor who holds storage magazine keys, persons who direct explosive use by others, or persons like a truck driver transporting explosives) must be identified.

ATF defines a **responsible person** as an individual who has the power to direct the management and policies of a company as they pertain to explosive materials (e.g., facility-site managers, corporate officers).

In addition, infrequent users of explosives must now obtain a 1-year “**limited**” or **Intrastate permit** prior to receiving, transporting, or shipping explosive materials within the State of his or her residence. Limited use is defined as receiving, transporting, and/or shipping on no more than six occasions during the course of the single, permitted year.

ATF: Storage Classification

For purposes of storage, ATF defines three **explosive-storage classifications**:

- *High explosives*, which can be caused to detonate by means of a detonator when unconfined;
- *Low explosives*, which can be caused to deflagrate when confined; and
- *Blasting agents*, which amount to ANFO and certain water gels, as well as DOT division-1.5 materials.



Explosives must be stored in an ATF-approved magazine type.

Magazine, Type 1

A type-1 magazine is defined as permanent storage for high or bullet-sensitive explosives that can mass detonate (other classes allowed).

A type-1 magazine must be constructed of wood, metal, or masonry, and it must have one door with two mortise locks. The building must be ventilated, bullet-proof, fire-resistant, and theft-resistant; it must be made with a weather-resistant wood frame exterior of 14-gauge metal, metal walls with 4-inch hardwood interior faces, floors of non-sparking, bullet-proof metal, and a roof of 26-gauge metal.



Detonators CAN NOT be stored with high explosives or blasting agents.

Magazine, Type 2 (Outdoor)

A type-2 outdoor magazine is defined as portable or mobile storage for high or bullet-sensitive explosives that will mass detonate (other classes allowed).

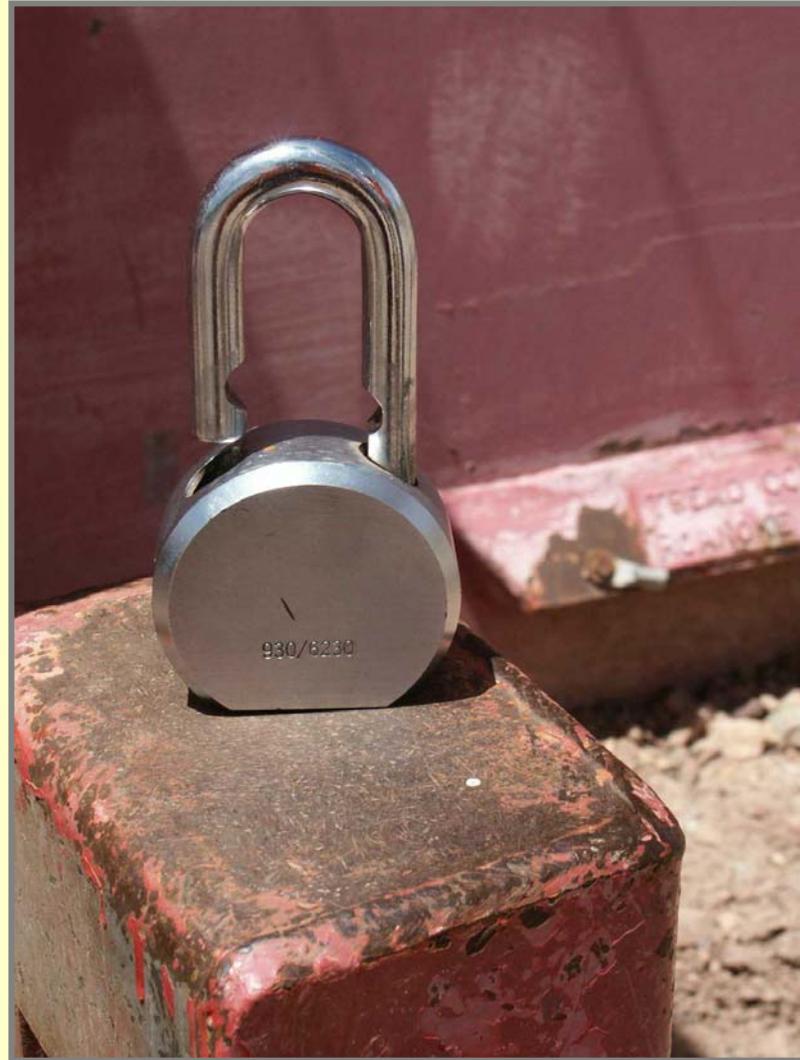
A type-2 outdoor magazine must be constructed as a box or trailer (mobile), with ¼-inch steel walls lined with 2-inch hardwood interior faces, and it must have one door with two mortise locks. The box/trailer must be ventilated, fire-resistant, theft-resistant, weather-resistant, and bullet-proof.



Magazine, Type 2 (Indoor)

A type-2 indoor magazine is also defined as portable or mobile storage for high or bullet-sensitive explosives that will mass detonate (other classes allowed).

A type-2 indoor should be comparable to a type-2 outdoor magazine in all respects, except that it need only be fire-resistant and theft-resistant. Type-2 indoor magazines need not be bullet-resistant and weather-resistant if the buildings in which they are stored provide protection from the weather and from bullet penetration.



Magazine, Type 3

A type-3 magazine is defined as a portable box (often called a “day box”) for the temporary storage of high explosives while attended. (Note that day boxes *must* be attended at all times.)

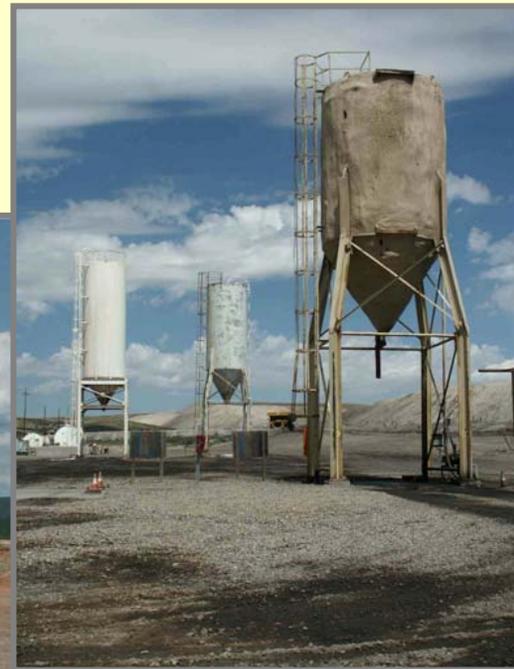
A type-3 magazine must be constructed with 12-gauge steel lined with ½-inch plywood; in addition, it must be fire-resistant, theft-resistant, and weather-resistant.



Magazine, Type 4

A type-4 magazine can be permanent, mobile, or portable storage for explosives with no mass-detonation hazard (that is, low explosives and non-mass-detonating explosives).

A type-4 magazine can be a building, tunnel, box, trailer, or semi-trailer; it must be constructed of 12-gauge steel lined with ½-inch plywood. The magazine must be theft-resistant, fire-resistant (not needed if temporary storage), and weather-proof, and it must be padlocked.



Magazine, Type 5

A type-5 magazine is defined as permanent, mobile, or portable storage for non-bullet-sensitive blasting agents, ANFO and non-cap-sensitive slurry, emulsion, water gel, and/or black powder.

Type-5 should be comparable to type-4 construction, except that a type-5 magazine does not need to be fire-resistant or ventilated if its purpose is for use as temporary storage. However, a type-5 magazine must be padlocked.



Transaction Records: Inventory of Magazines



Each approved storage facility must contain a summary record, or inventory, of all daily transactions. This inventory should itemize (1) the products the facility has handled that day, identified by the manufacturer's or brand name; (2) for certain explosives, an identification number; (3) the total quantity received in and/or removed from each of the facility's magazines during the day; and (4) the total inventory remaining on hand at the end of the day.

All records shall be maintained for 5 years from the dates of transactions.



Inspections

Magazines shall be inspected every 7 days to determine whether unauthorized entry has taken place or unauthorized removal of contents has occurred. The inspection need not be an inventory inspection.

Theft or loss of explosives must be reported to the ATF within 24 hours of discovery.



Location of Magazines

The “American Table of Distances” (reproduced in part on the next slide) specifies the minimum distance between explosives magazines and inhabited buildings, public highways, and passenger railways, as well as between two magazines.

When two or more storage magazines are located on the same property, and each magazine does not comply with minimum separation distances for magazines from each other, the magazine contents must be combined as if they were stored in one magazine to determine the distance from inhabited buildings, railways, and highway.

At coal mines, a minimum magazine separation distance of 25 feet must be maintained between detonators and all other explosives.

American Table of Distances

American Table of Distances for Storage of Explosives, Ammonium Nitrate, and Blasting Agents¹

(Source: U.S. Bureau of Alcohol, Tobacco, Firearms and Explosives, 27 CFR, Chapter II, Section 555.218)

Quantity of explosives		Distances (in feet) from magazine to:						Separation (in feet) between magazines	
		Inhabited buildings		Public highways with traffic volume of 3,000 or fewer vehicles/day		Passenger railways or public highways with traffic volume of more than 3,000 vehicles/day			
Pounds over	Pounds not over	B ²	U ³	B	U	B	U	B	U
0	5	70	140	30	60	51	102	6	12
5	10	90	180	35	70	64	128	8	16
10	20	110	220	45	90	81	162	10	20
20	30	125	250	50	100	93	186	11	22
30	40	140	280	55	110	103	206	12	24
40	50	150	300	60	120	110	220	14	28
50	75	170	340	70	140	127	254	15	30
75	100	190	380	75	150	139	278	16	32
etc.	etc.	etc.	etc.	etc.	etc.	etc.	etc.	etc.	etc.

¹Note that this module reproduces only a portion of ATF's distances table. See 27 CFR, Chapter II, Section 555.218 for the complete table.

²B = barricaded.

³U = unbarricaded.

Minimum Separation Distances

Minimum required separation distances between AN and/or ANFO and the point of detonation for HE and/or a blasting agent

(Source: U.S. Bureau of Alcohol, Tobacco, Firearms and Explosives, 27 CFR, Chapter II, Section 555.220)

Donor weight (pounds)		Minimum separation distance (in feet) of acceptor from donor when barricaded ¹		Minimum thickness (in inches) of artificial barricades
Over	Not over	Ammonium nitrate	Blasting agent	
0	100	3	11	12
100	300	4	14	12
300	600	5	18	12
600	1,000	6	22	12
1,000	1,600	7	25	12
1,600	2,000	8	29	12
2,000	3,000	9	32	15
3,000	4,000	10	36	15
4,000	6,000	11	40	15
6,000	8,000	12	43	20
8,000	10,000	13	47	20
10,000	12,000	14	50	20
12,000	16,000	15	54	25
16,000	20,000	16	58	25
20,000	25,000	18	65	25
25,000	30,000	19	68	30
30,000	35,000	20	72	30
35,000	40,000	21	76	30
40,000	45,000	22	79	35
45,000	50,000	23	83	35
50,000	55,000	24	86	35
55,000	60,000	25	90	35
60,000	70,000	26	94	40

¹When the acceptor agents are not barricaded, the separation distances must be multiplied by 6.

Detonator/Detonating-Cord Ratings



For storage, No. 8 detonators are rated at 1.5 pounds of high explosive per 1,000 caps.



50- to 60-grain detonating cord is rated at 9 pounds of high explosive per 1,000 feet.

Barricades

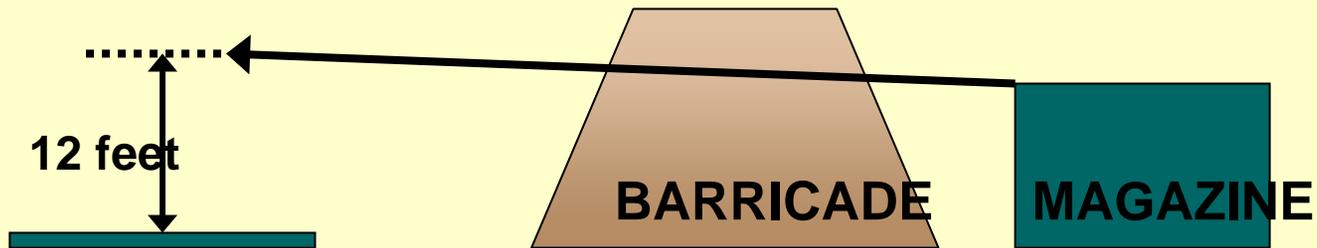
“**Barricading**” is defined as the effective screening of a magazine containing explosive materials from another magazine, a building, a railway, or a highway, by either a natural barricade or an artificial barricade.



A barricade, such as a berm made from natural soil (like the one shown above), must be constructed wide enough at height so that a straight line drawn from the top of any sidewall of the magazine it is screening to the eave line of any other magazine or building will pass horizontally through a portion of the barricade that is at least 3 feet thick.

Barricades Screening Public Roads or Railways

Any magazine that contains explosive materials and that is proximate to a public road or railway must be positioned such that * * *



* * * a straight line from the top of any sidewall of the magazine to a point 12 feet above the center of a railway or highway will pass through a natural or artificial barricade.

Magazine Housekeeping

Inside the Storage Magazine

Magazines are to be kept clean, dry, and free of grit, paper, empty packages and containers, and rubbish.

No combustible or sparking materials may be kept in a magazine.

Floors are to be regularly swept.

Brooms and other items used in the cleaning and maintenance of magazines must have no spark-producing metal parts and may be kept in the magazine.

ATF states that boxes or cases of explosives must never be stacked over 8 feet high in a magazine. *(MSHA, which regulates these matters as they relate to coal mines, specifies a more restrictive [6-foot] height for explosives storage in magazines at such mines. Therefore, given its superseding jurisdiction, MSHA's requirement takes precedence. [See 30 CFR 77.1301(g).])*



Magazine Housekeeping

Outside the Storage Magazine

The area surrounding magazines is to be kept clear of rubbish, brush, dry grass, and trees (except live trees over 10 feet tall) for not less than 25 feet in all directions (this requirement is similar to an MSHA requirement; see next and following slides).



Smoking, matches, open flames, and spark-producing devices are not permitted in any magazine, in any room that contains an indoor magazine, or within 50 feet of any outdoor magazine.

Mine Safety & Health Administration

CFR Title 30 Safety Standards and Handling of Explosives



Parts 15, 56, and 77

MSHA regulates safety in the handling of explosives in all types of mining. Specific MSHA regulations relate to onsite storage, transportation from a magazine to a job site, and the use of explosives, in particular with respect to hole-loading practices.

MSHA recognizes portions of both DOT and ATF regulations; it also enforces ATF regulations on sites over which it has jurisdiction. (*Note, however, that in some instances MSHA regulations may be slightly different from ATF regulations.*)

[An example here would be one we have already looked at: MSHA limits the height to which explosives can be stacked in magazines at coal mines to 6 feet; ATF allows an 8-foot limit.] *In such instances, MSHA enforces its own regulations onsite.)*



MSHA: Storage of Explosives

Location and Construction

Locations of magazines are prescribed by the ATF “American Table of Distances.” Like ATF, MSHA prescribes that magazines shall be kept locked when not attended. MSHA also requires that magazine construction will:

- Include non-combustible material or be covered with fire-resistant material;
- Be reasonably bullet-resistant;
- Incorporate interiors of non-sparking materials; and
- Provide adequate screened ventilation near the floor and ceiling.

Storage of Explosives Materials in Magazines

Detonators cannot be stored with other explosive materials. ANFO must be separated from other explosives, safety fuses, and detonating cord so as not to cause contamination. Magazines storing detonators must be at least 25 feet away from magazines storing explosives. Boxes containing explosives shall be placed at least 2 inches away from all walls.

Heating of Magazines

Magazines will not be heated unless in a manner not to create a fire or explosion hazard.

Signs

Warning signs shall be posted for all storage facilities indicating the contents of such facilities. These signs must be visible from all approaches to the storage location, such that a bullet passing through a sign shall not strike the storage facility.

MSHA: Vehicle Transport of Explosive Materials

Vehicles used to transport explosives must be well-maintained, clean, free of grease, and vented, and they must have working brakes, steering, horns, mirrors, windshield wipers, reflectors, steering mechanism, and good tires. Such vehicles must carry at least one fire extinguisher, possess no spark-producing materials in the cargo space, and only transport persons directly involved with the blasting operations.

Signs warning of explosives content must be posted on all sides of vehicles transporting explosives.



When parking a vehicle containing explosives:

- The brakes must be set,
- The wheels must be chocked to prevent movement, and
- The engine must be turned off, unless it is powering equipment used in the loading process.

Explosives and detonators can be transported together if they are separated by 4 inches of hardwood or their equivalent. If a vehicle used for explosives transport must be sent for repair, all explosives and blasting agents must be removed from the vehicle, and the vehicle and all components in contact with explosives or bulk agents thoroughly washed to remove all traces of agents or explosives.

Office of Surface Mining



CFR Title 30

Permanent Program Performance Standards

Parts 780, 816, 817, 850 and 955

OSM regulates surface coal mining and the surface effects of underground coal mining in the United States. Most often they pass the responsibility to state agencies. In States that do not have primacy or on Indian lands, OSM is the regulator. OSM regulations are intended to protect people and property outside the coal mine area from the harmful effects of blasting.

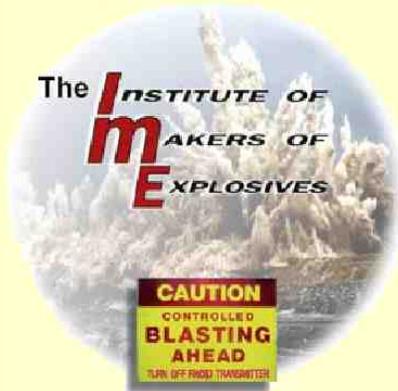
The “Adverse Effects of Blasting” module discusses OSM’s regulations in detail. OSM rules set the baseline for state rules as they pertain to:

- Blaster training and certification,
- Pre-blast surveys of structures,
- Public announcement of blasting schedules* and warning signals,
- Ground vibrations, airblast and flyrock, and
- Blasting records.



*Note that the Wyoming regulations for public notice of blasting schedules specify a different time period (30 to 60 days prior to the implementation of a blasting program) from the period OSM regulations specify (10 to 30 days prior to implementation).

The Institute of Makers of Explosives



IME, which was founded in 1913, is the safety association of the commercial explosives industry in the United States and Canada.

Located in Washington D.C., IME represents explosives manufacturers working together to promote the safety and protection of employees, users, the public, and the environment throughout all aspects of the manufacture and use of explosive materials in industrial blasting and other essential operations.

IME is frequently called upon to provide guidance to legislators and regulators who formulate new policy with regard to the commerce and use of explosive products.

IME publishes booklets on recommended safe practice in the areas of transportation, storage, and the use of explosives in the rock-blasting industries.

Communication and Continued Learning



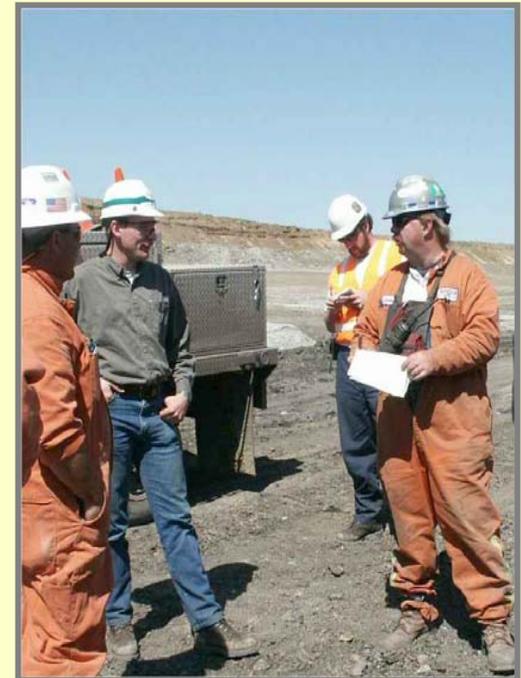
The key to ensuring that your blasting operations remain as safe as possible is maintaining constant communication with others.

If you are unsure of a certain procedure or encounter a new situation, ask for help from your supervisor.

In some instances, you or your supervisor may need to contact your explosives supplier for advice.

A blasting crew should meet often with someone who can represent their concerns to management and resolve potentially critical situations.

Every member of a blasting crew has the right to feel confident that he or she is conducting work in a safe, technically correct manner and that the work represents best practices, regardless of the challenge.



Remember: Safety Comes First!



Review Questions and Discussion

1. Smoking cannot take place within how many feet of explosive materials or a magazine?
 - a. 25 feet
 - b. 50 feet
 - c. 15 feet

2. True or false: detonating cord and blasting caps may be stored together in the same magazine.

3. Inventory of 25-millisecond non-electric blasting caps shows 570 caps in the magazine at the start of the day. The same day, 2,000 caps are brought to the magazine by the regional distributor and 200 caps are removed from it for purposes of the daily blast. What should the written inventory show at the close of the business day?

4. How high can cases or boxes be stored in a magazine at a coal mine?
 - a. 10 feet
 - b. Six cases
 - c. 6 feet
 - d. 8 feet

5. The minimum barricaded distanced to an inhabited building from a magazine containing 15,000 pounds of explosives is:
 - a. 1,800 feet
 - b. 18,000 feet
 - c. 900 feet
 - d. None of the above

Review Questions and Discussion—continued

6. True or false: a metal dustpan can be used inside a magazine as long as it placed 10 feet from explosives.
7. True or false: it is acceptable to take the mine surveyor back to the office in the explosives transport truck to obtain surveying supplies.
8. True or false: the Safe Explosives Act now requires all blasters loading blastholes to obtain a permit or license from ATF as “employee-possessors.”
9. All magazines storing explosives must have signs (select each that applies):
 - a. On all four sides of the building or facility
 - b. On the roof
 - c. Posted well away from the structure, such that a bullet passing through the sign will not strike the magazine
 - d. Stating “Explosives – Keep Off”
10. True or false: on hot days (over 100°F), a magazine door should be propped open to maximize ventilation while the blasting crew is loading blastholes.
11. A vehicle used to transport explosive materials must have (check all that apply):
 - a. A working horn
 - b. Fire extinguishers
 - c. An extra 12-V battery
 - d. Wheel chocks
 - e. Satellite radio
 - f. Cargo for holding explosives lined with non-sparking material

Answers

1. b. is correct.
2. False. Caps must be placed in a separate magazine.
3. Total inventory at the end of the day would be:
$$570 \text{ caps} + 2,000 = 2,570 - 200 = 2,370 \text{ caps}$$
4. c. is correct.
5. c. is correct.
6. False. All metals pose sparking hazards and are not allowed inside magazines.
7. False. Only trained blasting-crew members may ride in the truck.
8. True.
9. c. and d. only.
10. False. Magazine doors must remain closed and locked when unattended.
11. a., b., d., and f.