

# Oral Exam Explosives



**What is the only kind of explosive that can be used in an underground coal mine?**



# Permissible explosives and permissible blasting devices.



**How must a permissible explosive be fired?**



**Only with electric  
detonators of proper  
strength.**



**What is the maximum charge of permissible explosive for a hole (six) 6 ft. or more in depth?**



**Answer: three (3) pounds**



**What is the maximum charge of permissible explosive for a hole less than six (6) ft. in depth?**





**Answer: one and one half  
( $1\frac{1}{2}$ ) pounds**



**How must permissible  
explosives be stemmed?**



**Answer: they must be properly confined in a hole with incombustible stemming material of the following lengths:**

- (1) At least 24 in. long; or**
- (2) One-half the length of the hole if the hole is less than 4 ft. in depth**



**What must be done  
immediately before the  
shot is detonated?**



**The place must be checked for gas and the methane content must be less than 1% and excessive coal dust must not be present.**



**What may be the result of using permissible explosives in a non-permissible manner?**



**Any of the following can occur: an ignition of methane/air/dust mixture, misfire, blowout, or a premature ignition.**



**What is the principal cause  
of explosives accidents  
when permissible explosives  
are used?**





**Answer: Carelessness or  
improper use**



**What poisonous gases are  
liberated by explosives  
when fired?**



**Answer: carbon monoxide  
and oxides of nitrogen.**



**How shall explosives and  
detonators be transported  
into a mine?**



**They shall be enclosed in non-conductive boxes and transported separately from firing devices.**



**If explosives and detonators are to be hauled on the same trip, how shall they be kept in relation to each other?**



**They shall be separated by substantially fastened hardwood partitions, at least 4 in. thick, or by a construction providing equivalent safety protection.**



**How may explosives be hauled by electrically operated trips?**





**In covered cars or containers that are substantially well built and lined with non-conductive material.**



**What are the provisions related to carrying explosives on trips which transport workers?**



**Explosives are prohibited  
on trips which carry  
workers.**



**At what time interval  
should explosives trips  
precede or follow any other  
trip?**



**They should be not less  
than five minutes apart.**



**What supplies may not be hauled in the same trip with explosives?**



**Oil, grease or other highly flammable materials.**



**How may explosives and  
detonators be transported  
by belt conveyors?**





**Only in the original,  
unopened case or in  
enclosed, insulated  
containers.**



**Where explosives and detonators are transported by belt conveyor, what must be provided at loading and unloading points?**



**Stop controls must be provided and an attendant shall supervise the loading and unloading of supplies.**



**What types of equipment are illegal to use for the transportation of explosives and detonators?**



**Flight conveyors,  
continuous mining  
machines, loading and  
cutting machines, and  
drills.**



**How much clearance is required where explosives are transported on a belt conveyor?**



**The same clearance as is required for workers, I.e. 24 in., except in low coal, where 18 in. may be approved.**



**How shall explosives be stored?**





**In cool, dry, well ventilated  
magazines.**



**With what material shall  
the outside of explosives  
magazines be constructed?**



**Incombustible material.**



**In what condition should  
the area in or around  
magazines be maintained?**



**Rubbish or accumulations of combustible material should not be permitted in or within 25 ft. of the magazines.**



**What methods of lighting shall not be permitted in magazines.**



# Open lights



**What kind of lights may be used inside magazines?**





**Only permissible lights  
that are worn or carried.**



**Is it permissible to smoke,  
carry smokers' articles, or  
have open flames in or  
near any magazine?**



**No. Smoking, carrying smokers' articles, or having open flames is prohibited in or near any magazine.**



**What quantity of explosives may be stored underground in magazines?**



**Not more than a 48-hour  
supply.**



**How should explosives be stored near the working faces?**



**They shall be stored in separate, closed containers and shall be in a location that is at least 50 ft. from the face and out of the line of blasting.**



**How far from pipelines,  
power lines, rails, or  
conveyors shall explosives  
and detonators be kept  
when stored near the  
working faces?**





**At least 15 ft.**



**What distance shall  
separate explosives and  
detonators when stored  
near working faces?**



**A distance of at least 10 ft.**



**When shall explosives and detonators be removed from their containers?**



**Immediately before use at  
the working face.**



**What shall be posted near  
surface magazines?**



**Warning signs, placed so that a bullet passing directly through them will not hit the magazines.**



**What type of tools should  
be used to open cases of  
explosives?**





**Only non-metallic tools.**



**What safety precaution shall be taken with surface magazines?**



**They must be kept locked  
at all times when  
unattended.**



**What type of blasting units  
must be used to fire  
permissible explosives?**



**A permissible shot-firing  
unit of adequate capacity  
to fire all caps.**



**By whom shall shots be  
charged and fired?**



**By certified shotfirers  
designated by the mine  
foreman.**



**How is an electric blasting cap protected from stray electric current?**





**By means of a shunt.**



# How is a shunt made?



**It is made by short-circuiting the ends of the leg wires.**



**How should a shunt on leg wires be maintained until its removal?**



**It should be short-circuited or shunted at the battery until ready to attach to the blasting unit.**



**What is the proper type of shot-firing cable?**



**A well insulated, two-conductor cable of adequate size, strength, and length to permit the shot firer to get to a safe place, i. e. around a corner of a pillar.**



**What precaution should be observed when unwinding the shot-firing cable?**





**The cable should be kept clear of power wires and all other possible sources of active or stray electric currents.**



**How should the shot firing cable be handled between the charge and the firing station?**



**It should be staggered as to length, ends kept well separated when attached to the detonator leg wires, and unreeled from the charge toward the “firing station”**



**What are the two dangers  
of electric firing?**



**The current may be applied before all workers have reached a safe place or stray electric currents may cause premature detonation.**



**When should the blasting cap be placed in explosives?**



**Not until the holes are  
ready to be charged.**



**Where should the blasting cap be placed when a bore hole is charged?**





**The blasting cap, or primer, shall be placed in the bore hole first, pointing outward, and the rest of the charge shall be pushed in a continuous train to the back of the bore hole to prevent cuttings from getting between the cartridges.**



**What is a primer?**



**An explosives cartridge  
with a blasting cap  
inserted.**



**How should the blasting cap be inserted in a primer?**



**In making a primer, a powder punch of non-sparking material shall be used. The hole in the cartridge shall be at least  $\frac{1}{2}$  in. deeper than the length of detonator used. Rolling the end of a cartridge is prohibited.**



**What is meant by the term  
“multiple blasting”?**



**Detonating more than one  
hole at a time.**



**What are the advantages of multiple blasting?**





**The shot firer is less likely to be injured by a premature blast caused by a possible misunderstanding and not as apt to be injured by roof loosened by preceding shots.**



**What are the disadvantages of multiple blasting?**



**One or more of the shots may fail to detonate due to faulty wiring or defective detonators. Failed shots are usually covered by loose coal from other shots and are undetected until dug into by machines or by hand.**



**How must the leg wires be connected when using delay detonators?**



**In a series circuit.**



**Why is series wiring of  
shots considered  
preferable?**



**If the shots are properly prepared and wired correctly, all shots will detonate, unless there is a defective detonator.**



**May instantaneous,  
regular or zero-delay  
detonators be fired in the  
same circuit as delay  
detonators?**





No



**What is the minimum delay interval between adjacent rows of shots when using delay detonators?**



**25 milliseconds.**



**What must be done before a misfire is removed when using delay detonators?**



**The failed shot must be tested with a galvanometer.**



**Does a shot firer and drill operator for solid blasting have to be certified?**



Yes



**Should mudcaps (adobes)  
or other non-permissible,  
unconfined shots be fired  
underground.**





No



**What is the purpose of cutting the coal prior to blasting?**



**To provide an additional free face or faces to assist the action of the explosive and lessen the danger of blown-out shots.**



**Must a coal mine have a permit to shoot from the solid?**



Yes



**What procedure should coal mine operators follow in order to engage in shooting coal from the solid?**



**They should submit an application for a permit to the Office of Mine Safety and Licensing.**



**What is the danger of  
blasting off the solid?**





**Ignition of explosive mixtures of gas and coal dust by blown-out shots.**



**What is the minimum  
burden that all blasting  
charges shall have?**



**Eighteen inches in all directions, if the height of the seam permits.**



**What is the limit of drilling  
blast holes in relation to  
cut depth?**



**Blast holes shall not be drilled beyond the depth of the cut.**



**What is the remedy for  
holes that are drilled  
deeper than the cut?**



**The holes must be stemmed with incombustible material to the depth of the cut.**



**Why should holes not be drilled deeper than the depth of the machine cut?**





**They may result in a  
blown-out shot and will not  
be as effective.**



**How does the shot-firer  
know if holes are drilled to  
the correct depth?**



**By carefully measuring the depths of the cut and holes.**



**How shall a hole be prepared before loading the charge?**



**It shall be scraped as clean  
as possible.**



**What may be the result of a charge that is separated by unremoved drill cuttings?**



**Incomplete explosion and possible burning of the unexploded charge.**



**How many types or brands  
of explosives may be used  
in the same hole?**





**Only one.**



**How shall explosives be placed in the borehole?**



**Explosives shall be pushed into the hole in a continuous train, with no cushions between the back of the hole and the explosives or between the explosives and the stemming.**



**How shall explosives be confined in a drill hole?**



**They shall be confined with  
incombustible stemming  
material.**



**What is proper stemming material?**



**Incombustible material  
such as sand, clay, rock  
dust, or special devices  
such as water dummies.**



**Why is coal dust stemming dangerous?**





**The flame of the explosive blast will be increased and the coal dust may be ignited.**



**What are the practical  
benefits of proper  
stemming?**



**Proper stemming makes a shot more effective.**



**What is the danger of  
improper stemming?**



# The danger of a blown-out shot.



**What type of tool should  
be used for tamping?**



**Only non-metallic tamping bars shall be used for charging and tamping bore holes. This does not prohibit the use of a non-metallic tamping bar with a non-sparking metallic scraper on one end.**



**What kind of tamping tools  
are prohibited?**





**Metal or metal-clad  
tamping bars.**



**After holes have been  
charged, what should be  
done with surplus  
explosives?**



**They should be removed  
from the place to be  
blasted and out of the line  
of fire.**



**Can flying coal or slate  
from a shot detonate  
permissible explosives?**



**Yes. Miners have been killed when explosives were not removed to a safe place and were detonated by flying material from shots.**



**May electrical equipment  
be operated in the face  
area while blast holes are  
being charged?**



No



**How soon after charging  
shall holes be fired?**





# Promptly



**What may be the cause of premature detonation of a shot?**



# Stray electric currents.



**What creates the force  
when an explosive is fired?**



**The sudden expansion of  
the gases liberated.**



**What is required before  
shots may be fired in a  
working place?**



**The place shall be properly examined for the presence of methane.**



**What is considered a dangerous percentage of methane when permissible explosives are to be fired?**





**A methane content of 1%  
or more.**



**In what direction is the maximum force of an explosive exerted?**



**The force is exerted  
equally in all directions;  
however, it takes the  
direction of least  
resistance.**



**How should warnings be given when shots are about to be fired?**



**By distinctly shouting  
“fire” three times after  
miners have withdrawn  
from the area where the  
blasting will occur.**



**What should persons do  
when warned that shots  
are to be fired?**



**They should withdraw  
immediately and proceed  
to a safe place.**



**Where should persons be  
when shots are fired?**





**Around the corner of a  
pillar and out of the line of  
fire.**



**When should the shot firer  
make the connection to the  
shooting cable?**



**When all persons are out  
of the line of fire.**



**How soon may a person  
approach the face after a  
shot has been fired?**



**Not until the smoke has  
cleared away.**



**What shall be done before  
work is resumed after  
blasting?**



**The roof shall be examined and the working place shall be checked for gases and made safe.**



**What is the first thing to do when a misfire has occurred?**





**Disconnect the wires from the blasting unit and short-circuit them at that location.**



**How long shall any person  
wait after a misfire before  
going back into the place?**



**At least five minutes.**



**How shall a misfire be removed?**



**By firing a separate charge at least two feet away from, and parallel to, the misfired charge or by washing the stemming and the charge from the bore hole with water, or by inserting and firing a new primer after the stemming has been washed out.**



**Who shall supervise the  
removal of a misfire?**



**A foreman or a competent person.**



**What method of removing misfires is not permitted?**





**Drilling them out.**



# How can misfires be prevented?



**By careful selection of the explosives and firing devices and correct loading and firing of the charge.**



**What precaution should be taken with respect to misfires when using multiple blasting?**



**A careful examination should be made for misfires after each shot.**



**Who shall be designated to fire shots?**



**Only a certified shot firer.**



**What is the danger of  
adobe or mud-capping  
with explosives other than  
permissible sheathed  
explosives?**





**The unconfined explosion will raise coal dust which may become ignited.**



**What important regulation must be followed in the use of explosives and detonators underground?**



**Except for work involved in sinking a shaft or slope from the surface, all explosives and blasting devices used underground must be of the permissible type, including explosives used for blasting rock.**



**When may explosives and detonators be removed from their original containers?**



**Not until all other preparation work is completed and boreholes are ready for charging.**



**What type of blasting units  
may be used while firing  
underground?**



**Only permissible blasting units, unless firing is done from the surface with all personnel out of the mine.**



**What precaution must be taken when using permissible explosives in a mine?**





**A test for gas shall be made before and after firing each shot or group of shots.**



**What other work may be done  
while shots are being charged?**



**No other work shall be permitted in the danger zone except emergency work necessary to safeguard the employees.**



**What type of tools may be used for opening explosive cases or boxes and inserting holes in the individual sticks of explosives?**



**Only non-sparking tools may be used for this type of work.**



**When may the shunt be removed from the detonator leg-wire?**



**Not until the shot-firer is ready to connect to the firing cable.**



**May shots be fired by any other means than a permissible unit?**





**No, except when all personnel  
are outside the mine.**



**What safety measure must be strictly observed before shots are fired in any working place?**



**Ample warning must be given and care taken to ascertain that all persons are in the clear, including persons working in the adjoining vicinity, before shots are fired.**



**What is the danger of under-charging or over-charging a shot or shots?**



**Blown-out shots.**



**How many holes may be fired  
at the same time and remain  
permissible?**



**No more holes may be fired at any one time than the number for which the permissible shot-firing unit is designed.**



**What device should be used to check the continuity of a circuit before blasting?**





**A galvanometer.**



# End of Unit 4