

Queensland Railways
Chief Engineers' Branch

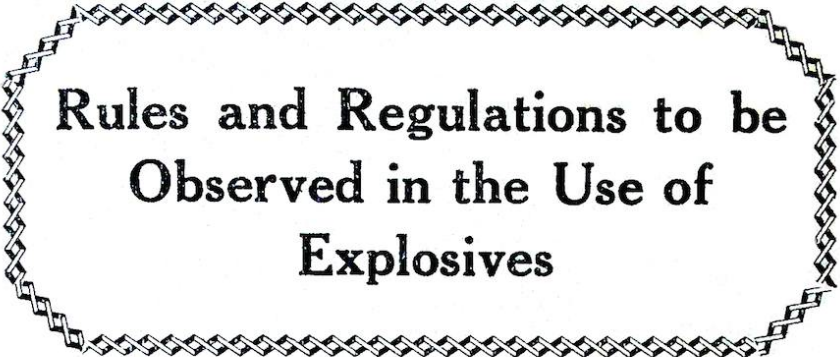
INSTRUCTIONS

for the

**Guidance of Gangers, Powder
Monkeys, and other Employees
using Explosives**



January
1913



Rules and Regulations to be Observed in the Use of Explosives

MAGAZINES.

8th January, 1913.

(a) The magazines shall not be established in any underground place where work is being carried on, or where persons are employed. All magazines are to be securely locked, and magazines containing large quantities of explosives are to be fenced in. The ground is to be thoroughly cleared of surface growth for a radial distance of 50 feet.

(b) The magazines shall be substantially built of galvanised iron or heavy slabs, covered with earth, or shall be excavated in solid rock or earth, or mine refuse not liable to ignition, and shall be so made and closed as to prevent unauthorised persons having access thereto and to secure them from danger from without.

(c) The interior of the magazine, and the benches, shelves, and fittings therein, shall be so constructed as to prevent the exposure of any iron or steel, or

the detaching of any grit, iron, or steel, or similar substance, in such manner as to come in contact with the packages containing explosives; and the interior of the magazine shall be kept free from grit, and otherwise clean. The explosives must be placed on shelves or logging raised well above the floor.

(d) The following table gives the relation between the quantities of explosives stored and the distances to be observed:—

Class of Magazine,	Maximum amount of nitro-compound and gunpowder, in all not exceeding—	Distance to be observed between the magazine and works where explosives are used,	Distance to be observed between magazine and any road, building, or place of public resort.
	Lb.	Yds.	Yds.
A	300	75	75
B	1,000	75	150
C	2,000	100	200
D	4,000	120	280

The danger areas must be clearly defined and precautions taken to prevent unauthorised persons having access to them. The distances mentioned under columns three and four may be reduced by one-half if the roads, buildings, and works are effectually screened from the magazine by the natural features of the ground, or by substantial mounds, except for quantities of 1,000 lb. and under.

(e) The amount of explosives stored in a magazine shall not exceed the amount for which the magazine is qualified by reason of its situation, as per clause (d) above.

(f) The magazine shall be used only for the keeping of explosives, and the necessary copper or wooden tools for opening the packages of explosives.

(g) Detonators or caps are not to be kept with the other explosives, but small quantities only may be stored in the centre of the magazine well away from such explosives. In cases where large stocks of detonators are held they must be stored in a separate magazine at least 30 feet away from other magazines.

(h) Should it be necessary to repair a magazine, all explosives must be first removed from it.

(i) Care must be taken to exclude from the magazine fire, matches, charcoal, oiled cotton, rags, or waste, or any article liable to spontaneous ignition, and any substance or article likely to cause fire or explosion.

(j) Dynamite and other nitro-compounds are dangerously affected by water, and must be carefully protected from damp.

(k) No person shall smoke in or near a magazine.

(l) No person under the age of sixteen years shall enter a magazine.

(m) The ingredients for making rackarock must not be kept together in the same building or maga-

zine, but must be kept separated, and, where possible, the oil should be stored on the down hill side of the magazine, or at a lower level.

SPECIAL RULES.

(1) Remove matches, keys, pipes, and other articles from your pockets before entering magazine.

(2) Lock the magazine securely on leaving.

(3) When either opening or repacking cases of explosives no steel or iron tool to be used. The Storekeeper's special attention must be called to any cases of explosives which have once been opened and which for any reason have to be returned to store. Use only copper or wooden tools for opening packages.

(4) Do not open packages in the magazine. If required to be opened and no examining-room is provided, place the mat or a clean sack on dry ground at a safe distance (25 yards) from the magazine, and open only one package at a time on the mat or sack.

(5) Remove the dirt and grit from the packages before placing them in the magazine.

(6) Nothing in the above regulations shall be taken to authorise the storage of any explosive unless the same is an "authorised" explosive and is packed and marked in accordance with the provisions of "The Explosives Act of 1906."

CONVEYANCE.

(1) In conveying explosives, care must be taken to have them securely packed and covered with tarpaulins or other suitable material, or to enclose them in a box which can be locked.

(2) Special care must be used in the carriage and handling of detonators.

(3) The man in charge of the conveyance of the explosives must not smoke while in charge.

USE.

(1) Explosives are only to be issued to experienced men who have proper magazines, ready prepared, and who accept their responsibility in taking charge of them, and who also understand that they will be held responsible for the safe keeping of the explosives put in their charge.

(2) When not in use, all explosives must be kept locked in the magazine.

(3) The explosives are only to be handled by the ganger or foreman, and the powder monkey and assistant. No person under the age of twenty-one is to be employed in handling explosives or to assist in charging holes, and the ganger in charge of such work must personally supervise the charging of every hole and be responsible for the work being properly done.

(4) Explosives are, as far as possible, to be used in daylight; but when they have to be handled or used otherwise, covered lights only are to be used.

(5) As nearly as possible only sufficient explosives are to be brought from the magazine to do the actual charging required each time. No explosives, other than those required for immediate use, are to be allowed within 100 yards of the site of any proposed blast on the surface, or within 150 yards of any proposed blast underground (as in tunnels).

(6) After "bulling" any hole water is to be poured down it, and charging must not be proceeded with for at least one hour from the time the hole was "bulled." "Bulling" must be done before explosives for charging are brought from the magazine.

(7) No person shall smoke on or near the place where blasting operations are being carried on.

(8) When explosives are used in cartridges, the drill-hole must be sufficiently large to admit of the cartridge sinking easily to the bottom, where it must be pressed home, and not pounded.

(9) All tamping or ramming is to be done with a wooden tamping-bar for a distance of 3 feet from the top of the explosive charge in the hole, and the balance of the hole may be tamped with a wooden bar properly shod with copper. The charging of the side holes is always to be done with a copper side charger fixed in a wooden rod, and no iron or steel is to be used in tamping or ramming any charge. Wooden tamping-rods are in all cases to be used where possible, and when dynamite is being used the first foot of the charge is to be but lightly pressed in.

(10) Where practicable, water or clay tamping is to be used, but if neither of these can be obtained, sand must be used in preference to coarser material. A double fuse is to be used in every hole which is 20 feet and over in length or depth.

(11) When using nitro-glycerine compound, the hole in the cartridge for the reception of the detonator is to be made with either the copper tip on the end of the pliers or a wooden skewer.

(12) No hole shall be bored in the butt or in the remaining portion of a hole in which a charge of nitro-glycerine compound has been previously exploded.

(13) Great care is to be used to avoid scratching the fulminating mixture in the cap when the fuse is being inserted, and pliers are only to be used for pinching the cap at the open end to grip the fuse.

(14) No overcharging will on any consideration be allowed. Where any danger is likely to occur from flying debris, the blasts must be covered.

(15) Persons working in the neighbourhood of blasts are to receive warning of the intention to fire the same in sufficient time to enable them to reach a place of safety, and it will be the duty of the ganger in charge to see that such sufficient notice is given.

(16) Any misfire must be immediately reported to the inspector, foreman, or ganger in charge of the particular work, who will personally direct the method of exploding or removing the misfire.

(17) A charge which has missed fire is not to be approached until at least one hour has elapsed from the time of lighting.

(18) When more than three charges of explosives are being fired at one time in any working place, the number of shots exploding shall be counted by at least two persons.

(19) Where water tamping has been used, the original unexploded charge may be exploded by placing thereon a fresh cartridge and detonator in the usual manner; but where clay or any other description of tamping has been used, **a fresh hole is to be drilled at a safe distance from the unexploded charge, and in such a position and direction that the boring tool cannot come into contact with the explosive charge in or escaping from the hole which has missed fire.**

(20) A charge of gunpowder which has missed fire may be drawn by a copper pricker, but shall not be visited until one hour has elapsed from the time of lighting the fuse of such charge. **In no case shall an iron or steel tool be used for the purpose of drawing or drilling out such charge.**

(21) After any charge has been exploded, a careful examination must be made for any loose portions of the charge which may have escaped ignition.

RE DYNAMITE AND OTHER NITRO-GLYCERINE COMPOUNDS.

(1) These goods must be kept in a dry and moderately warm place.

(2) If exposed to cold they become hard and frozen, and then present a mottled white and yellow appearance.

(3) Hard or frozen cartridges must be softened by being placed in a clean, empty, water-tight vessel, inside another containing hot water, similar in arrangement to an ordinary gluepot.

(4) Hard or frozen cartridges should on no account whatever be put before an open fire, nor upon hot plates, boilers, or ovens, nor should they be put in tins of water over a fire. This latter practice is extremely dangerous and is almost certain to result in an explosion.

(5) The capped fuses should not be inserted into the cartridge more than three-quarters of the cap, lest faulty fuse should ignite the charge before exploding the detonator.

(6) One detonator will explode any number of cartridges when closely packed together.

(7) When charging the hole the paper should not be removed, but each cartridge should be pressed firmly home with a wooden rod, but must not be rammed nor pounded.

(8) Powder must not be charged on top of dynamite.

(9) Bore-holes in wet ground must be fired immediately after they have been charged.

(10) Should a charge misfire, no attempt is to be made to withdraw it, but after an interval of one hour has elapsed a second hole is to be bored a little distance (not less than 3 feet away from and above the first) and to the same depths as the hole that missed fire, and the debris examined after the shot to see that no unexploded cartridges remain.

(11) It is highly dangerous to strike a thawing or partly frozen cartridge.

(12) Cartridges damaged by wet or otherwise must be very carefully handled. If nitro-glycerine has exuded into the folds of the paper, a very light blow might cause an explosion.

(13) Every possible precaution shall be taken by every person employed in or about the works—

(a) To prevent accidents by explosion.

(b) To prevent any unauthorised person from having access to any magazine, box, or receptacle containing explosives.

(c) To prevent any act from being committed which tends to cause explosion or accident, and which is not reasonably necessary for the performance of the work being carried out.

(14) The following instructions, issued by Nobel's Explosives Company, Limited, Glasgow, are to be complied with:—

DYNAMITE, BLASTING-GELATINE, AND GELATINE-DYNAMITE.

Unlike gunpowder, dynamite, blasting-gelatine, and gelatine-dynamite require a special mode of firing, which consists of a very strong percussion-cap called a "detonator" attached to a piece of safety fuse. The fuse explodes the fulminate, which then explodes the cartridge.

A charge is made as follows:—

First Operation.—A piece of safety fuse is cut clean and inserted into a detonator till it reaches the fulminate. The upper part of the cap is then squeezed with a pair of nippers. The squeezing should not be neglected, as it not only secures the position of the fuse but also serves to develop the power of the fulminate.

N.B.—For use under water, great care should be taken to have the upper end of the detonator made watertight (with grease, tar, or otherwise) where it joins the fuse, to prevent the fulminate getting damp.

Second Operation.—A cartridge is opened at one end and the detonator, with the fuse already attached to it, is pushed in so as to leave about **one-third** of the copper tube **exposed** outside the cartridge. The detonator is then securely tied in that position. If the detonator is pushed too far into the cartridge, the fuse may set fire to the latter before the spark can explode the detonator, and unpleasant fumes may be the consequence.

Third Operation.—One or more cartridges (as the height of the charge may require) are inserted in the bore-hole and each squeezed with a wooden rammer so as to completely fill the bore-hole. **Never use iron in squeezing home cartridges.**

Fourth Operation.—Over the charge, placed as described in the third operation, the cartridge, with detonator and fuse affixed, is inserted, **but not squeezed**, and loose sand or water is poured in as tamping. The charge is then ready for firing.

TREATMENT OF DYNAMITE, BLASTING-GELATINE, AND GELATINE-DYNAMITE IN COLD WEATHER.

In cold weather these explosives become hard or frozen and lose their plastic or soft condition, but thaw and resume it when warmed.

Accidents have occurred through warming cartridges on or before stoves and fireplaces. This is highly dangerous, for these explosives, when slowly heated to 420 degrees Fahr., are liable to explode with great violence.

Frozen cartridges are easily and safely thawed and made to resume their plastic condition by putting them into an empty water-tight tin can, which should then be placed in a vessel of hot water till the cartridges have resumed their normal condition.

N.B.—Special portable warm water heating pans may be had, wherein the cartridges are kept warm, and in a soft plastic state, for hours in the coldest weather.

NOTE.—In tropical countries, open boxes of dynamite, blasting-gelatine, and gelatine-dynamite should never be exposed to the direct rays of the sun.

N.B.—Specially strong detonators are to be used to explode blasting-gelatine and gelatine-dynamite.

The foregoing instructions for charging holes and for treatment in cold weather apply equally to dynamite, blasting-gelatine, and gelatine-dynamite.

THE USE OF RACKAROCK AND SIMILAR COMPOUNDS.

(1) The cartridges must not be steeped in the oil until immediately before they are required for use.

(2) On no account should cartridges which have been steeped in the oil be returned to the magazine.

(3) Rackarock becomes dangerous to handle one hour after mixing has taken place, and if not used within that time must be destroyed.

(4) A wooden tamping-rod must be used, and, as the tamping-rod with frequent use becomes impregnated with the material, at least 4 inches must be cut from it every two or three days to preclude the chance of an explosion.

(5) In mixing, the manufacturers' directions must be strictly followed.

(6) Until brought together for the purpose of soaking the plugs, the plugs or solid ingredients shall not be kept in the same store or receptacle as the oil or liquid ingredients, nor shall either one of the

ingredients be kept in any place where it would be liable to come into contact with the other either under the action of fire or otherwise.

(7) The process of soaking the plugs shall not be carried on—

- (a) Within twenty-five yards of any fire or light unless a sufficient screen intervenes so as to protect the explosive from any danger which might otherwise arise from such fire or light;
- (b) Near any place where persons are engaged on work unconnected with the preparation of the explosive for use; or
- (c) In or near any place from which danger might arise from the fall or projection of any article on the explosive.

(8) No person, whilst engaged in soaking the plugs, shall smoke, nor shall he have about his person any matches or other articles liable to cause fire or explosion.

(9) The soaking of the plugs shall be done in a pan or receptacle specially adapted for and used solely for such purpose. Such receptacle shall be kept free from grit and otherwise clean, and shall, together with the explosive made and in course of manufacture, be in charge of and be attended by the powder monkey.

(10) The explosive shall not, whilst in course of manufacture, be exposed for a longer period than is absolutely necessary.

N.B.—The above clauses (6) to (10) inclusive are subclauses (i) to (m) inclusive of clause 85 of “The Explosives Act of 1906.”

**A copy of these Rules
is to be carried by
every foreman or
ganger who has occa-
sion to use explosives,
and any breach of
these Regulations will
be followed by instant
dismissal.**

By Authority: A. J. CUMMING, Government Printer, Brisbane.