

भारतीय मानक

नदी घाटी परियोजनाओं के निर्माण, प्रचालन तथा  
रखरखाव — सुरक्षा संहिता

भाग 4 विस्फोटकों का परिवहन, प्रहस्तन तथा भंडारण

*Indian Standard*

CONSTRUCTION, OPERATION AND  
MAINTENANCE OF RIVER VALLEY  
PROJECTS — SAFETY CODE

PART 4 HANDLING, STORAGE AND TRANSPORTATION OF EXPLOSIVES

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## FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Safety in Construction, Operation and Maintenance of River Valley Projects Sectional Committee had been approved by the River Valley Division Council.

With large scale increase in construction activity of river valley projects, the number of major accidents have increased. Further, increased construction activity has created certain hazards for persons working on the projects. The degree of safety achieved in project constructions has a direct bearing on the amount of effort expended to avoid accidents by those who control the conditions and practices on the project. In order to avoid accidents it should be the overall responsibility of the project authorities to provide measures for the safety of all persons working on the projects.

There are number of aspects that need to be kept in mind when the safety norms of an entire river valley project are envisaged. To this end, various aspects that need consideration, from the view-point of safety, are dealt with in various parts of this standard.

This part covers the safety aspects to be kept in view during handling, transportation and storage of explosives.

Explosives play a vital role in the construction of different components of modern river valley projects. Proper handling, transportation and storage of explosives is as essential from the view point of safety as selection and judicious use of proper kind and quality of explosive is for successful and efficient progress of every job.

Hazards arising out of mishandling of explosives are likely to result in accidents which may endanger the life of workers and inhabitants in the vicinity and also endanger the safety of buildings and structures.

*Indian Standard***CONSTRUCTION, OPERATION AND  
MAINTENANCE OF RIVER VALLEY  
PROJECTS — SAFETY CODE****PART 4 HANDLING, STORAGE AND TRANSPORTATION OF EXPLOSIVES****1 SCOPE**

**1.1** This part lays down requirements regarding storage of different classes of explosives, selection of site for magazine, maintenance and operation of magazine, transportation of explosives, their handling, loading, unloading and inspection as well as precautions to be taken therein.

**2 GENERAL**

**2.1** The use of explosives is very essential in hard ground tunneling, shaft sinking and other excavation operations of river valley projects. Selection and judicious use of proper kind and quality of explosive is very essential for safe and speedy execution of various components of such projects. All operations involved in transportation, handling and use of explosive should be as per the Indian Explosive Act 1884 and should also conform to the provisions made therein.

**2.2** Proper storage of explosives and accessories is important to ensure that these materials are kept out of reach of unauthorized persons to reduce the hazard of accidental explosion and also to maintain them in good condition for use.

**2.3** Gelatine tends to stiffen if exposed to low temperature for a long duration. Therefore some times, it may be desirable to place explosives in a warm room for several hours before use to enable them to soften and make them easier to prime and tamp in bore holes. In no case should the gelatine be placed close to a fire to thin or soften it.

**3 STORAGE OF EXPLOSIVES****3.1 Effect of Storage on Explosives and Accessories**

Explosives and accessories are perishable goods which are liable to deteriorate after prolonged storage, especially if subjected to high temperature and humidity. If kept in a moist place the compounds contained in the explosives may lose their power. It is due to this reason that underground magazines are not preferred on river valley projects. On the other hand, explosives should also not be stored in a very dry place, because they may lose the moisture they naturally contain and thus their speed of explosion may change.

**3.1.1** The method of packing used by the manufacturers is designed to give maximum

protection against moisture, provided the cases remain unopened. Stock should always be used in the sequence of the date of manufacture, which is marked on the cases. This avoids any accumulation of old stock and helps to make sure that the material is in the best condition. Once a case is opened the contents should be used as early as possible, if all the explosives are not used during the same day, the original packing should be folded over and the case should be closed to give the maximum possible protection to the contents. The storage of explosives shall be done as per provisions of the Indian Explosives Act, 1884 and rules made thereunder and conditions given in the licence to be issued by the competent authority as laid down in the act.

**3.2 Selection of Site for Magazine**

The magazine should be kept away from residential buildings, railroads or highways, transmission lines, dams and their appurtenant works.

**3.2.1** The safe distance required under the Explosives Rules 1940 depends upon the storage capacity of the magazine and may be carefully planned taking into account the rate of consumption and the frequency of replenishment.

**3.2.2** The best site for a magazine is on well drained sloping ground. The selected site should be accessible by road and it is advisable to make sure that the existing tracks are usable throughout the year. If there are overhead power transmission lines in the selected area, the distance between these and the magazine building should not be less than 92 metres.

**3.2.3** The construction and approval of the magazine shall be based on Standard Indian Practice as governed by the Indian Explosives Act 1884 and Explosives Rules 1940, as amended from time to time.

**3.3 Storage of Different Class of Explosives**

Under the Explosive Rules, the various explosives and accessories are classified under separate headings as below:

Class 1 — Gunpowder

Class 2 — Nitrate mixtures (GN/L, Powerflow 1, Powerflow 2, and Powerflow 3)

Class 3 — Nitrocompounds

*Div. 1 —* Blasting gelatine, special gelatines, opencast gelignite, permitted explosives, etc

*Div. 2 —* Seismex, seismex primers, gun cotton, PETN, TNT, primex, etc

**Class 4 —** Chlorate mixtures

**Class 5 —** Fulminates

**Class 6 —** Ammunition

*Div. 1 —* Safety fuse, fog signals, igniter cord connectors, electric lighters, safety electric fuses, percussion caps, safety cartridges for small arms

*Div. 2 —* Plastic igniter cord, detonating fuse, electric fuse, fuse igniters, etc

*Div. 3 —* Detonators, detonating relays, etc

**Class 7 —** Fireworks

Under the Explosives Rules the following can be stored together in the same magazine:

Gunpowder	Class 1
Nitrate mixture	Class 2
Nitrocompounds	Class 3
Chlorate mixtures	Class 4
Safety fuse	Class 6 Div. 1
Plastic igniter cord	Class 6 Div. 2
Detonating fuse	Class 6 Div. 2

On no account, however, should detonators be stored together with explosives. Normally detonators are stored in a separate building but if the number of detonators does not exceed 44 000 it is permissible to store them in a properly constructed annexe attached to the magazine.

### 3.4 Maintenance and Operation of Magazines

The following precautions should be taken for maintenance and operation of magazines:

- a) The inside of all magazines should be scrupulously clean. The floor of the building should be cleaned with a brush on each occasion when the magazine is opened for delivery or receipt of explosives.
- b) The magazine-keeper should ensure that cigarettes and matches are not taken into the magazine.
- c) All the tools used in the magazines for opening of explosive boxes should be of wood or soft non-ferrous metal such as brass, copper or bronze. Iron and steel tools are prohibited as they may cause sparking.

- d) The area surrounding explosive magazines should be kept free from bushes and vegetation.
- e) Empty boxes, loose packing material or cotton waste should not be kept on the magazine premises.
- f) Explosive magazines should be well ventilated and it is advisable to keep the magazine open every day for a period of one hour.
- g) Detailed records of all outgoing and incoming stocks should be kept. Explosives should be used according to date of manufacture.
- h) All magazines should be securely locked, when not attended.
- j) Cases of explosives should be stacked on trestles clear of the floor and a 15 cm air space should be left between the cases and the walls to allow circulation of air.
- k) Care should be taken that repairs to magazines are attended to on priority basis.
- m) Every explosive magazine should prominently display general rules governing conduct in magazines indicating prohibition of smoking, carrying of matches and/or any other rules that may be required by the local licensing authorities. A copy of the licence and lightning conductor test certificate should also be preserved in the magazine.
- n) On no account should the magazine be opened during, or on the approach of a thunder storm and no person should remain in the vicinity of the magazine during such a storm.
- p) Under no condition shall explosive caps or fuse be stored in the same place or kept in the same container with other explosives. A make up house shall be provided at each working place in which cartridges will be made up by experienced powermen as required for the immediate work. This make up building shall be completely without any internal source of heat, and only battery powered illumination should be used.
- q) The magazine should be guarded at all times.
- r) The area around the magazine should be properly fenced, provided with one entrance gate and should have adequate lighting arrangements.

### 3.5 Handling and Transportation of Explosives

**3.5.1** Explosives are transported in specially fabricated and licenced explosive vans conforming to the specifications prescribed in Explosive Rules, 1940. The van bears the inscription 'EXPLOSIVE VAN' so

as to warn the workers and public. Before transporting from the magazine to the site of work it should be ensured that the entire cargo is securely loaded. Metal tools, oil, matches, electric storage battery, acids or corrosive compounds, etc., are not to be carried in the body of the transporting vehicle. The van should be equipped with extinguishers. At the back of van, there should be two metallic chains hanging from the body in such a way that they are in contact with the ground all the time to provide necessary earthing for safety against lightning strike or the vehicle being short circuited. In addition to the above, all the provisions of Indian Explosives Act 1884 should be fully complied with.

**3.5.2** Explosives should not be transported on the site of operations except in suitable cases or canisters which are so made as to prevent any escape of explosives and are without danger of sparks or other sources of ignition during conveyance. No explosive should be removed from such cases or canisters except when it is to be used forthwith for purpose of work.

**3.5.3** No explosive should be transported in a mechanically propelled vehicle unless such a vehicle is locked and is of a type approved in writing by the Chief Inspector of Explosives. The following rules should also be observed:

- a) Vehicles should have springs under the body. Unsprung country carts should not be used.
- b) Detonators and igniters should not be carried in the same vehicle together with explosives.
- c) The speed of the vehicle should not exceed 25 km per hour.
- d) Besides the driver, only one more helper should be accommodated in the vehicle. The vehicle carrying explosives should not be used to transport workmen or other materials to work sites although there may be enough space for men or materials.
- e) Drivers should not leave the vehicle unattended while transporting explosives.
- f) All vehicles transporting explosive should be marked or placarded on both sides and ends with the word "EXPLOSIVES" in white letters not less than 76 mm high on a red background.
- g) The motor vehicle carrying explosive should not be refueled except in emergencies and no other vehicle should be allowed at the refueling station when the vehicle carrying explosives is being refueled. Refueling should be done at a fueling station located outside the city limits. Such vehicles should invariably have at least two fire extinguishers placed at convenient points.
- h) All vehicles transporting explosives should never be taken into a garage, or repair shop, or parked in congested areas, or parked over-

night or at any other time in a public garage or similar building.

- j) Explosives should not be transported on a public highway during hours of darkness except in an extreme emergency and only with the written approval of the project authorities.
- k) Explosives should not be transported in any form of trailer, nor should any trailer be attached to a motor truck or vehicle hauling explosives.
- m) No transfer of explosives from one vehicle to another should be made on any highway except in case of an emergency.
- n) Persons employed in the transport or handling of explosives should not carry with them, or in the vehicle, matches, fire arms or any flame producing devices.
- p) Smoking should be prohibited during handling and transport of explosives.
- q) As a special precaution at unmanned railway crossings, the vehicle should be brought to a complete halt and the journey proceeded with only after ensuring clear way.
- r) All accidents should be reported to the Chief Inspector of Explosives and others as specified in the Explosive Act.

**3.5.4** Vehicles used for transporting explosives should conform to Explosive Rules and should be carefully inspected daily to determine that:

- a) Fire extinguishers are filled and are in place;
- b) The electric wiring is well insulated and firmly secured;
- c) Chassis, engine and body are clean and free from surplus oil and grease;
- d) Fuel tank and feed lines are not leaking;
- e) Lights, brakes and steering mechanism are in good working order;
- f) Tyres are properly inflated and in good condition; and
- g) Vehicle is in proper condition in all respects for the safe transportation of explosives.

**3.5.5** Boxes of explosives should not be handled roughly or allowed to fall.

Containers of explosives should be opened only by means of non-sparking tools or instruments.

**3.5.6** After loading at the section to be blasted, all excess explosives and detonators should be removed to a safe location or returned at once to the storage magazine, observing the same rules as when being conveyed to the blasting area. The used and unused explosives should be properly accounted for.

**3.5.7** Containers for detonators should always be used for storing detonators only.

**3.5.8** *Place of Loading and Unloading*

**3.5.8.1** Loading and unloading of explosives should be done at a safe distance from dwelling houses, power house buildings, transmission towers, stores of petroleum, timber or any other flammable material.

**4 DONT'S**

**4.1** For the purposes of this list of DONT'S, the terms contained therein shall be as follows:

The term 'Explosives' shall signify any or all of the following dynamite, black blasting powder, pette powder, blasting caps and electric blasting caps, etc:

- a) **DON'T** purchase, possess, store, transport, handle, or use explosives except in strict accordance with organizational regulations.
- b) **DON'T** store explosives anywhere except in a magazine which is clean, dry, well ventilated, properly located, suitably constructed, securely locked, fenced and guarded and properly earthed.
- c) **DON'T** leave explosives lying around the work site where workmen can get them.
- d) **DON'T** allow leaves, grass, brush, or debris

to accumulate within 8 m of an explosive magazine.

- e) **DON'T** smoke or have matches, open lights, or other fire and/or flame producing devices in or near an explosives magazine, or have them nearby while handling or loading explosives.
- f) **DON'T** shoot into explosives with any fire arm, or allow shooting in the vicinity of an explosives magazine.
- g) **DON'T** store any metallic tools or implements in an explosives magazine.
- h) **DON'T** drop, throw, or slide packages of explosives or handle them roughly in any manner.
- j) **DON'T** open wooden cases of explosives with metallic tools. Use a wooden wedge and wooden, rubber, or fibre mallet. Metallic splitter may be used for opening fibre board cases, provided that the metallic splitter does not come in contact with the metallic fasteners of the case.
- k) **DON'T** store blasting caps or electric blasting caps in the same box, container or magazine together with other explosives.
- m) **DON'T** handle explosives during the approach or progress of an electrical storm. All persons should retire to a place of safety.

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