



GOVERNMENT POLYTECHNIC FOR GIRLS

AHMEDABAD

COURSE: ADVANCE CONSTRUCTION TECHNOLOGY

COURSE CODE : 3350605

TOPIC: BLASTING

INTRODUCTION OF BLASTING

- To explore or destroy something or someone with explosives or to break through or heat something with a similar very strong force.

Eg: A tunnel was to be blasted through the mountains.

- The blast had tone the building a part
- This bomb blast suggest that the terrorists are going on the attack again.
- A powerful bomb blast Has rocked the shrilanka capital combo, killing Atleast of 28 people and wounding more than 200 others.



TERMS USED FOR BLASTING

1. Dynamite
2. Safety fuse
3. Blasting cape
4. Prime line or code
5. Blast hole
6. Primer
7. Stemming
8. Prime det
9. Detonator
10. Track line
11. Gun powder

1. DYNAMITE :

It is an explosive used for blasting. Dynamite consists of 25% of Sandy earth saturated with 75% of nitro-glycerine. It is in the form of thick paste and it is sold in Cartridge. It is very poisonous in nature and develops violent headaches through touch with skin.

Dynamite cartridge is placed in the bore hole and tamped with wooden bar. This charge is fired by a fuse.

2.SAFETY FUSE:

Safety fuse is in the form of a small rope of cotton with a core of continuous thread of fine gun powder.

Rate of burning of a good safety fuse is about 1cm/sec. It is required to ignite the explosives. For blasting firing, patented electric fuses are used.

3.BLASTING CAP:

it is small metal tube filled with explosive. When electric current passes through the wire bridge kept inside the cap, It is blasted. Blasting cap also be blasted by a safety fuse.

4. PRIME LINE OR PRIME CORD :

IT is one type of high explosive detonating fuse. It is kept in water tight coating. It is used as downline. One end of down line is connected to the detonating cord trunkline and other end is connected to non – electric blasting cap, which causes detonation of explosive charge.

5. BLAST HOLE :

A hole drilled into rock to enable placing of an explosive.

6. PRIMER:

It is the portion of a charge which is loaded with a firing device and initiated the explosion.

7.STEMMING:

To preserve the energy of explosion, an inert material like rock powder is filled in the blast hole above explosive charge. This filling of inert material is called stemming.

8.PRIME DET:

It is non electric blasting cap. It is small tube filled with explosive. The detonation of this explosive is done by detonation of prime cord or prime line.

9.DETONATER:

A Detonator is a contrivance whose explosion initiates that of another. It is in the form of a copper cylinder having diameter 6mm and length 15mm. It is closed at one end with projecting fuse at other end. It contains 6 to 9 grains of fulminate of mercury. It is used when dynamite is adopted as explosive. Detonators are fired by fuse or electric spark.

10.TRACK LINE:

The detonating cord from ignition point to the blast hole is Called trunkline.

11.BLASTING POWER(GUN POWDER) :

It is a mechanic mixture of charcoal, sultpetre(KNO_3) and sulphur having proportions by weight 15, 75 and 10 respectively.

The quantity of gun powder can be obtained by the following thumb rule:
Blasting powder in $N = (\text{line of least resistance in m}) \cdot 1.50$

EXPLOSIVES USED FOR BLASTING

Various explosives used for blasting are:

1. Dynamite
2. Ammonium nitrate
3. Slurry
4. ANFO
5. RDX

1. DYNAMITE:

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2. AMMONIUM NITRATE :

This type of explosive is widely used in construction projects for surface as well as underground explosions. It is more safer than dynamite because it is detonated by special type of primer. It is economical than dynamite.

3. SLURRY:

This is a generic term for both water gels and emulsion. A slurry explosive is made of ammonium, calcium or sodium nitrate and a fuel sensitizer and a fuel sensitizer along with varying amounts of water.

A slurry explosive mixture of oxidizing salts, fuels and sensitizers made water resistant by the cross linking of gums or waxes referred to as a water gel.

4. ANFO:

ANFO: ammonium nitrate fuel oil.

This explosive is used extensively for construction blasting and represents about 80% of all explosives used in the United States. It is a mixture of 4.5 kg ammonium nitrate and 5 litre no.2 diesel fuel oil. This is the optimum mixture. The mixture is saturated for 24 hours.

The mixture is free flowing and can be directly poured into drill holes. In case of wet holes. The mixture is kept in plastic bags and placed in the holes. This explosive is definitely by dynamite primer placed at the bottom of hole.

5.RDX:

RDX= Rapid detonating explosive

Other explosives are:

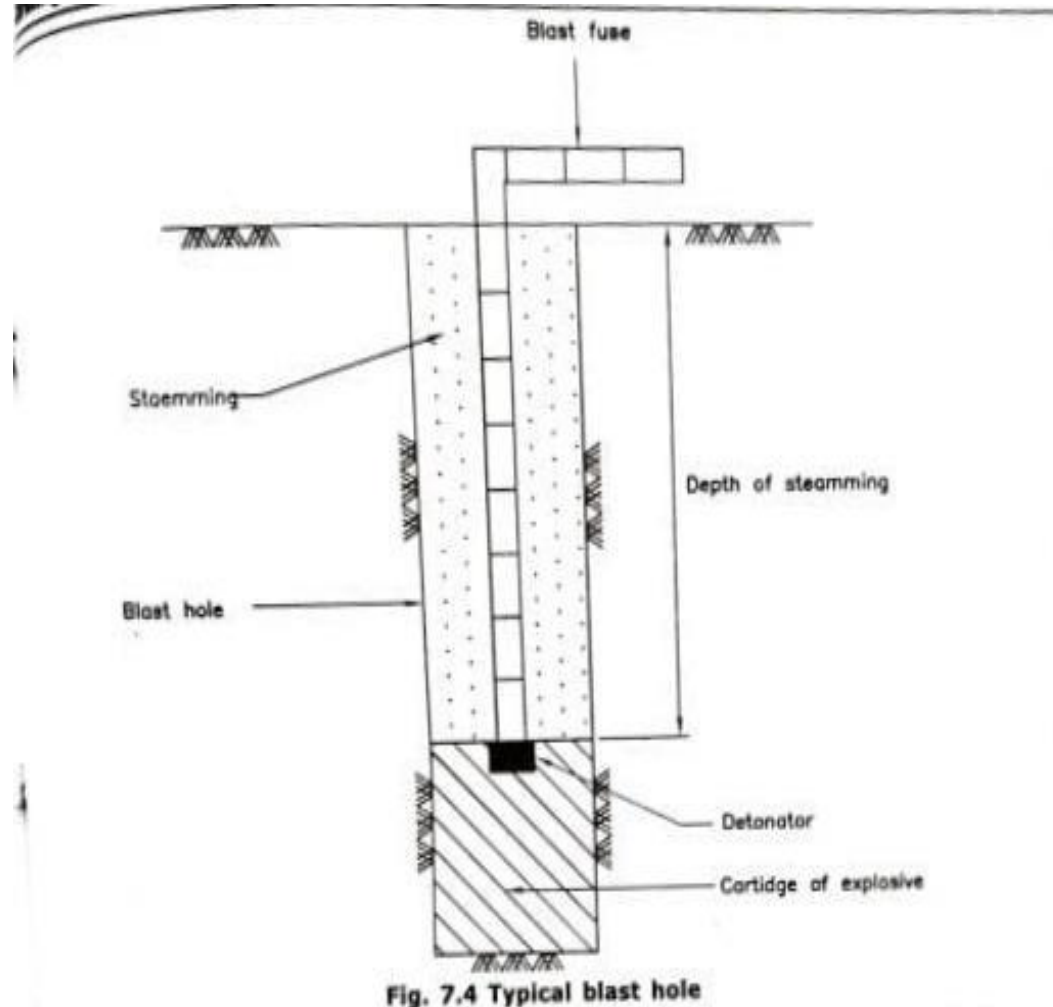
- (a) TNT – tri nitro toluene
- (b) PENT – pentagram enythrital .
- (c) Gun powder
- (d) Blasting gelatine – consists of 93% of nitro glycerine and 7% of gun cotton
- (e) Liquid oxygen – it contains 95% liquid o₂. It is used for blasting on a large scale, for mining operations, for blasting under water etc.

EXPLOSION PROCESS:

1. The blast hole is cleaned and gun powder or dynamite charge is filled at the bottom of the hole. A priming needle in the form of copper rod is kept in the center of hole. Grease is applied to the priming needle so that it can be easily pulled out.
2. The remaining portion of the hole is filled with inert material like rock powder or wet clay, known as stemming material is properly compacted by copper rod.
3. After tamping is completed, the priming needle is pulled out, and the hole so created is filled with gun powder or dynamite.
4. A fuse is kept in the hole with its end 15 to 20cm above the surface of the rock.
5. The outer end of fuse is detonated by match box or electric spark.

Advantages of electric spark fuses:

- More safer
- Saving in the time and labour
- Fuse can be detonated even in water
- Efficiency of explosive increase



6. After blast the rock mass is decided into small parts.

The quantity of explosive required in blast hole depends upon :

- 1) depth of hole
- 2) spacing of holes
- 3) sizes of holes
- 4) type of rock

PRECAUTIONS IN BLASTING

The following precautions should be taken in the process of blasting to avoid my serious incident :

1. Failure of explosion .
2. Line of least resistance (LLR)
3. Needle and tamper
4. Notice of blasting
5. Retreat to a safe distance
6. Seepage of water
7. skilled supervision
8. Stemming
9. Storing
10. Transportation of explosive

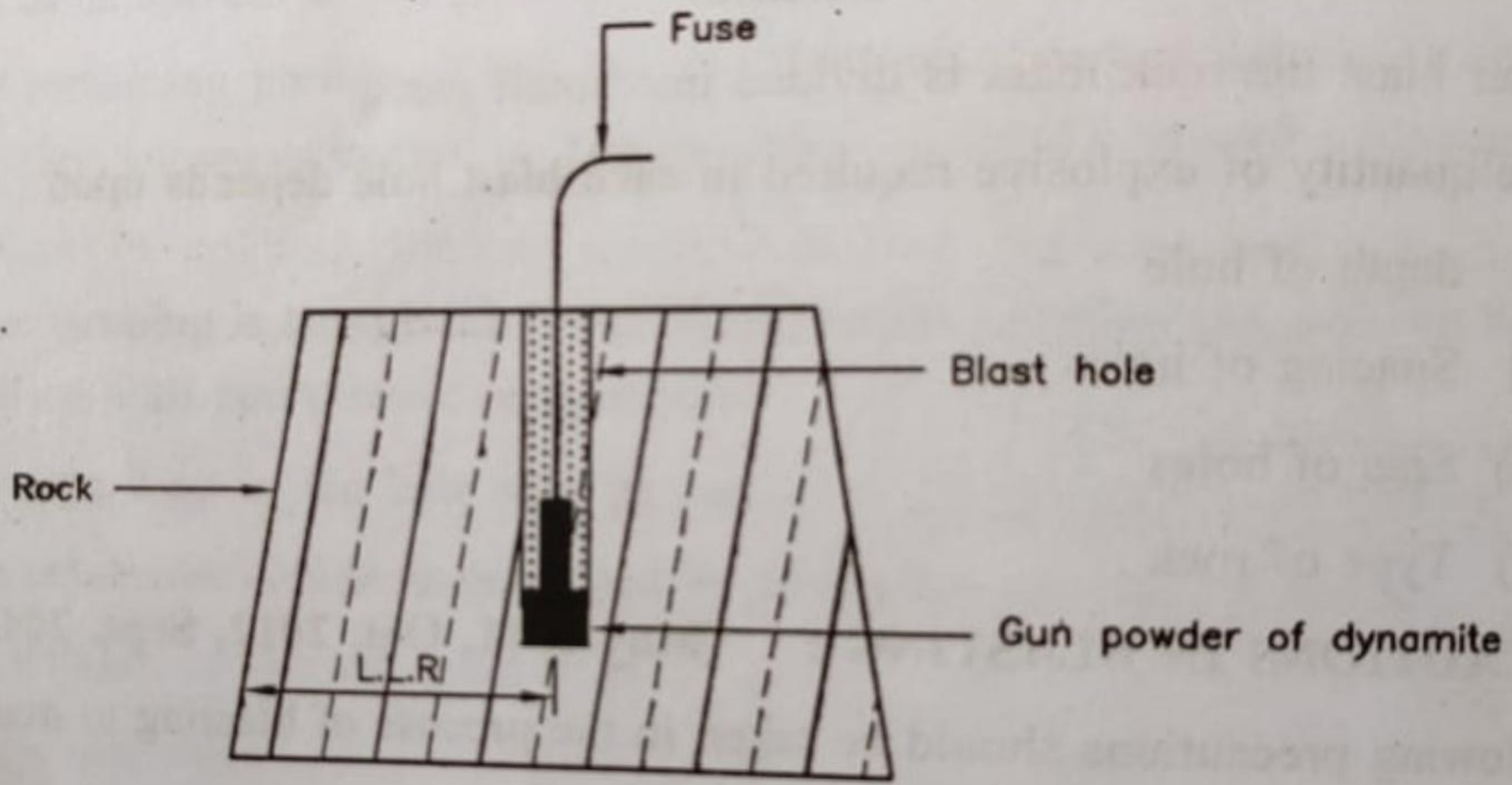
1. Failure of explosion :

sometimes a charge fails to explode due to any reason. In the case, a fresh blasthole is made near the hole that has failed and the process of blasting is repeated. Fresh blast hole should not be too near to the failed hole. Sometimes, explosion on fresh blasthole hole will also explored the charge of failed blast hole

2. Line of list resistance :

rocks contains cracks, fissures, bedding plans, etc. When explosion occurs gases are formed. If blasthole is tamped sufficiently hard, it will not be possible for gases to come out through blast hole. In such case, gases will follow the line of path line of path which offers list resistance. Such a line is known as line of list resistance

In practice, LLR is takes as the shortest distance from the center of charge to the nearest rock surface. LLR plays an important role in determining the quantity of explosive required in blasting and hence, LLR should be carefully decided.



3. Needle and tamper :

needle and tamper should be of copper, brass, Bronze and not of steel. A spark is formed when steel sticks the rock, resulting in premature explosion force.

4. Notice of blasting :

notices and visible signs such as red flags should be placed at suitable place along periferi of such area. Nobody should be allowed to enter the area where blasting is being done.

It is desirable to avoid blasting operations late in evenings or early in mornings. The fixed hour of blasting operations should be made non to the public.

5. Retreat to a safe distance .

Fuse adopted should be such that a worker can retreat to a safe distance after firing it. For large work, whistles or sirens May be used to warn the worker to go to a safe places before explosions takes place.

6. Seepage of water :

if water is entering the blast hole, charge of explosive should be placed in thin iron plate or in water proof paper.

7. Skilled supervision :

work of blasting should be entrusted only to trend and experienced person.

8. Stemming :

the presence of stemming condense the energy of an explosive and result into an over all increase in the effectiveness of explosion . Proper stemming serves as precausnery measure for avoiding an accident.

9. Storing :

explosives should be stored very carefully in specially constructed magazine building. It should be away from residential building and imported structure.

10. Transportation of explosives :

The explosives should be transported by othorised person by well maintained and specially designed vehicles only. Smoking or caring of matches on the vehicle should be strictly prohibited.

- **Precautions during transportation :**

- (1) Explosive should be transported in specially designed vehicles.
- (2) Smoking or Carrying of matches on the vehicle should be strictly prohibited.
- (3) Explosives should be transported without breaking it's packing.
- (4) Words 'explosive material' should be written on all the sides of a vehicle carrying explosives.
- (5) Blasting caps or Datonater should not be transported with explosive.
- (6) Battery, dry cell or other electric appliances should not be transported with explosives.
- (7) Passenger should not be allowed in the vehicle carrying explosives.
- (8) The unused quantity of explosive at the end of day should be deposited in the magazine building.

- **Precautions during firing:**

- (1) The end of safety fuse Should not be cut in advance. It should be cut at the time of use.
- (2) Exploder should be checked regularly. It should not be used to fire higher energy Path than its capacity.
- (3) The continuity of electric circuit should be checked before firing.
- (4) For joining purposes, insulation should be removed for maximum 5 cm length from wires, and ends should be properly joined.

- **MAGANIZE BUILDING** :

- A specially constructed building used for storing explosives is called **magazine building** or **store house**.
- It should be constructed of bricks, stones or cement concrete. It should be away from residential buildings and important structures. It should be properly ventilated. The walls, floor, roof and door-windows should be made of fire resistant materials.
- The magazine building should be provided by a high barbed wire fencing on its boundary. Smoking should be prohibited within a radius of 50m from the building. The electrical fittings of the magazine should be frequently checked by competent persons.

MAGAZINE BUILDING

- A specially constructed bldg used for storing explosive is called magazine bldg.



'Z' - TYPE VENTILATIONS FITTED WITH BRASSMESH

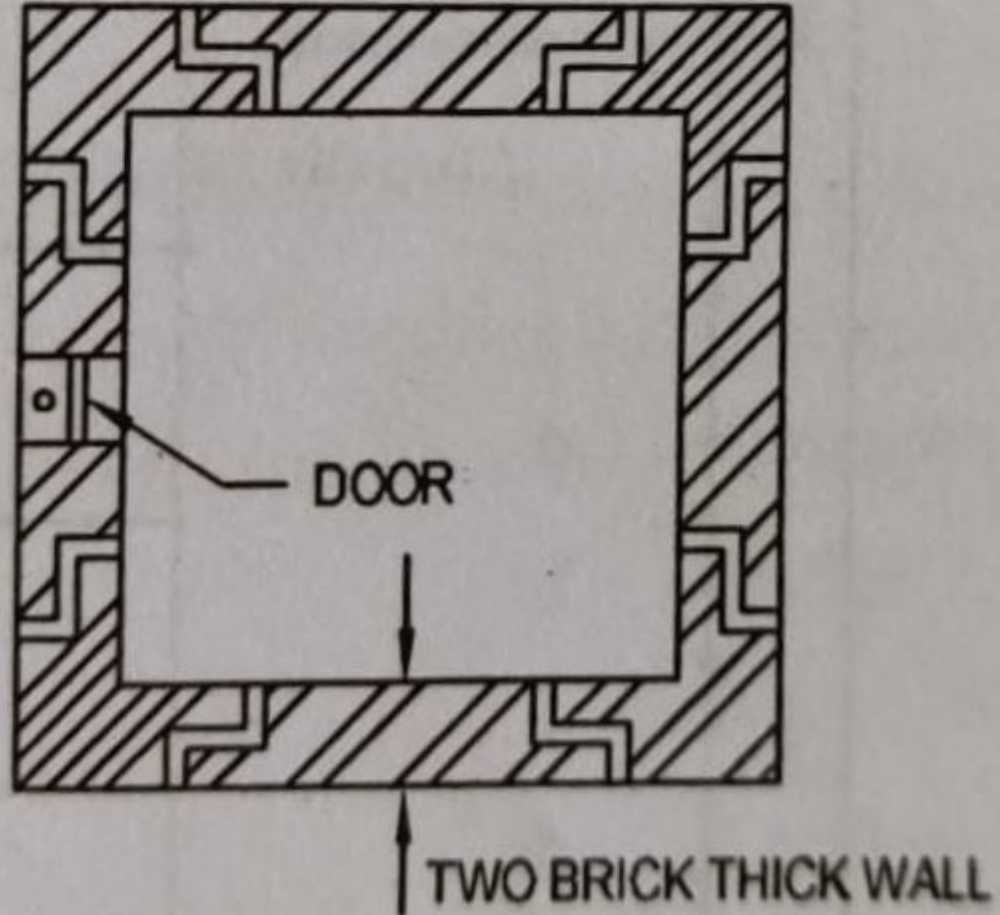


Fig. 7.6 Magazine Building

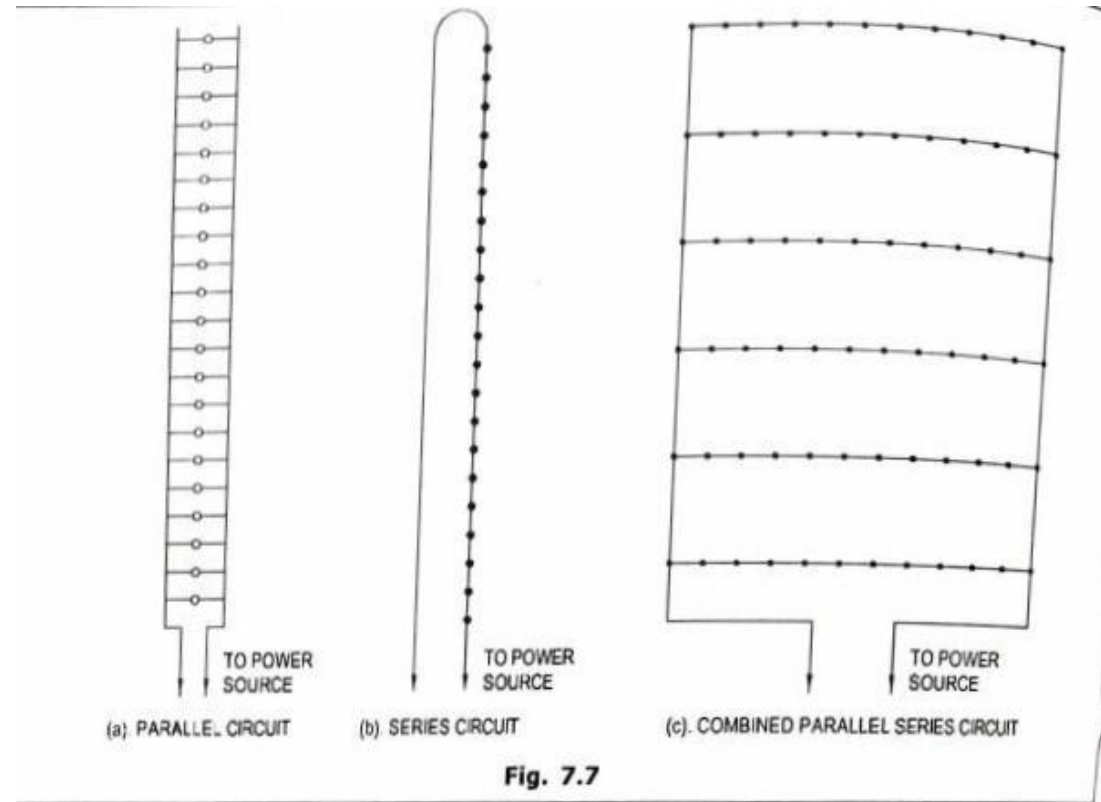
- The floor area of magazine building should not be less than 9m² not more than 150 kg of explosives or 50,000m of safety fuse should be stored in the magazine building. The house should be properly locked and only authorised persons should be allowed to enter it.
- A water tank of 15 cm depth should be provided near the gate of the magazine building persons entering the building should dip Their feet or shoes in water in water before entering. Nobody should be allowed to enter with bare feet and with nailed shoes.

- **PRECAUTIONS FOR STORAGE OF EXPLOSIVES :**

- (1) All laws in this respect should rigidly be followed.
- (2) The floor, roof, walls, door-windows of magazine building should be made of fire-resisting materials.
- (3) The floor area of magazine building should be not less than 9m².
- (4) The magazine building should be well ventilated.
- (5) Boxes of explosive should not be opened in the magazine building.
- (6) For opening boxes of explosives, brass hammer should be used.
- (7) The store house should be properly locked by an authorised person.
- (8) Detonators should Not be stored with other explosives.
- (9) Do not keep explosives where they are exposed to excessive heat, spark or impact.

- **MISFIRE :**

- Sometimes a charge fails to explode due to any reason. In this case, a fresh blasthole is made near the hole that has failed and the process of blasting is repeated. Fresh blast hole should not be too near to the failed hole sometimes, explosion of fresh blasthole will also explode the charge of failed blasthole.
- The methods of firing the misfired charge are:
 1. The stemming in the blast hole is removed by a jet of water or compressed air. A new primer is placed in the blast hole and is fired again.
 2. If lead wires are already connected, they are connected to the firing circuit and the charge is blasted.
 3. A new blast hole at a distance of about 60 to 75cm from the failed hole is filled, charged with explosive and blasted.



- ***FIRING CHARGES:***

- The common practice is to fire a number of holes at one time and for the purpose, parallel circuit of series circuit or combination of to is adopted as shown in fig above.
- Each circuit is tested for continuity with the help of a galvanometer before making final connection to the source of electric current. Such a precaution is necessary to avoid misfires.

Thank you

Courtesy :

Dr.R.P.Rethliya Sir