

# SHORING

**Shoring** is the construction of a temporary structure to support temporarily an unsafe structure. These support walls laterally. They can be used under the following circumstances:

1. When walls bulge out.
2. When walls crack due to unequal settlement of foundation and repairs are to be carried out to the cracked wall.
3. When an adjacent structure needs pulling down.
4. When openings are to be newly made or enlarged in a wall.

## Types of shoring

1. Raking shores
2. Flying shores
3. Dead shores

## RAKING SHORES

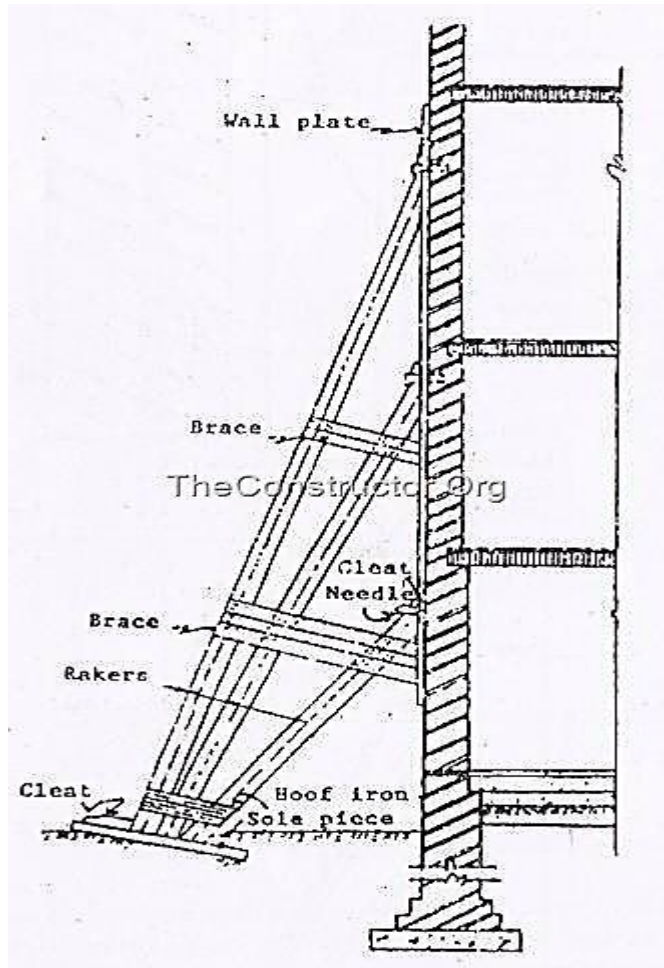
In this method, inclined members known as rakers are used to give lateral supports to walls. A raking shore consists of the following components:

1. Rakers or inclined member
2. Wall plate
3. Needles
4. Cleats
5. Bracing
6. Sole plate

**The following points are to be kept in view for the use of the raking shores:**

1. Rakers are to be inclined in the ground at  $45^{\circ}$ . However the angle may be between  $45^{\circ}$  and  $75^{\circ}$ .

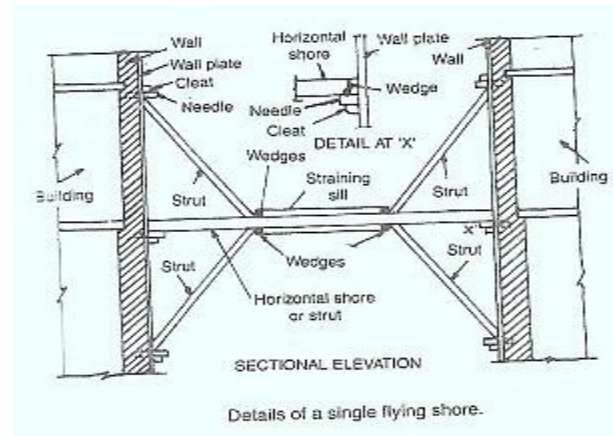
2. For tall buildings, the length of the raker can be reduced by introducing rider raker.
3. Rakers should be properly braced at intervals.
4. The size of the rakers is to be decided on the basis of anticipated thrust from the wall.
5. The centre line of a raker and the wall should meet at floor level.
6. Shoring may be spaced at 3 to 4.5m spacing to cover longer length of the bar.
7. The sole plate should be properly embedded into the ground on an inclination and should be of proper section and size.
8. Wedges should not be used on sole plates since they are likely to give way under vibrations that are likely to occur.



## FLYING SHORES

**Flying shores** are horizontal supports that are provided for supporting temporarily the parallel walls of the two adjacent buildings, which may tend to collapse or damage when one of the intermediate buildings has to be pulled down and rebuilt. Such conditions occasionally arise when one of the intermediate buildings from a series of buildings standing side by side is either required to be reconstructed or has collapsed due to some reason.

A single **flying shore** consists of wall plates, struts, straining pieces, horizontal shore (or, horizontal strut), needles, cleats and wedges, as shown in the above image. Likeraking shores, in this system also, the wall plates are secured against the walls by means of needles and cleats. The flying shores is held in position by wedges, needles and cleats to the wall plate as shown at section X in the image.

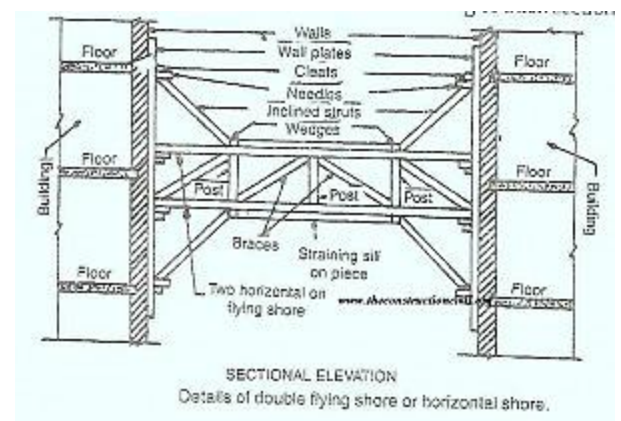


The inclined struts are supported by the needles at their one end and straining sill at the other end. Straining sill, in turn, is spiked to the horizontal shore.

(i) During reconstruction of the intermediate building, the flying shores temporarily take up the position of the dismantled building.

(ii) The centre-lines of flying shores and struts; and flying shores and walls, should meet at the floor levels. If the floor levels of two buildings are different or their strengths are different, then shore positions should be provided as shown in the below image.

(iii) The maximum distance of about 9 m between the parallel walls can be supported by single flying shores. For a distance more than 9 m, a double flying shore, having a trussed form work as shown in the figure, is employed.



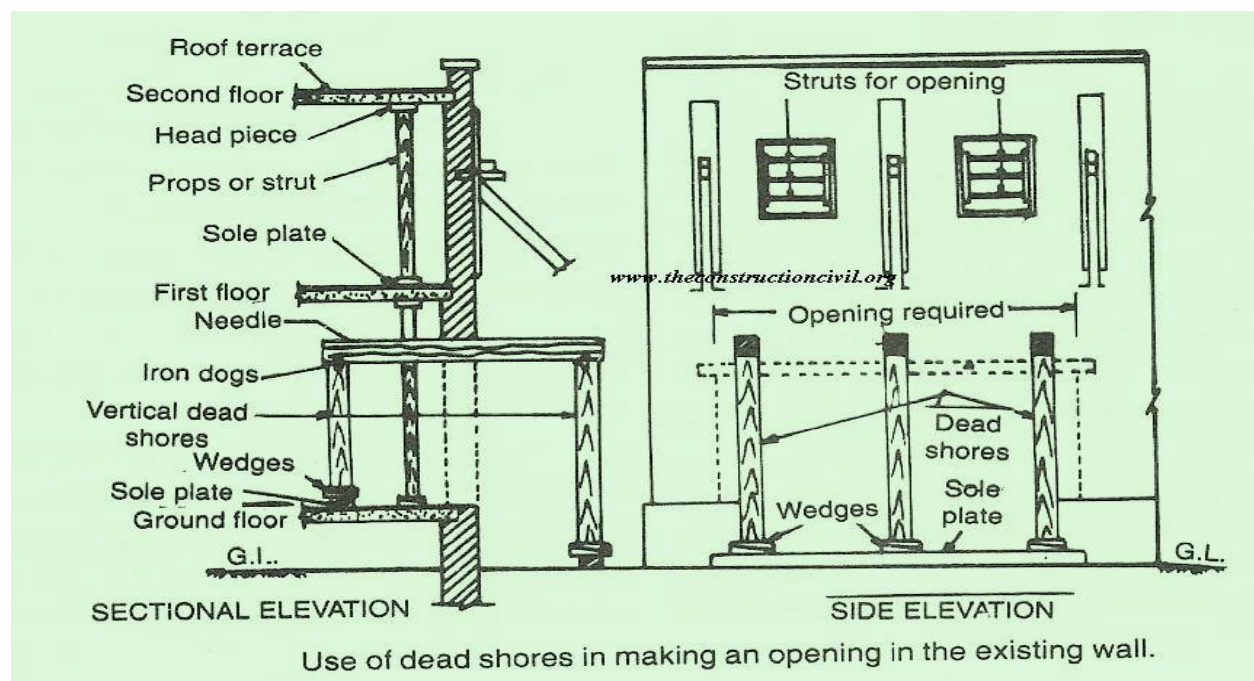
(iv) The flying shores are kept in position so long as the adjacent buildings are made stable by constructing the building to a sufficient height.

(v) Unlike the inclined shoring in this type, only one set of shoring is employed to strengthen the two adjacent walls.

(vi) A larger factor of safety should be adopted in design analysis of flying shores because of uncertainty of actual loads. For shores to be more effective, the struts should be inclined at  $45^\circ$ , if possible. In no case should this inclination exceed  $60^\circ$

## DEAD SHORES

This is the system of shoring which is used to render vertical support to walls and roofs, floors, etc when the lower part of a wall has been removed for the purpose of providing an opening in the wall or to rebuild a defective load bearing wall in a structure. The dead shore consists of an arrangement of beams and posts which are required to support the weight of the structure above and transfer same to the ground on firm foundation below.



Holes are made in the wall at suitable height. Needles, which are made of thick wooden sections or of steel, are inserted in the holes. Each needle is supported at its two ends by vertical posts called dead shores. The dead shores are supported on sole plates and folding wedges.

The following points are to be noted

1. The section of needles and dead shores should be adequate to transfer the load

2. The needles are spaced at 1 or 2 m. A minimum of three needles should be used for an opening
3. The needles should be suitably braced
4. If the opening is made in an external wall, the length of outer dead shores will be greater than the inner ones
5. The dead shores are supported on sole plates. Folding wedges are inserted between the two.
6. Shores should be removed only when the new work has gained sufficient strength, but in no case less than 7 days of the completion of new work.

## UNDERPINNING

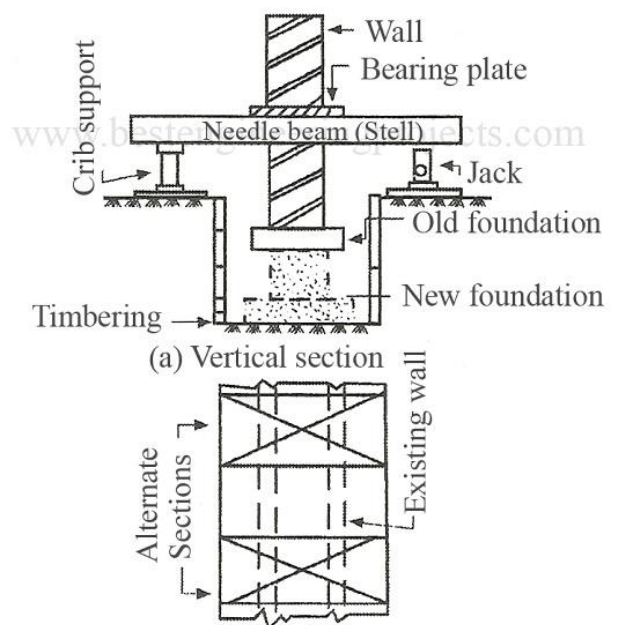
The process of placing a new foundation under an existing one or strengthening an existing foundation is called underpinning of foundations.

Underpinning is required to serve the following purpose

- i) To strengthen the shallow foundation of existing building when a building with deep foundation is to be constructed adjoining it.
- ii) To strengthen existing foundation which has settled down and caused cracks in wall.
- iii) To construct a basement in the existing building.

Underpinning is carried out in two methods

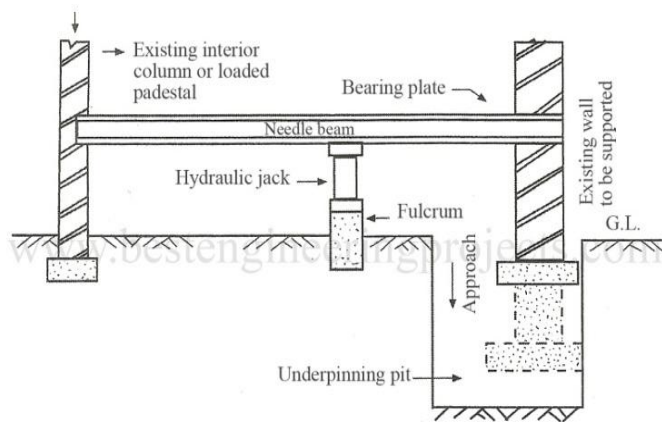
1. Pit Method: In this method, the entire length of foundation to be underpinned is divided into sections of 1.2 to 1.5 m lengths. One section is taken up at a time. For each section, a hole is made in the wall, above the plinth level, and needle is inserted in the hole. Needles may be either of stout timber or steel sections. Bearing plates are placed above the needle to support the masonry above it. Needle is supported



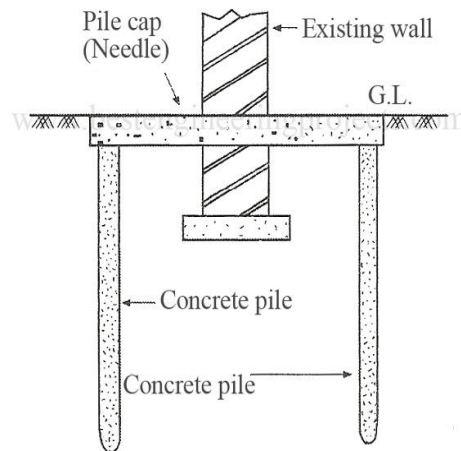


on either side of the wall on crib supports and screw jacks. The foundation pit is then excavated upto the desired level and new foundation is laid. When the work of one section is over, work on next to next section is taken up i.e. alternate sections are underpinned in the first round, and then the remaining sections are taken up. If the new foundation is deeper, proper timbering of the foundation trench may be done.

If an interior strong column exists, or if the foundation is to be extended only to one side, cantilever needle beams may be used in the place of central needle beams. If the wall is long, the work is started from the middle and extended in both the directions.



2. Pile Method: In this method, piles are driven at regular interval along both the sides of the wall. Generally, borehole piles or under reamed piles are used. The piles are connected by concrete or steel needles penetrating through the wall. These beams also act as pile caps. This method is useful in clayey soils, and also in water logged areas. The existing foundation is very much relieved of the load.



# SCAFFOLDING

When the height of wall or column or other structural member of a building exceeds about 1.5 m, temporary structures are needed to support the platform over which the workmen can sit and carry on the constructions. These temporary structures, constructed very close to the wall, is in the form of timber or steel framework, is called scaffolding.

Scaffolding has the following components:

- i)Standards: These are the vertical members of the framework, supported on the ground or drums, or embedded into the ground.
- ii)Ledgers: These are the horizontal members running parallel to the wall.
- iii)Braces: These are the diagonal members fixed on standards.
- iv)Putlogs: These are the transverse members placed at right angles to the wall with one end supported on ledgers and other end on the wall.
- v)Boarding: These are the horizontal platform to support workmen and material, supported on putlogs.
- vi)Guard rail: This is a rail provided like a ledger at the working level.
- vii)Toe board: These are the boards placed parallel to the ledgers, and supported on putlogs, to give protection at the level of working platforms.

Various components of the scaffolding are secured by means of rope lashings, nail bolts etc.

## Types of scaffolding

1. Single scaffolding or Brick layer's scaffolding: This consists of a single framework of standards, ledgers, putlogs, constructed parallel to the wall at a distance of about 1.2 m. The standards are placed at 2 to 2.5 m interval. Ledgers connect the standards and are provided at a vertical interval of 1.2 to 1.5m. Putlogs are placed with one end on the ledgers and the other end in the hole left in the wall, at an interval of 1.2 to 1.5m. Such a scaffolding is commonly used for brick laying and is also called *putlog scaffolding*.
2. Double scaffolding or Mason's scaffolding: In stone masonry, it is very difficult to provide holes in the wall to support putlogs, hence a more strong scaffolding is used consisting of two rows of scaffolding. Each row thus forms a separate vertical framework. The first row is placed at 20 to 30 cm away from the wall, while the other framework is placed at 1m distance from the

first one. Putlogs are then supported on both the frames. Rakers and cross braces are provided to make the scaffolding more strong and stable. Such a scaffolding is also called *independent scaffolding*.

3. Cantilever scaffolding or Needle scaffolding: It is adopted under the following circumstances.
  - i)When ground is weak to support the standards.
  - ii)When construction of upper part of the wall is to be carried out.
  - iii)When it is required to keep the ground near wall free for traffic

The scaffolding may be putlog scaffolding or independent scaffolding. In putlog scaffolding, the standards are supported on series of needles taken out through holes in the wall. In independent scaffolding, the needles are strutted inside the floors through the openings.

4. Suspended scaffolding: This is a light weight scaffolding used for repair works such as pointing, painting etc. The working platform is suspended from roofs by means of wire ropes or chains. The platform can be lowered or raised at any desired level.
5. Trestle scaffolding: Such type of scaffolding is used for painting and repair works inside the room, upto a height of 5m. The working platform is supported on the top of movable tripods or ladders, which are mounted on wheels.
6. Steel scaffolding: A steel scaffolding is similar to timber scaffolding, except that wooden members are replaced by steel tubes and rope lashings are replaced by steel couplets or fittings. Such a scaffolding can be erected and dismantled rapidly. It has great strength, durability and better fire resistance. Though its initial cost is more, but its salvage value is higher.
7. Patented scaffolding: Many patented scaffolding, made of steel are available in the market. These scaffoldings are equipped with special couplings, frames etc. The working platform is supported on brackets which can be adjusted at any suitable height.