

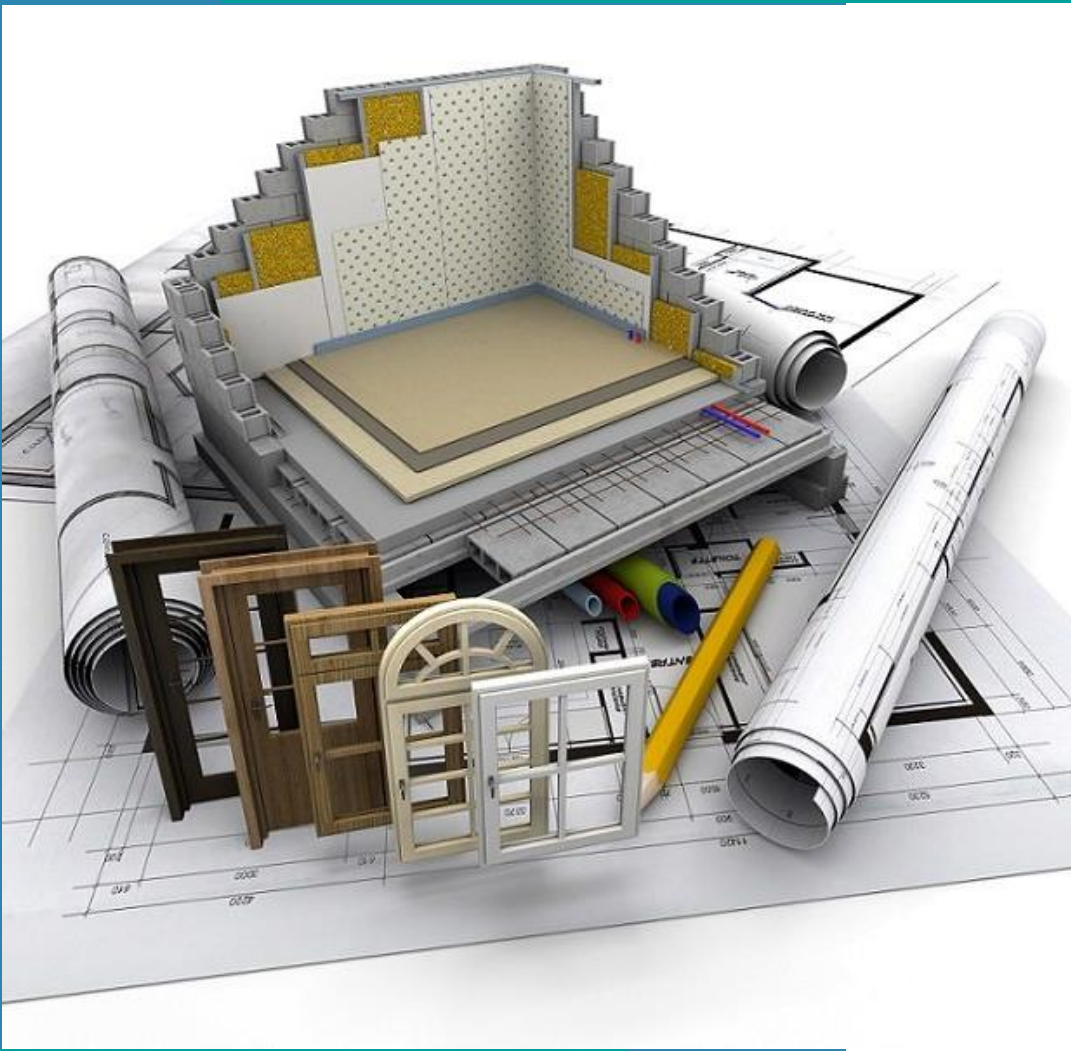


Foundation and Pile Driving Equipments

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- Purpose Of foundation
- Types of foundation
 - Shallow Foundation and its types
 - Deep foundation and its types
- Difference between shallow and deep foundation
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- Equipment used for constructing foundation and piles



What is foundation?

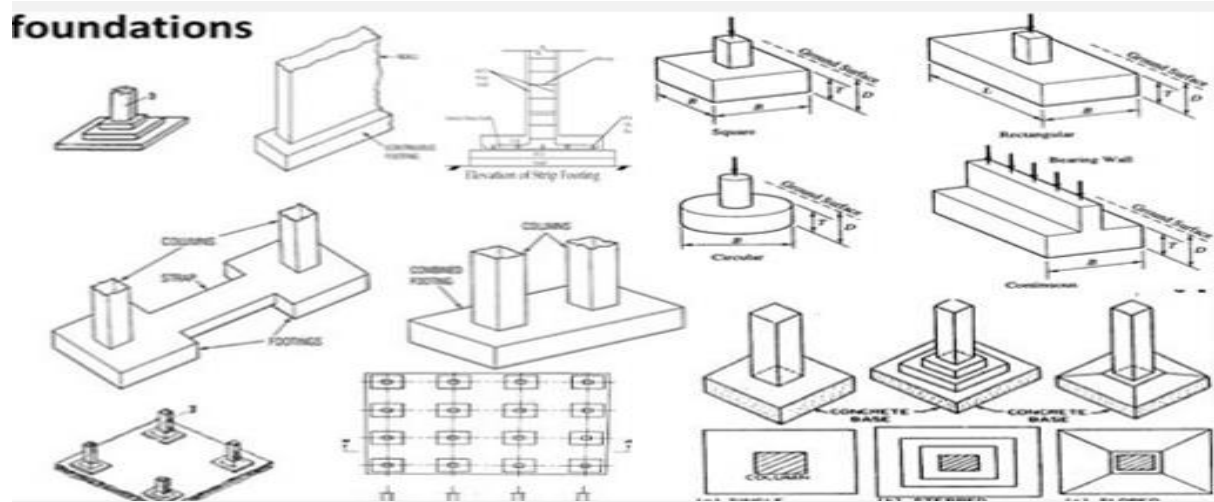
Definition: The lowest division of the building in direct contact with the soil, based on which a structure rests or stands is called the foundation. It is the basis of groundwork so the load is transferred from the constructed building to the soil.

The soil in which the foundation is to be built must have the capacity to bear the weight of the structure. So, we can say that foundation is one of the most vital components when considering to construct something at any place. A foundation bed is a ground on which it is to be built. Without the foundation bed of the building being strong or compatible with the soil, it is very likely to collapse especially during natural calamities such as an earthquake.

Purposes of Foundation

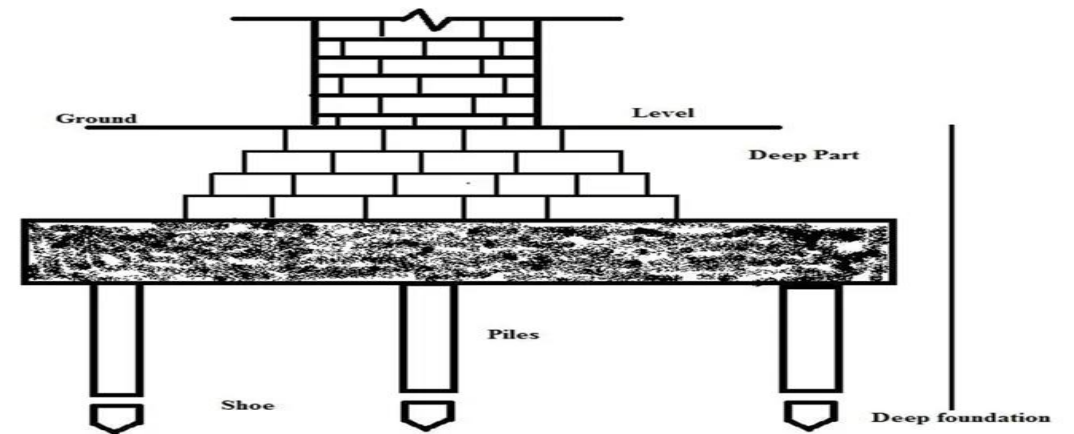
1. Providing level structure
2. Distributing weight of the structure
3. Supporting structure against natural disasters
4. Preventing lateral movements
5. Avoid unequal settlement.
6. Increase structural stability

Types of Foundation



- Deep foundation: -A deep foundation is a type of foundation that transfers building loads to the earth farther down from the surface than a shallow foundation does to a subsurface layer or a range of depths. A pile or piling is a vertical structural element of a deep foundation, driven or drilled deep into the ground at the building site.

- **Shallow Foundation:** - Foundation that transfers structural load to the earth very near to the surface, rather than to a subsurface layer or a range of depths, as does a deep foundation. Customarily, a shallow foundation is considered as such when the width of the entire foundation is greater than its depth. In comparison to deep foundations, shallow foundations are less technical, thus making them more economical and the most widely used for relatively light structures.

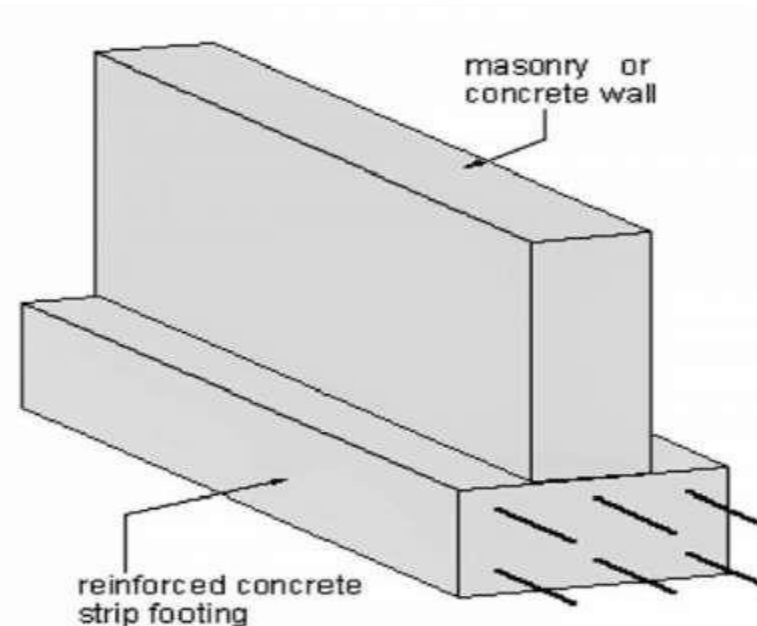
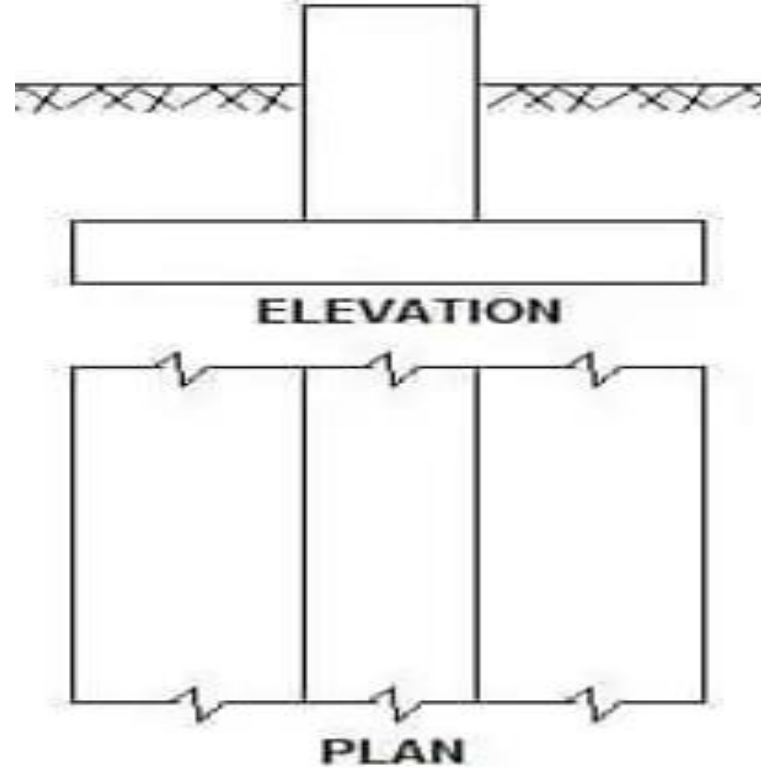




Types of shallow foundations

1. Strip footing
 2. Spread or Isolated footing
 3. Combined footing
 4. Raft or Mat foundation
 5. Cantilever or Strap footing
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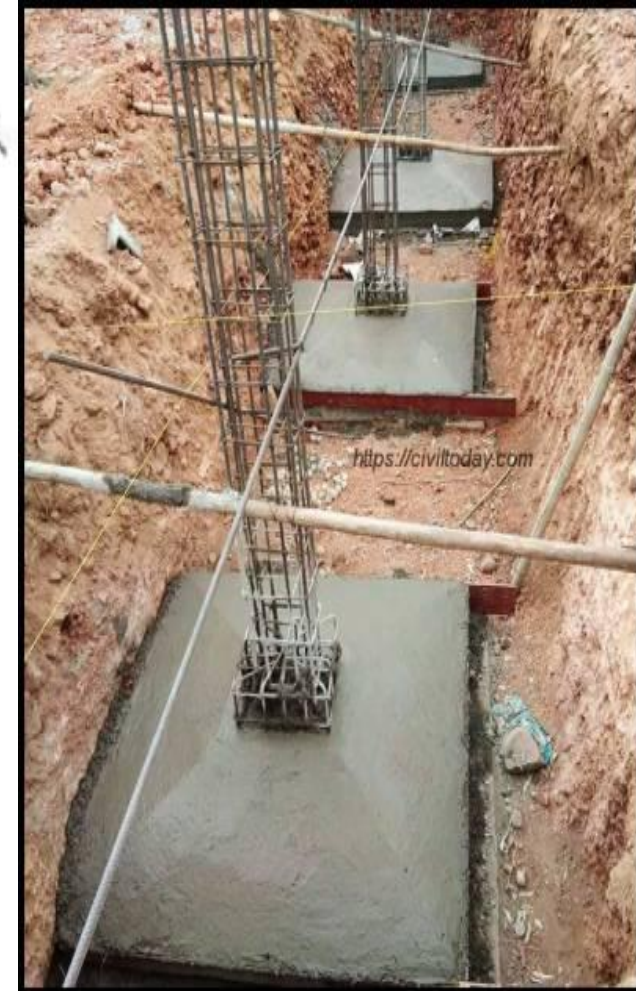
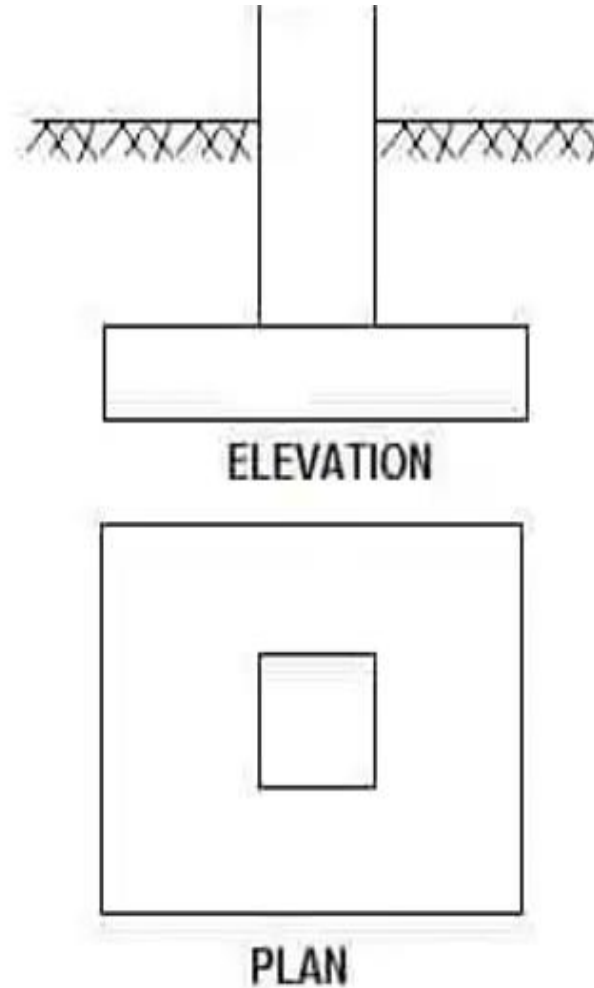
Strip Footing

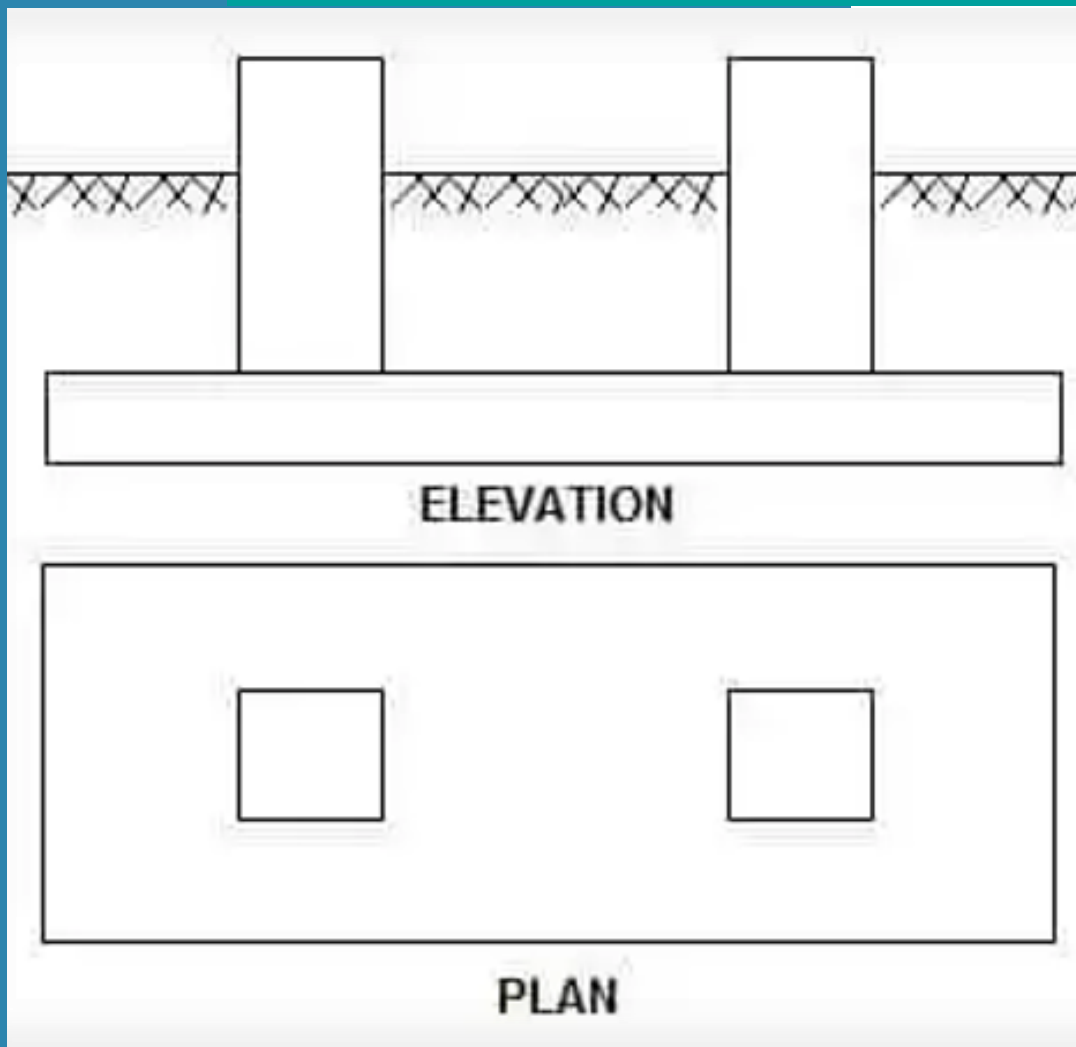


- A strip footing is provided for a load-bearing wall. A strip footing is also provided for a row of columns which are so closely spaced that their spread footings overlap or nearly touch each other. In such a case, it is more economical to provide a strip footing than to provide a number of spread footings in one line. A strip footing is also known as continuous footing.

Spread or Isolated footing

- A spread footing also called as isolated footing, pad footing and individual footing is provided to support an individual column. A spread footing is circular, square or rectangular slab of uniform thickness. Sometimes, it is stepped to spread the load over a large area



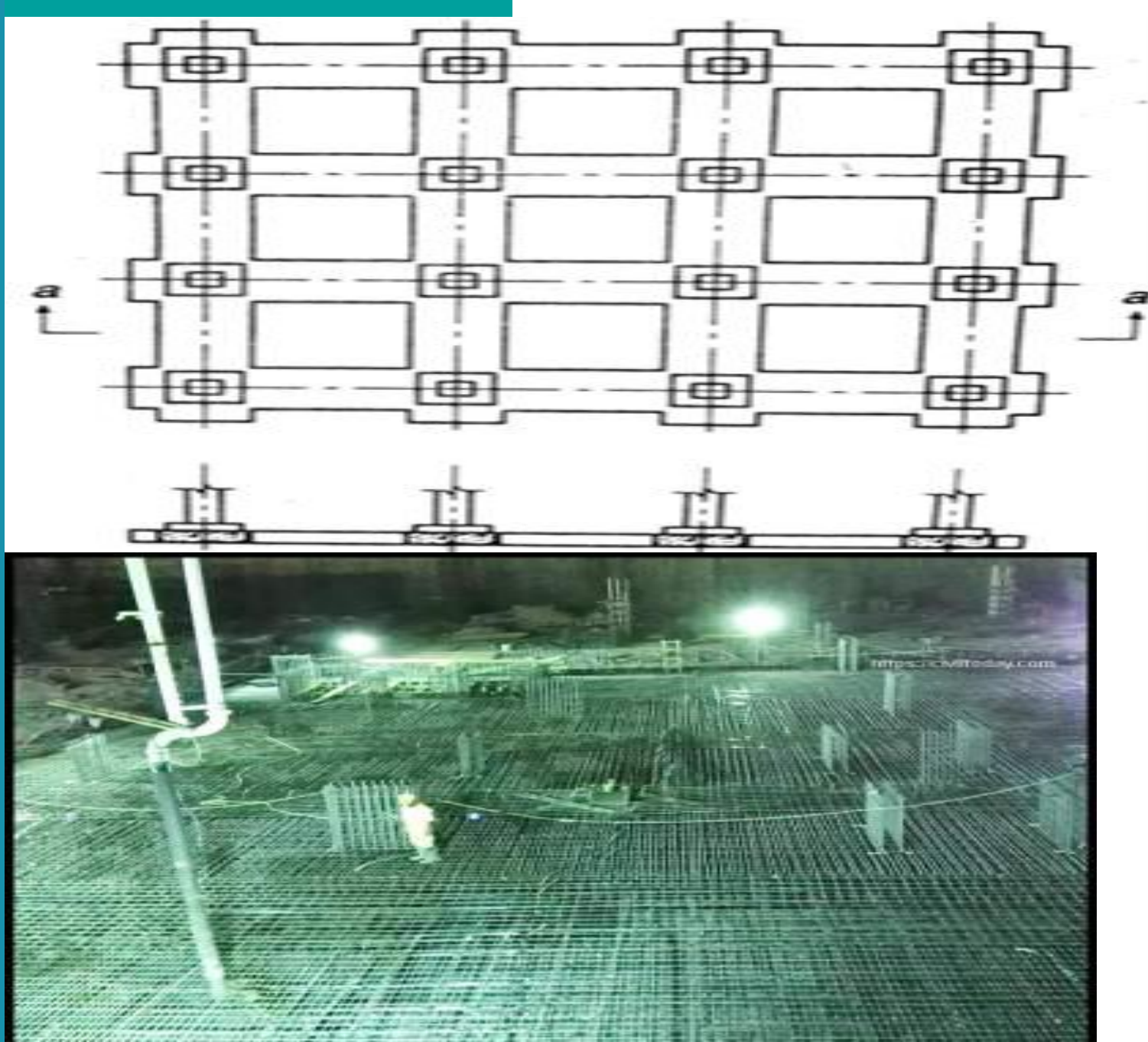


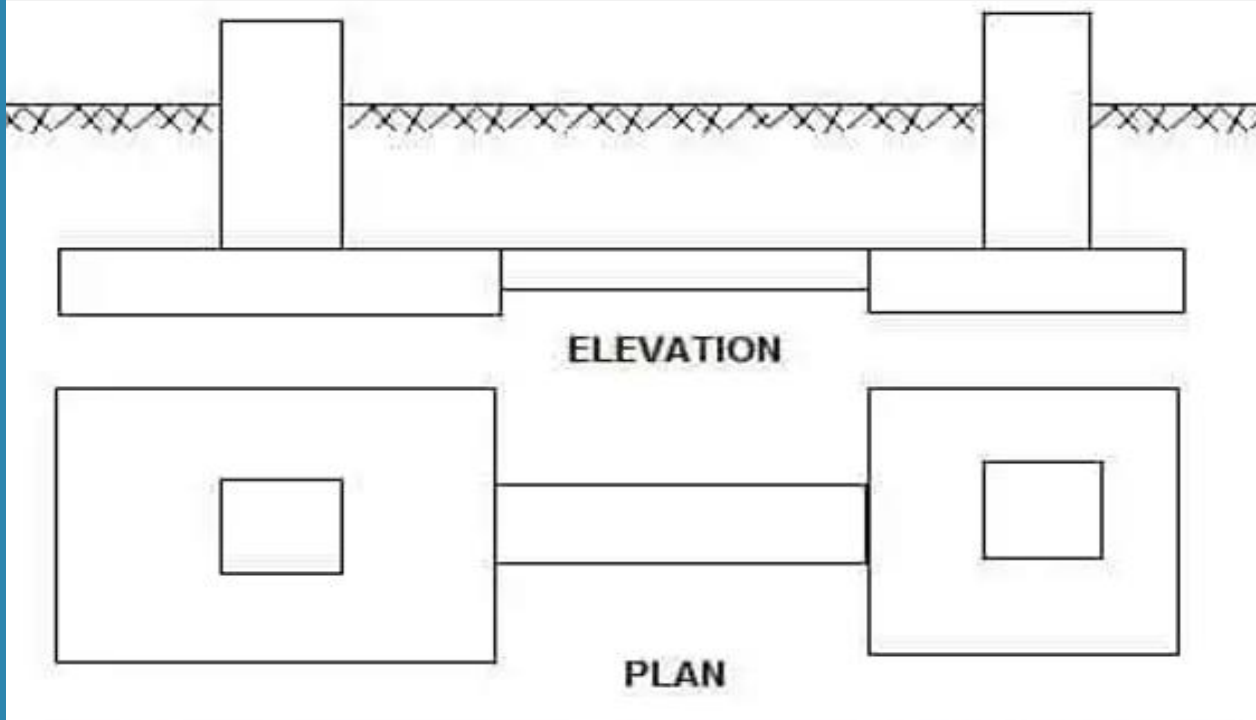
Combined footing

- A combined footing supports two columns. It is used when the two columns are so close to each other that their individual footings would overlap. A combined footing is also provided when the property line is so close to one column that a spread footing would be eccentrically loaded when kept entirely within the property line. By combining it with that of an interior column, the load is evenly distributed. A combined footing may be rectangular or trapezoidal in plan.

Raft or Mat foundation

A mat or raft foundation is a large slab supporting a number of columns and walls under the entire structure or a large part of the structure. A mat is required when the allowable soil pressure is low or where the columns and walls are so close that individual footings would overlap or nearly touch each other. Mat foundations are useful in reducing the differential settlements on non-homogeneous soils or where there is a large variation in the loads on individual columns.





Cantilever or Strap footing

A strap or cantilever footing consists of two isolated footings connected with a structural strap or a lever. The strap connects the two footings such that they behave as one unit. The strap is designed as a rigid beam. The individual footings are so designed that their combined line of action passes through the resultant of the total load. a strap footing is more economical than a combined footing when the allowable soil pressure is relatively high and the distance between the columns is large.

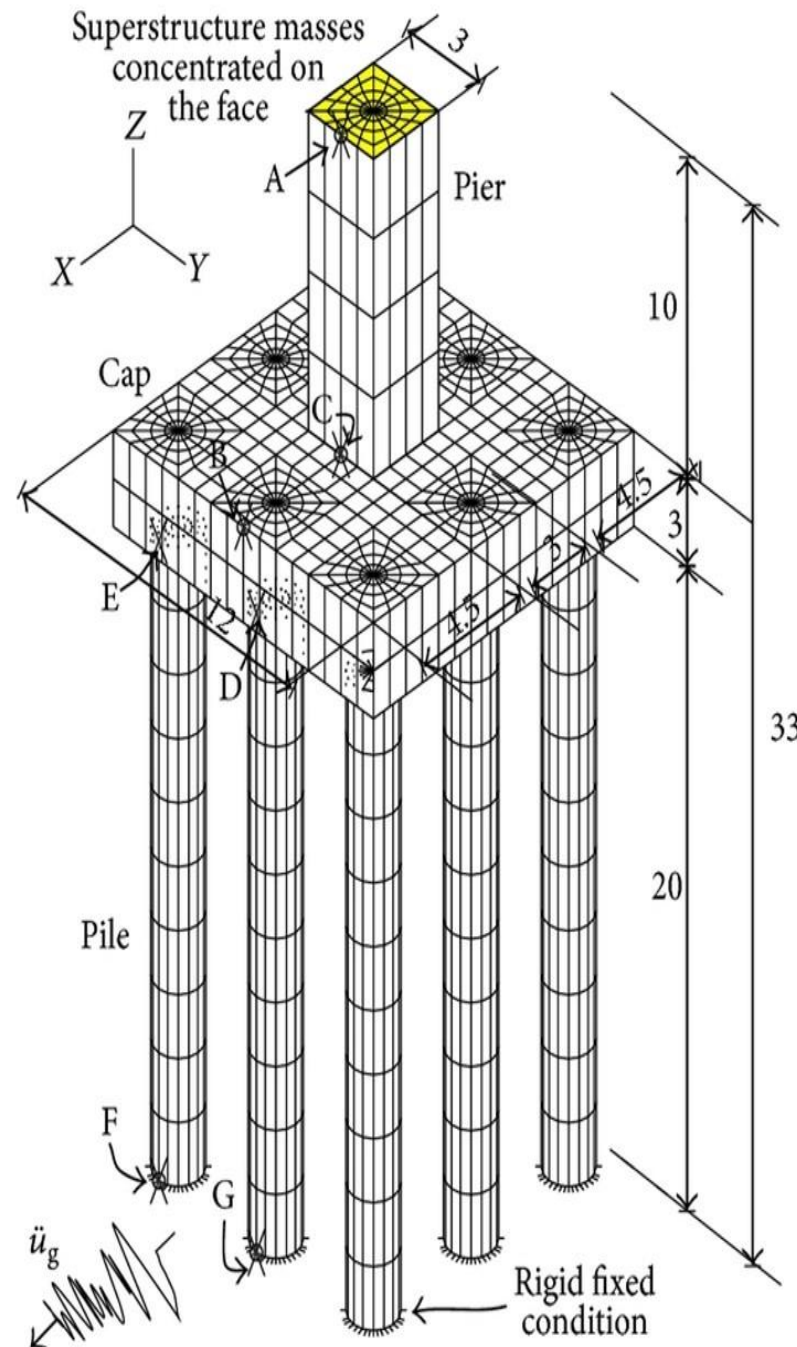




Types of deep foundation

1. Pile foundation
 2. Pier foundation
 3. caisson foundation
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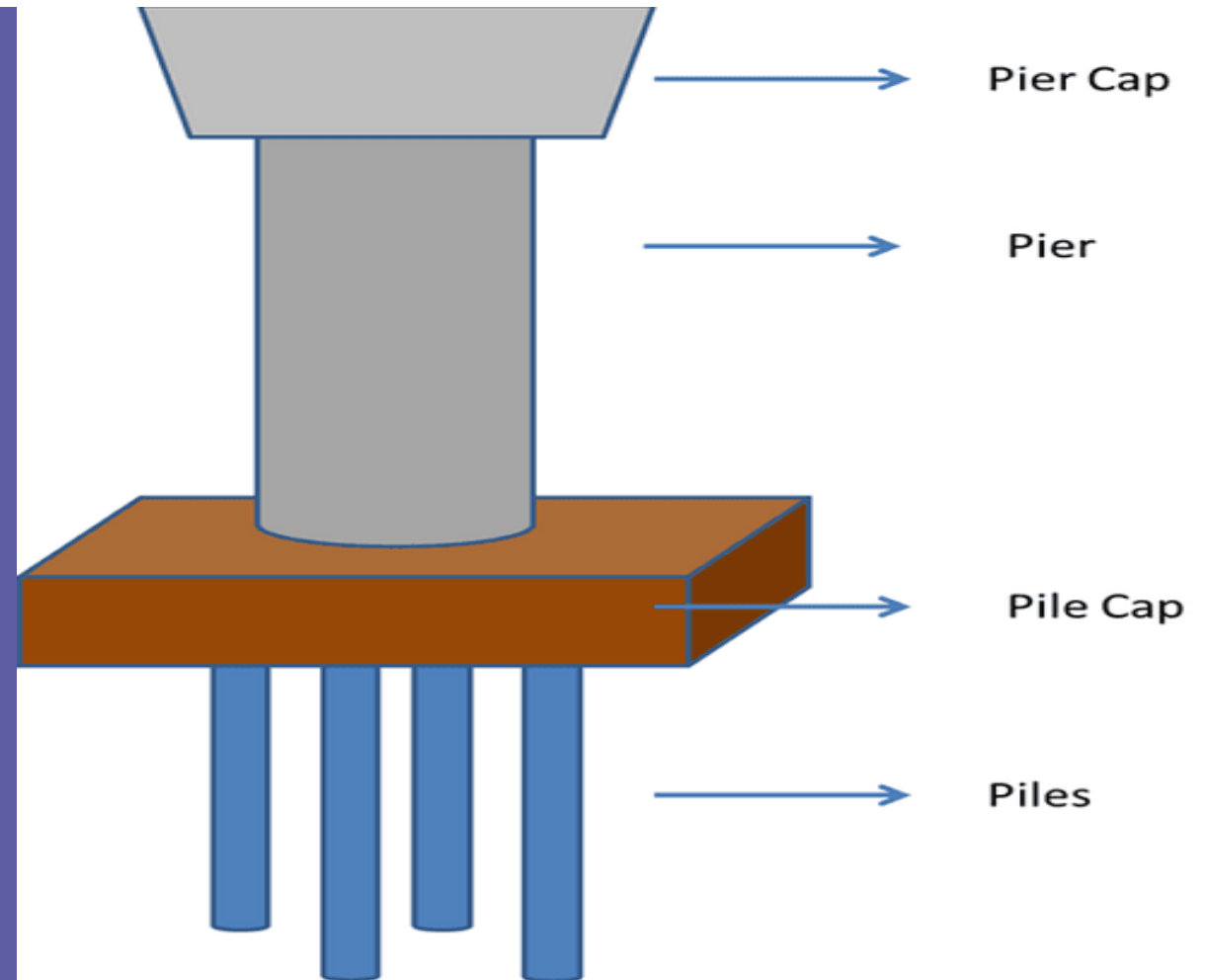
Pile Foundation



- Pile is a common type of deep foundation. They are used to reduce cost, and when as per soil condition considerations, it is desirable to transmit loads to soil strata that are beyond the reach of shallow foundations.

Pier Foundation

- Pier Foundation is usually shallower than piles. The pier foundation is generally utilized in multi-story structures. Since the base region is determined by the plan strategy for the regular establishment, the single pier load test is wiped out. Along these lines, it is increasingly well-known under tight conditions.
- Pier foundation is a cylindrical structural member that transfers heavy load from the superstructure to the soil by end bearing. Unlike piles, it can only transfer load by bearing and by not skin friction.





Caisson Foundation

Caisson foundation is a watertight retaining structure used as a bridge pier, construction of the dam, etc. It is generally used in structures that require a foundation beneath a river or similar water bodies. The reason for choosing the caisson is that it can be floated to the desired location and then sunk into place

Difference between Shallow and deep Foundation

Shallow Foundation

1. A foundation that is placed near the surface of the earth or transfers the loads at a shallow depth is called the shallow foundation.
2. The depth of a shallow foundation is generally about 3 meters or the depth of the foundation is less than the footing.
3. A shallow foundation is cheaper.
4. Shallow foundations are easier to construct.
5. Shallow foundations transfer loads mostly by end bearing.
6. Construction materials are available, less labor is needed, the construction procedure is simple at an affordable cost, etc.
7. Possibility of a settlement, usually applicable for lightweight structure, weak against lateral loads, etc.
8. Isolated foundation, strip foundation, mat foundation, combined foundation, etc.

Deep Foundation

1. A foundation that is placed at a greater depth or transfers the loads to deep strata is called a deep foundation.
2. Greater than the shallow foundation.
3. Deep foundations are generally more expensive than shallow foundations.
4. The construction process of a deep foundation is more complex.
5. Deep foundations rely both on end bearing and skin friction, with few exceptions like end-bearing pile.
6. Foundation can be provided at a greater depth, Provides lateral support and resists uplift, is effective when foundation at shallow depth is not possible, can carry a huge load, etc.
7. More expensive, needs skilled labor, has complex construction procedures, can be time-consuming and some types of deep foundations are not very flexible, etc.
8. Pier foundation, pile foundation, caissons, etc.



Material used in pile foundation





Concrete



**Steel
Pipe**



Timber



Steel H



**Pre-cast
Concrete**



Composite



Foundation on the basis of weight of structure



*Low
Weight*



*Large Distributed
Weight*



*Very Large Concentrated
Weight*



*Soft to
Firm Clay*

Strong Rock



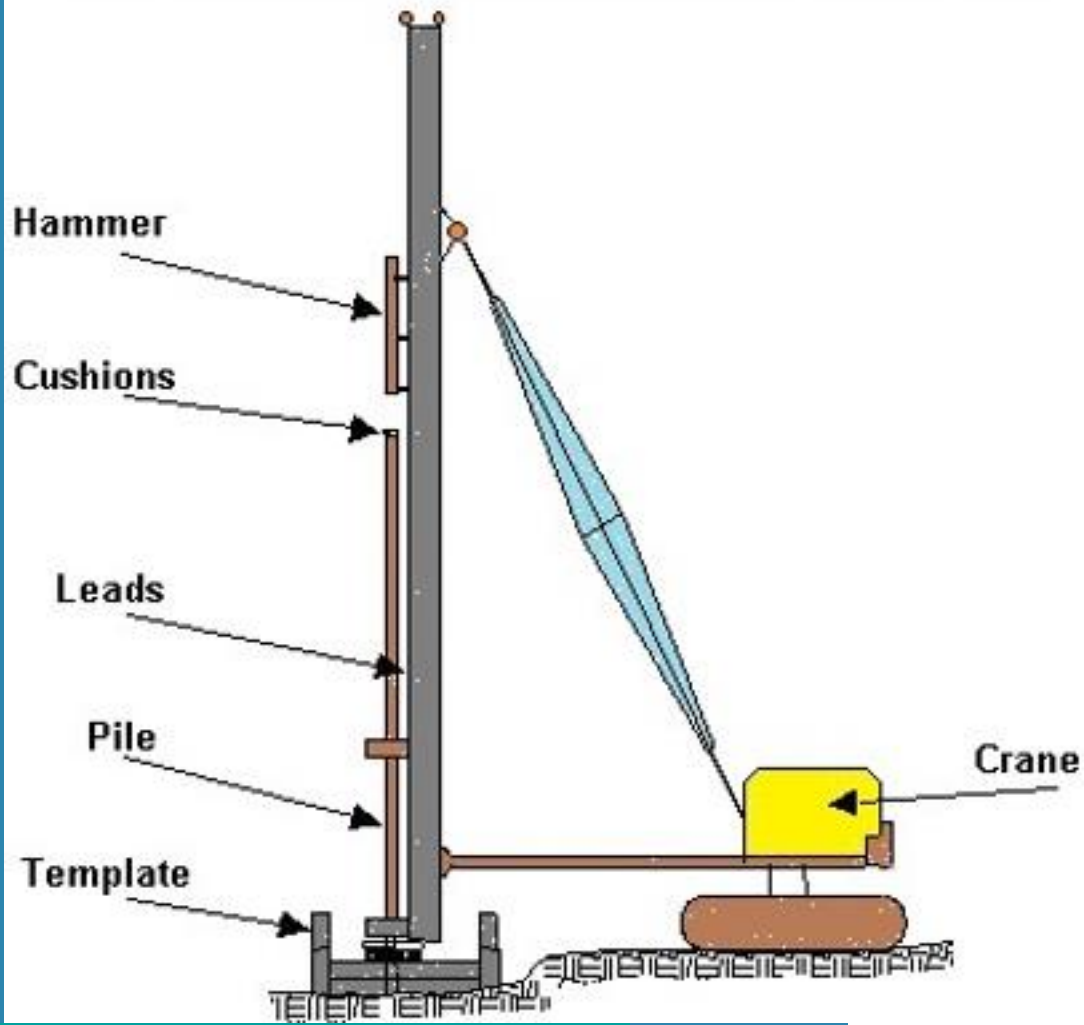
Equipment used for construction of foundation and piles



Types of Pile Driving Equipments

1. Drop hammer or Single acting hammer
2. Double acting hammer
3. Diesel hammer
4. Hydraulic hammer
5. Vibratory hammer
6. Piling rig
7. And other accessory tools





Drop hammer or single acting hammer

- The drop hammer in the pile driving equipment consists of a heavy ram in between the leads. The ram is lifted up to a certain height and released to drop on the pile. This type is slow and therefore not in common use. It is used in the cases where only a small number of piles are driven.

Double Acting Hammer

Double acting hammer employs steam or air for lifting the ram and for accelerating the downward stroke. The weight of the hammer is only 500 kg but because of accelerating effect it has an effect of a weight of 3 tones. The pile driving is very quick.



Diesel hammer



The diesel hammer is a small, light weight and highly mobile. They use gasoline for fuel. To start the operation, the ram is raised, and the fuel is injected. As the ram is released, the ram falls and compresses air and fuel. The air and fuel becomes hot because of the compression and the air-fuel mixture is ignited. The resulting explosion. In this machine impact, compression and explosion energy is used for pile driving.

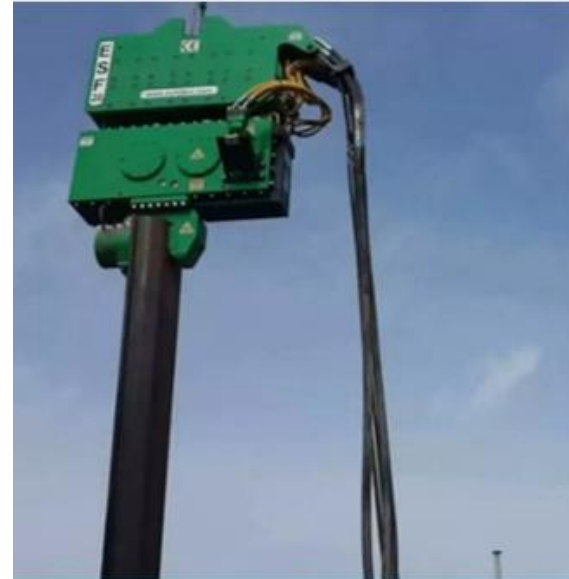


hydraulic hammer

It is a modern type of piling hammer. it is more environment friendly as these generate less noise and pollutants. Only noise produced is the impact of hammer

Vibratory hammer

- The principle of the vibratory driver is two counter-rotating eccentric weights. The driving unit vibrates at high frequency and provides two vertical impulses, one up and one down. The downward pulse acts with the pile weight to increase the apparent gravity force. These hummers have reduced driving vibrations, reduced noise, and great speed of penetration



Pilling rig



- Pilling rig is a construction machine for pilling in foundation engineering. Mainly applied to drill in sandy soil, clay, silty clay, etc. . It is widely used for cast-in-situ piles, diaphragm walls, foundation reinforcement and other foundation projects.

Questions

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