2.5 DAMP PROOFING

Damp proofing in construction is a type of moisture control applied to building walls and floors to prevent moisture from passing into the interior spaces. Damp problems are one of the most frequent problems encountered in homes.

Different types of damp proof course

Damp proof courses (DPC‟s) are types of barriers designed to span across the length or width of your walls to prevent the onset of rising or penetrating damp; there are various options to choose from, including:

- **Solid DPC** – a solid DPC is made of some kind of waterproof material – such as bituminous felt, copper sheet or polythene – and is fitted either horizontally or vertically on the exterior or interior of the wall, at least six inches above ground level (in accordance with the *British Standard Code of Practice for Installation of Damp Proof Courses* BS 6576:1985). Solid DPC‟s are considered the most reliable form of preventing groundwater ingress, but are really only suitable for newly erected walls; fitting them onto already built walls adds the risk of cutting through pipe work or wiring, which could cost you more money later on.

- **Chemical DPC** – this involves drilling holes 10-12mm in diameter into the wall (also at least 6in above ground level), and injecting liquid silicone-based chemicals into the holes using a high pressure pump to create a water repelling layer in the wall. This often proves a more practical and less obtrusive DPC for home owners, but it can take a few months for results to emerge and the effectiveness will vary as the chemicals won‟t pass through the walls evenly.

This method won't work on breeze block walls, as they are non-porous and thus won‟t allow the chemicals to permeate properly.

- **Porous tube DPC** – this DPC involves fitting small clay tubes into closely spaced rows along the wall, also into the mortar at least 6in above ground level; these tubes then allow moisture to locate an outlet that allows it to evaporate more freely and therefore limits the amount of water that can rise above them. This is a relatively simple and cheap method but it doesn't always produce effective results.

- **Electro osmotic DPC** – if you want a more scientific based DPC, electricity can even be utilized to help prevent the onset of damp. Titanium cathodes and anodes are fitted into the interior of the wall and power is drawn from the mains supply, usually by using a standard 13amp socket. The entire system is professionally earthed and the subsequent injected electricity creates an electric field, whereby the water molecules are naturally drawn downwards toward the negative electrodes and away from the bulk of the wall. The system is specifically designed to counteract the rising water that causes damp.

2.6 JOINTS IN CONCRETE CONSTRUCTION

Squared rubble masonry: The rubble masonry in which the face stones are squared on all joints and beds by hammer dressing or chisel dressing before their actual laying, is called squared rubble masonry. There are two types of squared rubble masonry.

Coursed Square rubble masonry: The square rubble masonry in which chisel dressed stones laid in courses is called coarse square rubble masonry. This is a superior variety of rubble masonry. It consists of stones, which are squared on all joints and laid in courses. The stones are to be laid in courses of equal layers. and the joints should also be uniform.

Suitability: Used for construction of public buildings, hospitals, schools, markets, modern residential buildings etc. and in hilly areas where good quality of stone is easily available.

Faster Construction

What do we mean by faster construction?

We're not necessarily talking about how fast the pavement can be constructed, but

rather how fast it can be opened to traffic. Conventional cast-in-place pavement requires several days of additional curing time after the concrete is placed before it is strong enough to withstand traffic loading. While "fast-setting" concrete mixtures have been developed for this purpose, these can be cost-prohibitive for

large-scale pavement construction.

Reduced User Delay Costs

What are user delay costs? These are costs to the drivers of the roadway that are directly attributable to congestion caused by construction activities. Increased fuel consumption, lost work time, increased vehicle wear and tear, and increased air pollution are just a few of these costs. The savings in user delay costs realized through limiting construction to only off-peak travel times (at night or over a weekend) can be substantial. This is where the primary economic benefit of precast pavement will be realized.

Improved Durability and Performance

Precast concrete has a proven track record as a durable high-performance product for bridge and commercial building construction. This is the result of a high degree of quality control that can be achieved at a precast fabrication plant. High strength, low permeability concrete mixtures with a low water-cement ratio and uniform aggregate gradation are used routinely by precast fabrication plants. At most plants concrete batching and quality control is done on-site and the concrete is transported only a short distance from the batch plant to the forms, minimizing changes in concrete properties between the mixing and placing operations. What's more, precast fabrication plants offer tremendous flexibility over the curing operation. Precast concrete elements can be fabricated indoors, they can be wet-mat cured, steam cured, and curing can be

maintained as long as necessary after casting. Problems that can plague cast-in-place pavement construction such as surface strength loss, “built-in” curling, and inadequate air entrainment, canall be eliminated with precast concrete.

Why Prestressed Precast Pavement?

Prestressing has a proven track record for enhancing the performance and durability of concrete structures. And though it has seen very limited use in pavements, there are clearly benefits of prestressed concrete pavement, such as reduced cracking, reduced slab thickness, and bridging capability.

Reduced Cracking

While conventional pavements are "designed" to crack at specific locations (at saw cut joints for JCP) or at regular intervals (CRCP), in general cracking is not desirable. Cracks can spall, they can permit water to penetrate the underlying base, they can fault, and they can eventually lead to severe pavement failures such as punch outs. Prestressing helps to minimize or even eliminate cracking. By putting a pavement in compression there is less likelihood of cracking due to tensile stresses. What's more, the so-called "elastic-plastic" behavior of prestressed concrete will help keep any cracks that do form tightly closed.

Reduced Slab Thickness

While the underlying pavement structure is also a factor, the primary controlling factor in pavement thickness design is the magnitude and number of wheel load repetitions on the pavement over its expected design life. For a given pavement support structure and a given wheel load, tensile stresses in a thinner pavement will be higher than those in a thicker pavement. These higher stresses wear out or fatigue a concrete pavement faster. Prestressingcan be used to reduce the tensile stresses in a thinner pavement slab to those of a much thickerpavement slab, increasing the design life of the pavement.

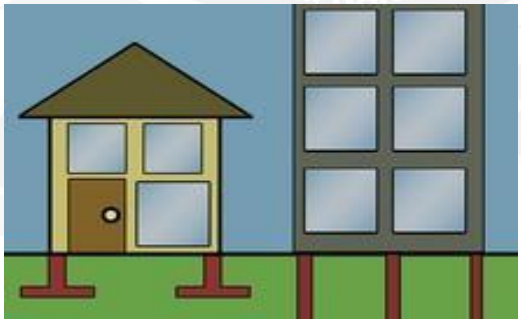
Why is this important? First is the savings in concrete material. Constructing an 8-inch thick pavement slab instead of a 12-inch-thick pavement slab will save more than 780 cubic yards of concrete per lane-mile. Secondly, for removal and replacement it is generally necessary to matchthe existing slab thickness. Most existing pavements that are in need of replacement are on the order of 8-10 inches thick. Prestressing permits in-kind replacement of the existing pavement with a pavement slab that will have a

design life of a much thicker slab. Finally, slab thickness can often times be governed by overhead clearance constraints. When replacing a pavement under a bridge overpass, for example, it is often not possible to construct a thicker pavement than what was in place already without having to excavate base material.

Bridging Capability

Prestressing gives the pavement a certain "bridging" capability that permits the pavement slab to span small voids and "soft" base materials beneath the pavement. This is critical for pavement removal and replacement operations that are limited to short (overnight) construction windows when it is often not possible to recondition or replace the underlying base material.

2.7 Foundation



Shallow foundations of a house versus the deep foundations of a skyscraper.

FOUNDATIONS

The foundations of the building transfer the weight of the building to the ground. While 'foundation' is a general word, normally, every building has a number of individual foundations, commonly called footings. Usually each column of the building will have its own footing.

Since the weight of the building rests on the soil (or rock), engineers have to study the properties of the soil very carefully to ensure that it can carry the loads imposed by the building. It is common for engineers to determine the ***safe bearing capacity*** of the soil after such study. As the name suggests, this is the amount of weight per unit area the soil can bear. For example, the safe bearing capacity(SBC) at a location could be 20 T/m2, or tones per square meter.

This capacity also changes at different depths of soil. In general, the deeper one digs, the greater the SBC, unless there are pockets of weak soil in the earth. To properly support a building, the soil must be very firm and strong. It is common for the soil near the surface of the earth to be loose and weak. If a building is rested on this soil, it will sink into the earth like a ship in water. Building contractors will usually dig until they reach very firm, strong, soil that cannot be dug up easily before constructing a foundation. To study the properties of the soil before designing foundations, engineers will ask for a ***soil investigation*** to be done. A soil investigation engineer will drill a 4" or 6" hollow pipe into the ground, and will remove samples of the earth while doing so. He will then send these samples to a lab to find out the detailed properties of the soil at every depth. Soil is usually composed of *strata*, or different layers, each with its own set of properties. Drilling technology today makes it easy and economical to drill to great depths, easily several hundred meters or more, even in hard rock.

The soil investigation team will then prepare a *soil investigation report* that lists the engineering properties of the soil at regular intervals, say every 2 meters. Based on this deport, engineers designingthe structure can decide at what depth of soil to provide the foundations, the type of foundations they should provide, and the size of the foundations.

Every once in a while, engineers will find ***fill*** at a site. This occurs when humans have previously dug up the earth there, and then filled it back in. This happens if a quarry was dug or a building built there previously. Since fill is loose and soft and cannot support weight, engineers will dig to a depth below thatof the fill, where strong soil is found, and construct foundations there.

TYPES OF FOUNDATIONS

Read our introduction to foundations if you have missed it.

In this article we will discuss the common types of foundations in buildings. Broadly speaking, all foundations are divided into two categories: shallow foundations and deep foundations. The words shallow and deep refer to the depth of soil in which the foundation is made. Shallow foundations can bemade in depths of as little as 3ft (1m), while deep foundations can be made at depths of 60 - 200ft (20 - 65m). Shallow foundations are used for small, light buildings, while deep ones are for large, heavy buildings.

SHALLOW FOUNDATIONS

Shallow foundations are also called spread footings or open footings. The 'open' refers to the fact that the foundations are made by first excavating all the earth till the bottom of the footing, and then constructing the footing. During the early stages of work, the entire footing is visible to the eye, and is therefore called an open foundation. The idea is that each footing takes theconcentrated load of the column and spreads it out overa large area, so that the actual weight on the soil does not exceed the safe bearing capacity of the soil. There are several kinds of shallow footings: individual footings, strip footings and raft foundations. In cold climates, shallow foundations must be protected from freezing. This is because water in the soil around the foundation can freeze and expand, thereby damaging the foundation. These foundations should be built below the *frost line*, which is the level inthe ground above which freezing occurs. If they cannot be built below the frost line, they should be protected by insulation: normally a little heat from the building will permeate into the soiland prevent freezing.

Individual footings- Individual footings waiting concreting of the footing column

Individual footings are one of the simplest and common types of foundations. These are used when the load of the building is carried by columns. Usually, each column will have its own footing. The footing is just a square or rectangular pad of concrete on which the column sits. To get a very rough idea of the size of the footing, the engineer will take the total load on the column and divide it by the safe bearing capacity (SBC) of the soil. For example, if a column has a vertical load of 10T, and the SBC of the soil is 10T/m2, then the area of the footing will be 1m2. In practice, the designer will look at many other factors before preparing a construction design for the footing Individual footings connected by a plinth beam. Note that the footings have been cast on top of beds of plain cement concrete (PCC), which has been done to create a level, firm base for the footing. Individual footings are usually connected by a *plinth beam*, a horizontal beam that is built at ground or below ground level.

strip footings

Strip footings are commonly found in load-bearing masonry construction, and act as a long strip that supports the weight of an entire wall. These are used where the building loads are carried by entire wallsrather than isolated columns, such as in older buildings made of masonry.

raft or mat foundations

Raft Foundations, also called Mat Foundations, are most often used when basements are to be constructed. In a raft, the entire basement floor slab acts as the foundation; the weight of the building isspread evenly over the entire footprint of the building. It is called a raft because the building is like a vessel that 'floats' in a sea of soil.

Mat Foundations are used where the soil is week, and therefore building loads have to be spread over a large area, or where columns are closely spaced, which means that if individual footings were used, theywould touch each other.

DEEP FOUNDATIONS

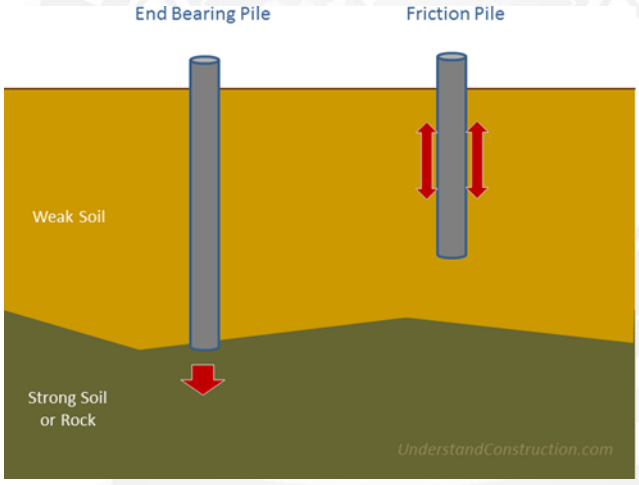
pile foundations

A pile is basically a long cylinder of a strong material such as concrete that is pushed into the ground sothat structures can be supported on top of it.

Pile foundations are used in the following situations:

1. When there is a layer of weak soil at the surface. This layer cannot support the weight of the building, so the loads of the building have to bypass this layer and be transferred to the layer ofstronger soil or rock that is below the weak layer.
2. When a building has very heavy, concentrated loads, such as in a high rise structure.

Pile foundations are capable of taking higher loads than spread footings. There are two types of pile foundations, each of which works in its own way.



End Bearing Piles

In end bearing piles, the **bottom end of the pile rests on a layer of especially strong soil or rock**. The load of the building is transferred through the pile onto the strong layer. In a sense, this pile acts like a column. The key principle is that the bottom end rests on the surface which is the intersection of a weak and strong layer. The load therefore by passes the weak layer and is safely transferred to the strong layer.

Friction Piles

Friction piles work on a different principle. The pile transfers the load of the building to the soil across the full height of the pile, by friction. In other words, the entire surface of the pile, which is cylindrical in shape, works to transfer the forces to the soil.

To visualise how this works, imagine you are pushing a solid metal rod of say 4mm diameter into a tub of frozen ice cream. Once you have pushed it in, it is strong enough to support some load. The greater the *embedment depth* in the ice cream, the more load it can support. This is very similar to how a friction pile works. In a friction pile, the amount of load a pile can support is directly proportionate to its length.

A **foundation** (or, more commonly, **foundations**) the element of an architectural structure which connects it to the ground, and transfers loads from the structure to the ground. Foundations are generally considered either shallow or deep.[1] Foundation engineering is the application of soil mechanics and rock mechanics (Geotechnical engineering) in the design of foundation elements of structures.

Chillon Castle (Château de Chillon) basement

Old Town medieval basements in Warsaw

A Stasi basement hallway

A **basement** or **cellar** is one or more floors of a building that are either completely or partially below the ground floor. Basements are generally used as a utility space for a building where such items as the boiler, water heater, breaker panel or fuse box, car park, and air-conditioning system are located; so also are amenities such as the electrical distribution system, and cable television distribution point. However in cities with high property prices such as London, basements are often fitted out to a high standard and used as living space.

Construction of basement in Top-Down method

Technology particulars:

- Top-down technology (downward) is the advanced method employed to substructure construction, other than the conventional method (upward).
- In this method, basement concrete slabs act as lateral bracing for the perimeter wall system. Ground level and first basement slabs are poured, with access holes left to allow excavation beneath. As each subsequent subgrade level is completed, the floors act as lateral bracing for the perimeter wall system.

Advantages:

- Working space and construction duration: it is not required a large working space for foundation excavation and saving cost by eliminating to construct the retaining wall. Especially for public transport works as traffic tunnels, this method helps to soon re-established traffic road. And the top-down method of construction enables a high-rise superstructure and its sub-basement to be

built simultaneously (popularly for civil works have basements) > accelerate construction.

- It is not required of the temporary strutting system (Bracsing System) to support the basement walls during excavation and construction of basement. That is cost-saving for construction. Temporary strut system is often very complex problems of space and very expensive construction.
- Construction schedules can be compressed by saving time in construction of substructures and high-rise superstructure at the same time (of course, we have increase the cost of strengthening the lower part, and if the "savings" schedule can not cover the "cost" for safety strengthening, it's not necessary to do quick, top-down first and then the high-rise super structures the as seen in Hanoi. After construction of the ground floor, we can separate completely superstructure and underground construction. You can construct simultaneously the basements and the superstructure.
- Foundation problems (the phenomenon of sludge, groundwater ...): attention that in dense urban areas of high-rise buildings, if open excavation (open cut) with diaphragm wall, deep foundation and water table to be lowered in the construction of the underground structures, adjacent buildings are not assured. (easily occur sliding roof excavation, subsidence, cracking ...), Top- down construction method to solve this problem.
- Construction of the basement with groud floor was constructed at first can partly reduce the impact of bad weather.

Construction of basement in Bottom-Up method

Technology particulars - Construction Sequence:

- Under this method, after the construction of pile and diaphragm wall, slurry pile or sheet pile surrounding the construction works, the contractor will conduct open-cut excavation to certain depth and then proceed installation of the strutting system (Bracing System) to support the basement walls during excavation and construction of the basement. Depending on the depth of

  Foundation mat, structure design may require one or more different layers of struts to ensure sufficient resistance against pressure of soil + ground water outside the project impact on the basement walls.

- After installation of strutting system is completed and ground is excavated to bottom level of foundation, the contractor will construct foundation, basement, superstructure of the building upward from the bottom in accordance with normal procedures.

- Strutting system can be used as hard core for structural beams / floor of the basement or will be removed after the basement floor shall afford all the pressure exerted on the basement walls.

- Projects using Bottom-Up method in construction of basement: Using steel struts

- Oriental Hotel, No. 26-28 Tran Phu Str., Nha Trang; East Sea Tourism Company as real estate investor: Construction of 03 basement.

- Kinh Do Building, No. 93 Lo Duc, Ha Noi; Kinh Do Hotel Company Limited as investor: Construction of 03 basements.

- Business Center of Tech com bank, No. 70-72 Ba Trieu Street, Hoan Kiem District, Hanoi; VietThanh Co Branch as investor: Construction of 02 basement.
- Treatment Building of central maternity hospital maternity; No. 43 Trang Thi Street, Hanoi, by central maternity hospital as investor: Construction of 02 basements with sheet piling and steelstrut.

Temporary Shed

Temporary shed construction will be the first step before you bring your material near your site.

- You need to construct temporary Shed to keep your construction material and your watchmen will stay there to look after your site and material
- You need to construct this in your neighbors site with their permission. So have a plan tocontact them early
- Since it is temporary, you can consider using soil instead of cement.

Centering and Shuttering / Form Work

Shuttering or form work is the term used for temporary timber, used to provide support to wet concrete mix till it gets strength for self-support. It provides supports to horizontal, vertical and inclined surfaces or also provides support to cast concrete

according to required shape and size. The form work also produces desired finish concrete surface.

Shuttering or form work should be strong enough to support the weight of wet concrete mix and the pressure for placing and compacting concrete inside or on the top of form work/shuttering. It should be rigid to prevent any deflection in surface after laying cement concrete and be also sufficient tight to prevent loss of water and mortar form cement concrete. Shuttering should be easy in handling, erection at site and easy to remove when cement concrete is sufficient hard.

Steel plates for Steel Shuttering Generally there are three types of shuttering.

- Steel Shuttering
- Wooden Planks Shuttering
- Temporary Brick Masonry Shuttering

Steel Shuttering

Steel shuttering plate is the best type of shuttering because this is water tight shuttering which can bear the load of cement concrete placed on it. This shuttering can be used for horizontal, vertical or any other shape required for the work. It gives leveled surface which has good appearance. This shuttering gives good appearance and pattern work according to architectural drawings. If the plaster is required, the thickness of plaster will be less. Being water tight shuttering, the strength of concrete with steel shuttering is comparatively higher. Shuttering with the help of Steel Plates.

Note: As this is water tight shuttering, it is considered the best shuttering.

Wooden Plank Shuttering

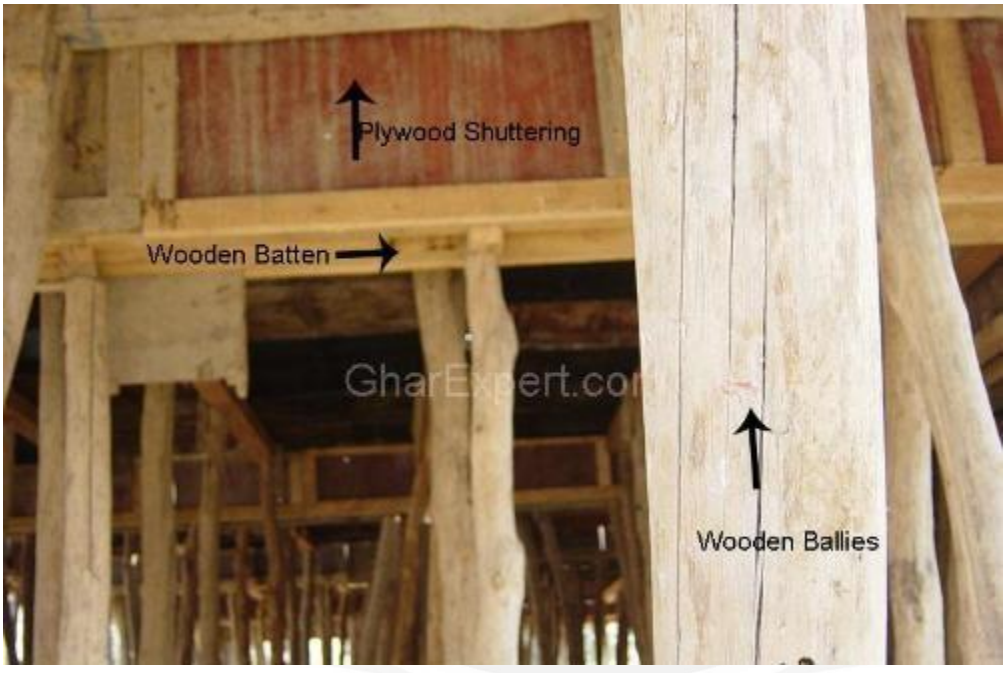
Generally wooden planks shuttering is used by contractors because this shuttering is cheap and easily available. But this type of shuttering effect the strength of concrete and have some disadvantages which are given below.

Disadvantages

- This is not water tight shuttering as the size and thickness of planks differ and are not of same size. Due to this difference the water and cement flow to the ground from joints andreduce the strength of concrete.
- Bottom level of RCC slab is not in straight line and the surface being uneven, the thickness of plaster is more which remains weak.
- Due to leakage of cement slurry through joints, earth work below ‟"Ballies‟ may

settle and create problems.

- In some cases wooden planks cannot bear the weight of concrete. Due to low strength there is bending or deflection in wooden planks. Sometimes the planks may break



Shuttering done with the help of wooden bullies and battens.

Temporary Brick Masonry Shuttering

In some cases labor contractor uses Temporary Brick Masonry in mud for vertical support of sides of beams, fascia etc. This shuttering should be avoided. This type of shuttering reduces the strength of cement concrete by soaking cement slurry. Also no proper compaction is made as this shuttering does not bear the pressure of vibrator. The surface of cement concrete given by this type of shuttering is uneven and the

thickness of plaster is increased.

Precautions for Vertical Supports for RCC Beams, Slabs etc

- the ‟"Ballies‟ used for vertical support should not be less than 6" dia and these should bein one length without joints.
- never allow bricks support of more than one or two bricks below a 'balli' to make required height.
- Cross Ballies or bracing should be done for better support to beam as well as slab.
- The wooden batten used below the plate should not be less than 5" in height
- At the time of concreting one carpenter with helper having spare ballies, nails etc. shouldbe deputed for watching any disturbances in ballies under shuttering

Precautions for Cantilever slabs and Beams

- While doing shuttering of a cantilever part, outer edge of shuttering is 1” to 2" higher than inner edge with the wall.
- The bracing of vertical supports for cantilever portion should be tied to vertical supports of internal slab.
- The concrete should be laid on cantilever portion very gently.
- The shuttering should be removed after 28 days.

Recommended Period for Removal of Shuttering

- 48 hours for sides of foundations, columns, beams and walls.
- 7 days for underside of slab up to 4.5 meter span
- 14 days for underside of slab, beams, arches above 4.5 meter up to 6 meter span.
- 21 days for underside of beams arches above 6 meter span and up to 9 meter span.

- 28 days for underside of beams arches above 9 meter span.

Defects Found In Shuttering/Form Work

- The supports of form work are not in plumb and are not cross braced.
- The ground supports of ballies are poor and therefore settle the form work.
- There is insufficient thickness of shuttering plates/planks unable to bear lateral pressureimposed by wet concrete especially in columns.
- Shuttering plates are not cleaned and oiled or oiled with dirty oil.
- There are many insufficient and loose connections in centering and shuttering.
- The form work is removed before time. The work is not planned and designed properly.
- In case of beam shuttering proper provision for retaining side is not made. Hence the sideof beam is not in proper line.
- The shuttering is poorly made with cracked and warped timber planks having lots ofholes and knots.
- Through bolts for RCC walls form work for an underground tank is used. Later theseholes made by bolts are not plugged.
- „Ballies" are resting on bricks or brick pillars
- Ballies are not in one piece. Small ballies are used and these are not properly jointed.

  Also no additional cross bracing is provided at the joint.
- The supports under shuttering plates are not properly tight.
- The earth work under supports is not properly compacted before starting shuttering work.
- The bottom of „ballies" are in wedge shape, not having proper base

SLIPFORM CONSTRUCTION METHOD

Slipform construction is a method for building large towers or bridges from concrete. The name refers to the moving from the concrete is poured into, which moves along the project as the

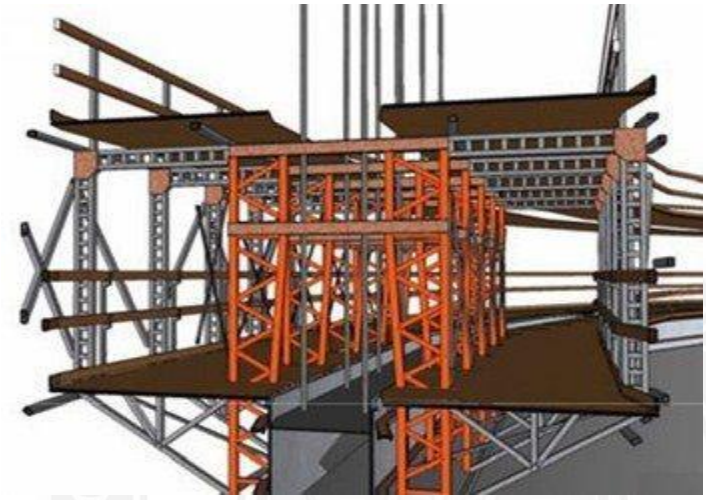
previously poured concrete hardens behind it. The technique has also been applied to roadconstruction.

The technique was in use by the early 20th century for building silos and grain elevators.

Vertical slipform relies on the quick-setting properties of concrete requiring a balance between early strength gain and workability. Concrete needs to be workable enough to be placed to the formwork and strong enough to develop early strength so that the form can slip upwards without any disturbance to the freshly placed concrete.

A notable use of the method was the Skylon Tower in Niagara Falls, Ontario, which was completed in 1965. The technique was soon utilized to build the Inco Super stack in Sudbury, Ontario and the CN Tower in Toronto. It is the most common method for construction of tall buildings in Australia.

From foundation to rooftop of even the very tallest projects, with the system‟s hydraulic jacks, installing steel reinforcement and pouring concrete become much easier and faster, plus can be more efficiently controlled to assure the highest quality



finished cement structure. SLIPFORM technology virtually eliminates unnecessary waste and hazards, making this construction system even more efficient and economical.

Benefits

- Careful planning of construction process can achieve high production rates
- Slip form does not require the crane to move upwards, minimizing crane use.
- Since the formwork operates independently, formation of the core in advance of the rest of the structure takes it off the critical path – enhancing main structure stability.

- Availability of the different working platforms in the formwork system allows the exposed concrete at the bottom of the rising formwork to be finished, making it an integral part of theconstruction process.
- Certain formwork systems permit construction of tapered cores and towers.
- Slip form systems require a small but highly skilled workforce on site.

Safety

- Working platforms, guard rails, ladders and wind shields are normally built into the completedsystem.
- Less congested construction site due to minimal scaffolding and temporary works.
- Completed formwork assembly is robust.
- Strength of concrete in the wall below must be closely controlled to achieve stability duringoperation.
- Site operatives can quickly become familiar with health and safety aspects of their job
- High levels of planning and control mean that health and safety are normally addressed from thebeginning of the work.

Other considerations

- This formwork is more economical for buildings more than seven storeys high.

- Little flexibility for change once continuous concreting has begun therefore extensive planningand special detailing are needed.
- Setting rate of the concrete had to be constantly monitored to ensure that it is matched with thespeed at which the forms are raised.
- The structure being slip formed should have significant dimensions in both major axes to ensurestability of the system.
- Standby plant and equipment should be available though cold jointing may occasionally be necessary.

Scaffolding

Scaffolding, also called **scaffold** or **staging**, is a temporary structure used to support a work crew and materials to aid in the construction, maintenance and repair of buildings, bridges and all other man made structures. Scaffolding is also used in adapted forms for formwork and shoring, grandstand seating, concert stages, access/viewing towers, exhibition stands, ski ramps,half pipes and even art projects .

There are four main types of scaffolding used worldwide today. These are Tube and Coupler (fitting) components, prefabricated modular system scaffold components, H-frame / facade modular system scaffolds, and timber scaffolds. Each type is made from several componentswhich often include:

- A base jack or plate which is a load bearing base for the scaffold.
- The standard which is the upright component with connector joins.

- The ledger (horizontal brace).
- The transom which is a horizontal cross section load bearing component which holds the batten, board or decking unit.
- Brace diagonal and/or cross section bracing component.
- Batten or board decking component used to make the working platform.
- Coupler a fitting used to join components together.
- Scaffold tie used to tie in the scaffold to structures.
- Brackets used to extend the width of working platforms.

Types Of Scaffolding And Their Uses

There is a surprising range of scaffolding types that can be used in construction and for other purposes. The general principle of a scaffolding construction, whether it is a static, rolling, or any other type of construction, remains the same – to provide a platform for workers and materials while work takes place.

Most often seen in construction projects, scaffolding structures and other constructs can be used for a variety of purposes. It is common to see scaffolding being used for repair work, to access high objects, for window cleaning tall buildings, and more. Choosing the most appropriate form of scaffold structure is an important stage in the project that you are undertaking.

Supported Scaffolding

This is the most commonly used form of scaffolding and is the type that you will see being used in construction work and on most other forms of work where elevation is required. Extra support may be required if the scaffolding will be long or required to take a lot of weight.

Supported scaffolding is built from the base upwards, and will normally be used wherever possible. It is considered the easiest, most convenient, safest, and most cost effective form of scaffolding construct. Different forms of supported scaffolding are available, and each will serve a very specific purpose and used in specific circumstances.

Suspended Scaffolding

Suspended scaffolding is typically suspended from a roof or other tall construct. It is most commonly used when it is not possible to construct a base, or where access to upper levels may be required, and the building of scaffolding from floor to the required level would be impractical.

This type of scaffolding is commonly used by window cleaners on tall buildings, but may also be seen where repairs are needed to the exterior of upper levels of similarly tall buildings.

Supported scaffolding is usually preferred where possible.

Rolling Scaffolding

Rolling scaffolding is a similar type of construct to supported scaffolding, but rather than offering a stable base, it uses castor style wheels that enable the base to be moved. This is a useful form of scaffolding when you need to complete work over a longer distance than a singlescaffolding construction would permit.

The wheels should be locked when workers or materials are on the scaffolding, in order to ensurethe safety of those using it, and those around it.

Mobile Scaffolding

There are a number of factors to consider when deciding whether to use static or mobile scaffolding. Ease of access is one such consideration, along with the amount of movement on the scaffolding itself. Where possible, you should rely on the use of a single scaffolding structure, or a number of structures, because mobile units, while perfectly safe when well-constructed and used properly, do pose more of a hazard than mobile constructs.

Most scaffolding is considered semi-permanent. Once used, it can be taken apart and moved to another location before it is constructed again. Fixed scaffolding can be left in position for longer periods of time, making it especially useful in those situations where permanent access may be needed to elevated positions.

Aerial Lifts

Aerial lifts should be used where workers need to be able to access a number of levels in order to be able to complete a construction. For example, if building work is being completed on the outside of a multi-storey property and both workers and materials will be needed to work outside two or more floors, at different times, then an aerial lift will make it easier and safer to lift even large amounts of material, and multiple workers to the levels required.

DESHUTTERING in simple means, the process of removing the shuttering (Formwork for Concrete).

Assuming standard conditions of workmanship and quality of materials, you can refer to the following time-frames for the removal of forms.

Walls/Columns & Vertical faces of structural members - 24 Hrs Slab Spanning up to 4.5 m - 7 days

Slab Spanning more than 4.5 m - 14 days Beams and arches spanning up to 6 m - 14 days

Beams and arches spanning more than 6 m - 21 days

*The above mentioned timeframe is excluding the day of casting

FABRICATION AND ERECTION OF STRUCTURAL STEELWORK

1.INTRODUCTION

The steel-framed building derives most of its competitive advantage from the virtues of prefabricated components, which can be assembled speedily at site. Unlike

concreting, which is usually a wet process conducted at site, steel is produced and subsequently fabricated within a controlled environment. This ensures high quality, manufacture offsite with improved precision and enhanced speed of construction at site. The efficiency of fabrication and erection in structural steelwork dictates the success of any project involving steel-intensive construction. Current practices of fabrication and erection of steel structures in India are generally antiquated and inefficient. Perhaps, this inadequate infrastructure for fabrication is unable to support a large growth of steel construction. In India, the fabrication and erection of structural steelwork has been out of the purview of the structural designer. Nevertheless, in the future emerging situation, the entire steel chain, i.e. the producer, client, designer, fabricator and contractor should be able to interact with each other and improve their efficiency and productivity for the success of the project involving structural steelwork. Hence it becomes imperative that structural designers also must acquaint themselves with all the aspects of the structural steel work including the "fabrication and erection," and that is the subject matter of the present chapter to briefly introduce good fabrication and erectionpractices.

2.0 FABRICATION PROCEDURE

Structural steel fabrication can be carried out in shop or at the construction site. Fabrication of steelwork carried out in shops is precise and of assured quality, whereas field fabrication is comparatively of inferior in quality. In India construction site fabrication is most common even in large projects due to inexpensive field labour, high cost of transportation, difficulty in the transportation of large members, higher excise duty on products from shop. Beneficial taxation for site work is a major

financial incentive for site fabrication. The methods followed in site fabrication are similar but the level of sophistication of equipment at site and environmental control would be usually less. The skill of personnel at site also tends to be inferior and hence the quality of finished product tends to be relatively inferior. However, shop fabrication is efficient interms of cost, time and quality.

Structural steel passes through various operations during the course of its fabrication.Generally, the sequence of activities in fabricating shops is as shown in Table1. These quence and importance of shop operations will vary depending on the type of fabrication required. All these activities are explained briefly in the subsequent parts of the section.

FABRICATION AND ERECTION OF STRUCTURAL STEELWORK

Sequence of activities in fabricating shops	Sequence of Operation
Surface cleaning	Cutting and machining	Punching and drilling
Straightening, bending and rolling	Fitting and reaming
Fastening (bolting, riveting and welding)	Finishing
Quality control	Surface treatment	Transportation

2.1 Surface cleaning

Structural sections from the rolling mills may require surface cleaning to remove millscale prior to fabrication and painting. Hand preparation, such as wire brushing, does not normally conform to the requirements of modern paint or surface protection system. However in some applications manual cleaning is used and depending on the quality of the cleaned surface they are categorised into Grade St-2 and Grade St

3. 1. Squared rubble masonry: The rubble masonry in which the face stones are squared on all joints and beds by hammer dressing or chisel dressing before their actual laying, is called squared rubble masonry.

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There are two types of squared rubble masonry.

a. Coursed Square rubble masonry: The square rubble masonry in which chisel dressed stones laidin courses is called coarse square rubble masonry. This is a superior variety of rubble masonry. It consists of stones, which are squared on all joints and laid in courses. The stones are to be laid in courses of equal layers. and the joints should also be uniform.

Suitability: Used for construction of public buildings, hospitals, schools, markets, modern residentialbuildings etc and in hilly areas where good quality of stone is easily available.

Frame Structures - Types of FrameStructures

Frame structures are the structures having the combination of beam, column and slab to resist the lateral and gravity loads. These structures are usually Advertisements *used to overcome the large moments developing due to the applied loading.*

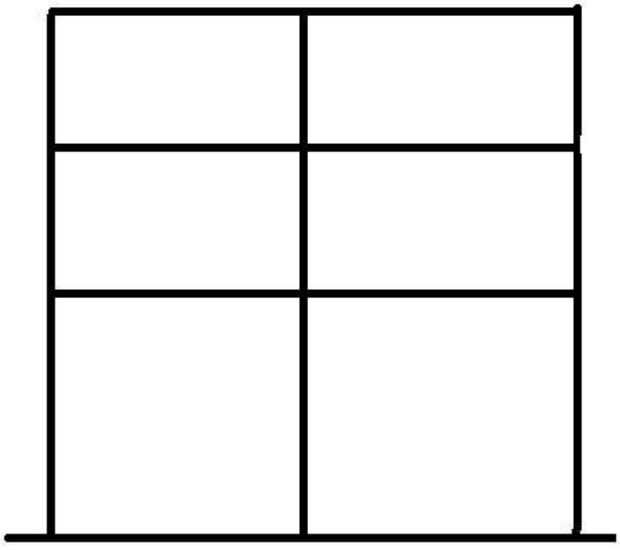
Types of frame structures

Frames structures can be differentiated into:

Rigid frame structure

Which are further subdividedinto:

- Pin ended
- Fixed ended



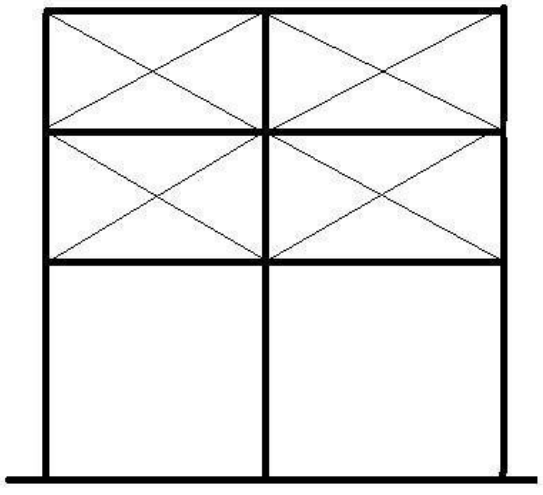
Braced frame structure

Which is further subdivided into:

- Gabled frames
- Portal frames

Rigid Structural Frame

The word rigid means ability to resist the deformation. Rigid frame structures can be defined as the structures in which beams & columns are made monolithically and act collectively to resist the moments which are generating due to applied load. Rigid frame structures provide more stability. This type of frame structures resists the shear, moment and torsion more effectively than any other type of frame structures.



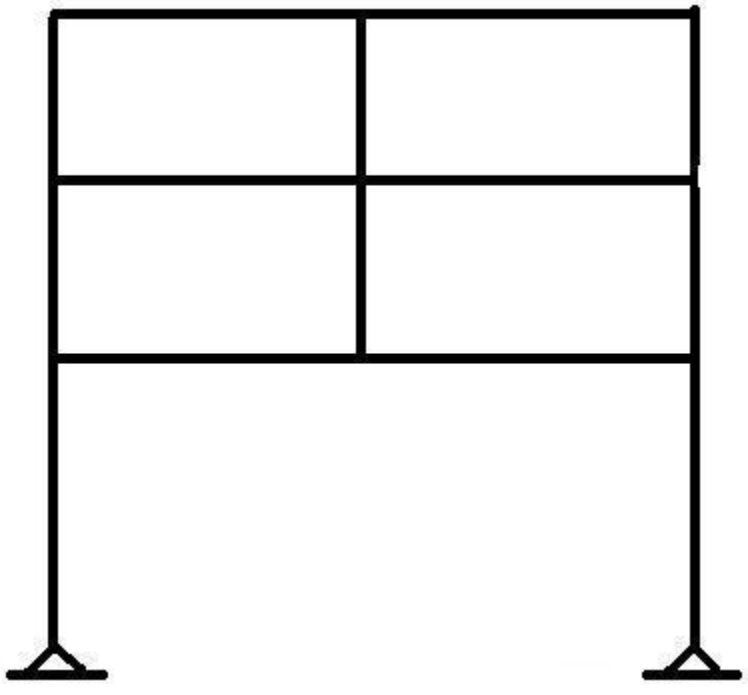
Braced Structural Frames

In this frame system, bracing are usually provided between beams and columns to increase their resistance against the lateral forces and side ways forces due to applied load. Bracing is usually done by placing the diagonal members between the beams and columns.

This frame system provides more efficient resistance against the earthquake and wind forces. This frame system is more effective than rigid frame system

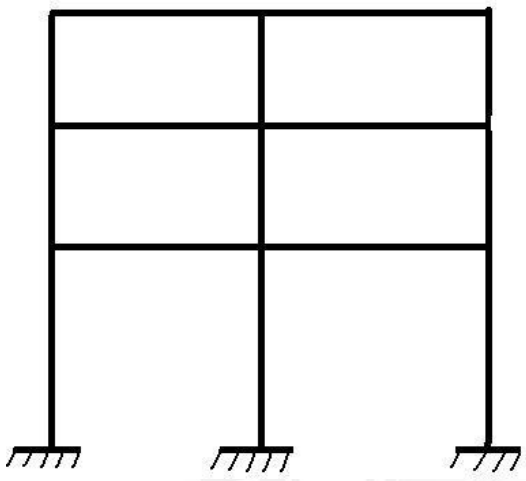
Pin Ended Rigid Structural Frames

A pinned ended rigid frame system usually has pins as their support conditions. This framesystem is considered to be non-rigid if its support conditions are removed.



Fix Ended Rigid Frame Structure:

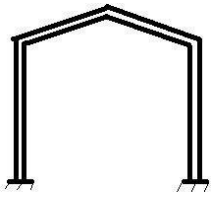
In this type of rigid frame systems end conditions are usually fixed.



Gabled Structural Frame:

Gabled frame structures usually have the peak at their top. These frames systems are in usewhere there are possibilities of heavy rain and snow

Portal Structural Frame

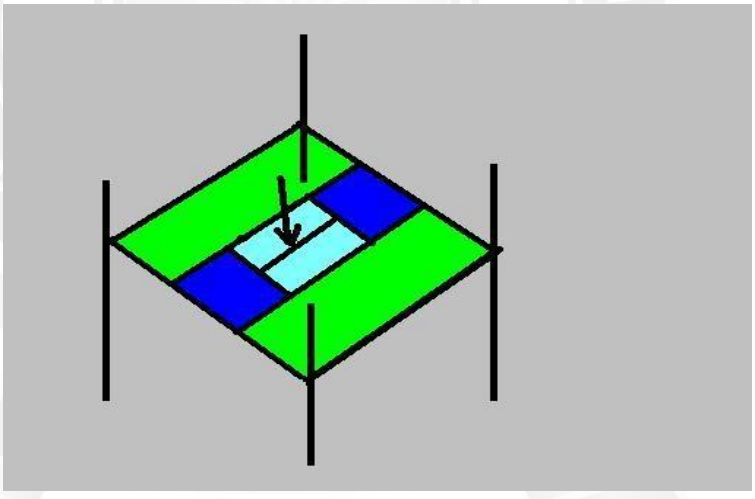


Portal structural frames usually look like a door. This frame system is very much in use forconstruction of industrial and commercial buildings

Load path in Frame Structure:

It is a path through which the load of a frame structure is transmitted to the foundations. In framestructures, usually the load path is:

Load first transfers from slab to beams then to from beam to columns, then from columns it transfers to the foundation.



Advantages of Frame Structures

1. One of the best advantages of frame structures is their ease in construction. it is very east to teachthe labor at the construction site.
2. Frame structures can be constructed rapidly.
3. Economy is also very important factor in the design of building systems. Frame

structures haveeconomical designs.

Disadvantages of Frames:

In frames structures, span lengths are usually restricted to 40 ft when normal reinforced concrete.Other wise spans greater than that, can cause lateral deflections.

Comparison of Frame structures with Normal Load bearing Traditional High RiseBuilding

Selection of frame structures for the high rise building is due to their versatility and advantages over the normal traditional load bearing structures. These include the following:

Actually the performance of load bearing structures is usually dependent on the mass of structures. To fulfill this requirement of load bearing structures, there is the need of increase in volume of structural elements (walls, slab).this increase in volume of the structural elements leads toward the construction of thick wall. Due to such a type of construction, labor and construction cost increases. in construction of thick wall there will be the need of great attention,which will further reduce the speed of construction.

If we make the contrast of load bearing structures with the framed structures, framed structures appear to be more flexible, economical and can carry the heavy loads. Frame structures can be rehabilitated at any time. Different services can be provided in frame structures. Thus the frame structures are flexible in use.

Braced domes may be fabricated in any of several common grid configurations. With different configurations, the dome performance varies considerably affecting both its competitiveness and suitability for specific applications. The study presented in this

paper is an assessment of themost commonly adopted dome configurations and their effect on the dome characteristics such as the stiffness/weight value, member stress distribution, number of joints and members, degree of redundancy and cost. The study is parametric and covers wide variations of dome span/rise ratio and boundary conditions. The results of this study could be of significant value to the design of future braced dome structures.

How to Lay Brick

1. *Squared rubble masonry: The rubble masonry in which the face stones are squared on all joints and beds by hammer dressing or chisel dressing before their actual laying, is called squared rubble masonry.*
2. **There are two types of squared rubble masonry.**
3. *Coursed Square rubble masonry: The square rubble masonry in which chisel dressed stones laid in courses is called coarse square rubble masonry. This is a superior variety of rubble masonry. It consists of stones, which are squared on all joints and laid in courses. The stones are to be laid in courses of equal layers. and the joints should also be uniform.*
4. Suitability: Used for construction of public buildings, hospitals, schools, markets, modern residential buildings etc and in hilly areas where good quality of stone is easily available.

Begin Laying Bricks

A mason's line acts as a guide for setting bricks in perfectly straight rows. It's made of twomason blocks with slots to hold a mason line.

Affix the blocks to either end of the row of bricks, with the line pulled tight. The top of eachbrick in the row should just touch the top of the line.

Step1

Step 2

Guide the Bricks

A story pole is a strip of wood that acts as a guide for laying bricks. Use a pencil to mark theheight of each course of bricks, including the mortar joints, on the pole.

Step3

Apply Mortar

Safety Tip: When working with mortar, always wear gloves and a mask or respirator.

Use a spade trowel to apply a generous amount of mortar to each layer of brick. Score a line through the center of the pile of mortar to allow it to spread. "Butter" the brick

with mortar, spreading mortar on the sides that will affix to the bricks beside them. Use the handle of the trowel to knock each brick into place and to release any air bubbles that may be in the mortarunderneath.

Step 4

Remove Excess Mortar

Using the sharp end of the trowel, scrape off any excess mortar that spreads beyond the joint. Finish cleaning off any other debris with a brush. Holding a spade trowel at a 30-degree angle, carve small lines between the bricks and the mortar. The lines will help protect the wall from theeffects of precipitation.

Step 5

Cut Bricks

Most walls require smaller bricks at their ends. Before cutting a brick, place it in a bed of sand ordirt to absorb the shock of the blow. Place the sharp end of a brick chisel at the line where you want to cut. Use a hammer to tap the end of the chisel, scoring lines on all four

sides where the brick must be cut.

After scoring the lines, hold the chisel on one of them, slightly angled toward the side of the brick that will be kept and used on the wall. With your other hand, strike the handle of the chiselwith a hammer. The blow should break the brick cleanly in two.

Top tips to optimally use conventional waterproofing techniques

While the first part of this two-part series examines conventional waterproofing systems and offers tips to use them for optimum effect, the second part will discuss modern waterproofing techniques.

Construction chemicals providing strength to construction industry

- Waterproofing begins to fight weak monsoon
- Chettinad Cement to acquire AP-based Anjani Portland Cement
- Cement firms remain pessimistic after bad Q2 run
- BASF to build centre for flooring and waterproofing systems in Germany

Waterproofing of building to prevent the ingress of water is an activity, which, perhaps is practiced in one form or the other, ever since the first building was built on earth. The methodology has been changing with the changes in the architectural designs and with theavailability different building materials in construction.

In the initial stages when stone was the main building construction material placed in position with mud or lime mortar the emphasis used to be to make the construction in such a way that the rainwater does not collect on the roofs. Hence old architecture relied mainly on dome structures or slanting roofs. The slow speed of such construction and unaffordability of common man to build such structures for their own dwelling, made constant evolution and development in the construction material technology.

With these developments the concepts of waterproofing also changed. Now in present day construction wherein the ordinary Portland cement and its blends with puzzolonic and slag materials has come to stay a lot of compatible alternatives are available for a builder to choose from various waterproofing systems. Some systems are old and conventional but still practiced successfully and some are modern systems designed taking the material and structural behavior into consideration.

There are some compounds, which are used in plastic concrete to make it less permeable to water. These compounds are known as integral waterproofing compounds. They are based on plasticizing and air-entrainment or water repellence principles. These are used as good waterproofing precautions when other factors such

as good mix-design, proper mixing/placing, compacting/curing etc. are taken care of. This subject of integral waterproofing compounds requires in depth discussion hence will not be taken up here. Similarly there are some water proofing techniques for vertical surfaces. These techniques are also used for preserving heritage buildings by stopping/minimising the aging process of these buildings.

For solving water seepage problems, customers use both conventional as well as modernwaterproofing techniques.

Some of the old and conventional waterproofing systems are as follows:

- Brick bat coba system or lime terracing
- Bituminous treatment
- Metallic sheet wrapping
- Polyurethane based waterproofing treatment
- Epoxy based waterproofing treatment
- Box-type waterproofing system

Brick bat coba system

This system was developed during the initial stages of flat roof construction with lime mortar burnt clay brick pieces. This system involved laying lightweight mortar on the roof and spreading it to give gentle slopes for draining away the rainwater immediately. The mortar consisted of lightweight brick pieces as aggregates and ground brick with lime as binding matrix.

During British rule this system became more popular not because of its waterproofing efficiency but because of its efficiency in keeping the interiors cool. Some applicators developed better skills in laying these systems, with neatly finished top with lines engraved on top of plastic mortar now known as IPS. Some practiced embedding broken tile or ceramic pieces in the plastic mortar and called it china mosaic.

This type of system remained most popular with multi-storeyed construction in all major cities. The system lasts up to 15 years if done by skilful applicators. This system may be considered more from its weather proofing abilities rather than its waterproofing qualities. Once water starts entering into the brickbat coba the brick pieces absorb too much of water and the roof becomes an invisible pond of water continuously causing leakage and increasing burden on the roof slab. It will be highly beneficial if brick- bat coba is laid on a flexible waterproofing membrane as water proofing as well as economical weather proofing can be achieved with this system.

Bituminous treatment

Discovery of petroleum and its products and by-products has given the construction industry an indispensable product in the form of bitumen. Bitumen is more commonly used in the form of felt or flexible membrane formed by sandwiching jute fabric or fiberglass/polypropylene mats with chemically modified bitumen. These membranes are laid on the roofing over a bitumen primer. There are two types of membranes one

is cold applied and the other hot applied which means one needs to heat the edges of the felt with a torch so that they melt and stick to the second layer in the overlap area.

On the RCC flat roofs the bitumen felts have not been successful because of the unacceptable black appearance and inaccessibility of the terrace for other social uses. Technically it is not preferred because bitumen layer or felt on the terrace not only makes it watertight but also airtight. Concrete has the breathing property. It takes water/moisture and breathes out water vapor. Hindrance of this breathing property of concrete develops pore pressure, which causes blisters in the felt.

After a few seasons the blisters multiply and eventually delaminate the felt from the concrete surface. Hindrance of breathing property of concrete makes the concrete weak. But on the asbestos cement sheets and zinc sheets in factory roofs, this bitumen felt is the only dependable waterproofing system. Hence all factory roofs in India adopt this water proofing system.

Bitumen is very effective in waterproofing of basements from outside. Bitumen primers have very successfully been used as damp-proof course in earlier days. This practice is slowly discontinued for whatever reasons now very few engineers now believe that this was in practice once. As consequence of this absent DPC we have a lot of cases of rising dampness, which we tend to attribute to wrong reasons such as the quality or salinity of sand etc. Bitumen still is the product of first choice where it is commonly recommended, in areas such as industrial roof waterproofing, basement waterproofing, and damp-proof course. More over bitumen is the most economical product available for waterproofing.

Metallic sheet wrapping

Because of the non-existence of suitable expansion joint filling compounds before the discovery of poly- sulphides, a complex procedure used to be adopted to treat expansion joints, in concrete dams and such huge structures utilising thick copper

sheets. An extension of this practice was to try thin foils of copper and aluminium for wrapping the concrete surfaces with nagging leakage problems.

Unavailability of common joining material for these metal foils and the concrete and mortar created weakness in the system at the joints. This discouraged the system in its infancy only. But there after the metal manufacturers have been trying to market this type of waterproofing system with improved adhesives as and when the metal market slumped.

Polyurethane based waterproofing treatment

Polyurethane consists of two liquid components one is called the base component and the other is called reactor or curing agent. Base is a polyol and the reactor is an isocyanide such as TDI or MDI. There are various grades of polyols and so also there are numerous isocyanides. The combination of these two ingredients results in a formation liquid applied rigid membrane or a foam depending upon the selection. In waterproofing, this rigid liquid membrane was tried with fibreglass reinforcing mats. The systems failed because coefficients of thermal expansion of concrete and rigid PU membrane being different lateral movement or creep occurred with the passage on one working climatic cycle. When exposed to ultra violet rays or direct sunlight most polyurethane rigid membranes became brittle and crumbled. Apart from this the application of polyurethane coating needed very rigorous surface preparation. The surface needed to be neutralized by removing alkalinity from the concrete surface through acid itching then washing and blowtorching to make the surface bone dry. This kind of surface preparation with acids angered the civil engineering community and the product ceased to be used as waterproofing material apart from its several failures. Never the less continuous research in the polyurethane technology gave the construction industry excellent sealant for glazing industry and foams for thermal insulations. The new generation polyurethanes, which are alkali stable and water-based, may find better applications in waterproofing industry.

Epoxy based waterproofing system

Like polyurethane is also a two-component system having a base resin and a reactor or curing agent. Base resin is obtained by dissolving bis-phenol A flakes in epichlorohydrin. This base is available in various viscosity ranges to suit different application conditions. The curing agent is an amine/polyamine aliphatic or aromatic or an amine-adduct for general applications and polyamide or an amino-amide for coating purposes. After mixing base and reactor components the resultant viscous liquid or paste if some fillers are added to it can be brush applied like a paint or trowel applied like a mortar. Here also epoxies notwithstanding the alkalinity of concrete and the concrete needs to be acid washed and neutralized, which the civil engineers hated. Here again the coefficient of thermal expansion of concrete and epoxy being different the compatibility of epoxy in waterproofing exposed concrete surfaces such as roofs became limited. Later the use of epoxy in waterproofing was discarded. But epoxies have come to stay in civil engineering industry as bonding agents, floor & wall coatings, coatings for food processing units, operation theatres and computer and pharmaceutical industries.

Box type waterproofing

This type of water proofing system is used only for basement waterproofing or waterproofing structures below the ground level from outside to prevent leakages of subsoil water into the basement. In this method, limestone slabs (Shahabad Stones) are first laid in the excavated pit over blinding concrete in a staggered joint fashion to avoid the continuity of the mortar joints. The joints are effectively filled with rich mortar admixed with integral waterproofing compound and cured. Over this the raft is laid and shear/brick walls constructed. The limestone slabs are erected around the walls in a similar fashion leaving a gap of one to two inches between the external surface of the wall and the inner face of the stone surface. The joints again effectively sealed with rich admixed mortar and the same mortar is filled in the gap between the wall and the stones. This stonework is continued up to ground level. In this system the raft and the sidewalls are protected from direct exposure to sub soil water. This system

works on two principles of common sense. First, the area exposed to subsoil water is only the area of the joint whereas the whole stone is impervious to water, hence only a fraction of area, that is, that of the joint is exposed to subsoil water, when the joint itself is filled with rich and quality mortar. Second, the path of water to reach the raft or the sidewall is elongated. This elongated path is through quality mortar. This system seeks to delay the occurrence of leakages in the basements. A lot of building structures are waterproofed by this system. A few notable successes are to its credit especially in five star hotels and of-course there are a few failures as well.

5 Types Of Roofs To Consider

High Humidity Care for Your Outdoor Wood

Pool Safety Tips

Repairing a Winter-Damaged Deck in 3 Easy Steps

Top 5 P interest Shabby Chic DIYs

Terms of the Trade: What Is an Allen Wrench?

Several **types of roofs** are available for residential construction. Different materials are chosen according to their various qualities, advantages and disadvantages. Roofing a house is quite a cost-intensive affair and you need to be prepared with sound information prior to making your investment. Here's an overview of some of the most used types of roofing:

1. Wood Shingle Roofing

Wood shingles are also known as shakes and they are especially ideal if you appreciate naturally beautiful looks. They will gracefully age with your house while retaining their aesthetic appeal. Wood shingle roofing is quite expensive though it makes up for the cost with its durability. Most people have concerns with this type of

roofing especially with issues like fire, splitting, rotting and molding. Always invest in shingles that have been treated with special protective glazes and finishes.

2. Slate Roofing

Another beautiful yet very costly roofing material is slate and is especially appropriate if your house is in the French or Colonial design style. Slate roofing is ideally composed of thin layers of rock and as such the roof is bound to be quite heavy. For this reason it is advisable to first put in place adequate structural support. Laying this type of roof can be quite complicated for a DIY project and the installation is better off when done by a licensed contractor.

3. Tile Roofing

Tile roofing is an option that goes very well with your house if it is in the Spanish or Mediterranean design. There are two types of roofing tiles: clay tiles and concrete tiles. Tiles are generally laid down on relatively new houses that have adequate structural support since tiles, like slates, are quite a heavy load. The services of a professional contractor will come in handy if you are not confident about taking on the task yourself. Tile roofing is also quite costly but if properly maintained it can give proper service for up to 50 years.

4. Metal Roofing

Metal roofing options are fast gaining a good reputation in building circles despite their initially high costs. These roof types boast durability as well as low maintenance qualities that extend their life beyond other conventional roof types. In terms of design and style you'll be glad to know that it's possible to get metal roofing that has been made to resemble different roofing types including slate, wood shingles and cedar.

5. Asphalt Roofing

Certainly the most affordable of roofing types has to be asphalt. Asphalt shingles that are made from the conventional highway asphalt are the least expensive. You can also invest in the costlieroption that is known as architectural shingles.

Cheap asphalt shingles are not the best if you intend to have a stylish roof. They will also disappoint with their short lifespan. Architectural shingles are much more presentable.

Both of these options are quite prone to scarring and may also succumb to the occasional mildew depending on the weather. They are also not environmentally-friendly and upon replacing them you'll need to take the waste to a landfill.

Acoustic, Thermal, Fire and Safety

Acoustic, Thermal, Fire and Safety

Is over leads the way in terms of performance criteria in each of these three critical areas.Acoustic, Thermal, Fire and Safety.

Acoustic

Noise reduction is an increasing priority in both new build and renovation projects. Is over offers a range of high performance acoustic installation solutions. Our Acoustic Partition Roll (APR 1200) is the only acoustic insulation product that forms part ofthe British Gypsum Spec Sure Lifetime Warranty. Is over RD Party Wall Roll is a proprietary component of three masonry party wall Robust Details constructions, E-WM-17, E-WM-20 and E-WM-24.

Thermal

With an impressive array of products, in both roll and batt formats, to suit every conceivable application and a wide range of lambda values the Is over thermal

insulation range is second to none. Is over also leads the way in simplifying the identification and selection of the correct product for a given application. Our new packaging style incorporates a unique indicator of relative thermal performance without the need for a detailed understanding of lambda values. Simply select from our three tier rating of standard, high and ultra-thermal performance, which is clearly marked on each pack and also detailed in our new Packaging Guide.

Definition of lambda:
The ease by which heat energy travels through a material is measured by lambda. The lower the lambda value the more difficult it is for heat to flow through the insulation.

Fire & Safety

All of our glass mineral wool products are non-combustible, have the highest possible Euro class A1 fire rating classification, and do not produce any toxic fumes in the event of fire. Many are also fire rated, offering added protection against fire and providing vital time for building occupants to evacuate. Is over provides fire safe insulation solutions to help protect your most precious resources and provide a safer building environment.