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Checking Foundation Integrity with Crosshole Sonic Logging Pile Test

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Checking Foundation Integrity with Crosshole Sonic Logging Pile Test

Any building rests on some kind of foundation, and therefore it is the most important part of the structure. To make sure the foundation of a building is solid and can withstand the loads coming from above, you need to check its integrity. Today, we will talk about how to check foundation integrity with crosshole sonic logging pile tests.

What is Crosshole Sonic Logging Test

The Crosshole Sonic Logging test, better known as the CSL test, is one of the surest ways to find out if a pile is good or not. The quickest way so far to estimate the integrity of deep foundation elements, the CSL test is mostly used for checking slurry walls and drilled shafts.

The ingenious crosshole sonic logging test is carried out by sending ultrasonic waves through the foundation and analyzing the results. In CSL, two probes are inserted into the foundation area - one of which fires an ultrasonic pulse (or several) and the other captures it on the other side of the foundation. If there are any irregularities in the foundation, it shows up in the received waveform.

This recorded data, coming out of the second, receiver probe, is called the Crosshole Tomography (CT). As sound carries out differently through different mediums, the CT data will show the size, shape, magnitude, and location of any irregularities (read: defects) in the poured concrete, and it would take only a few minutes. This is why CSL/CT is so popular nowadays.

Purpose of CSL Test

Most of the time, slurry walls and drilled shafts develop many issues. These problems almost always affect their integrity. They are:

- Pile damage
- Excess water intrusion
- Caving (in drilled shafts)
- Tremie burping
- Buckling of reinforcement cage

Doing stringent quality assurance work on the concrete immediately after pouring can reduce the chance of these issues happening. However, one cannot prevent chances, and so, later assessment of possible defects is very necessary. This is where foundation integrity tests come in. And none are better at this than the CSL test.

CSL Test Procedure

There are three major phases of the crosshole logging pile test procedure. We discuss them as follows.

1

. Access Tubes Installation

In this phase, two access tubes are installed in the foundation piles before concreting begins. Generally, the CSL test needs 35 to 50 mm pipes, PVC steel. The pipes are tied to the reinforcement cages in the formwork, on the insides.

You can install more tubes if you want, if you need to increase the resolution of the result image, or if the structure is quite large. You must, however, install at least two tubes. Once they are installed, fill the tubes with water.

2. Recording of the Readings

Hydrophones are used to send and receive the 'pings' that will go through the pile, creating a sonic image of it. A source and a receiver hydrophone (at least one) are lowered into the bottom of the tubes.

A pulse is fired from the source hydrophone and is sensed by the receiver hydrophone(s) across the pile, sending the data to a recorder unit outside the pile. Then we figure out what the data means.

This process is repeated as the hydrophone units are raised bit by bit, to form a total cross-sectional image of the pile. Generally, the data is taken every 6 cm.

3. Interpreting the Results

The results in the CSL test are basically the time it took for the ultrasonic pulse to cross the distance, and its amplitude. The basic interpretation are follows:

- Strong, fast response: the concrete is sound and is of good quality
- Delayed signal, with reduced strength: poor quality concrete, possible deformation
- Complete signal loss: void in concrete - cracks or gaps

The standards of the crosshole sonic logging tests are guided by ASTM D6760.

Why should you use CSL test

- You can easily find concrete issues in piles using the CSL test.
- The test accurately determines the nature and extent of the damage inside RCC piles.
- You can find out any number and type of defects using the CSL test.
- The CSL test can be done both above and below water.
- The CSL test is quite fast - it takes just a few minutes.
- The test is simple and accurate to a very high degree

Article

Building Cinder Block Walls - Everything You Need to Know

When you're short on budget and need to do some light building work on your own, cinder blocks are a great choice. Made from concrete and coal cinders, they are lightweight and cheap. However, building cinder block walls does need some specific knowledge, which we will discuss today.

A wall made of cinder block is quite light, and so it isn't recommended to build them anywhere they will come under some load. However, when you're building a retaining wall or a privacy wall, they are your go-to solution. Just make sure you aren't expecting any loads on them.
Here we describe how to build a cinder block wall.

Step 1. Prepare the wall layout

Mark the ground space wall with string or chalk after measuring up the dimensions and positions of the wall. Use the block dimensions to figure out the number of blocks you will need to make the wall.
Get the cinder blocks set containing mostly full-sized blocks and some half blocks, these will be useful in constructing the edges and corners. Place the blocks as close as possible and try to avoid applying any pressure on areas that aren't ready to accept loads.

Step 2. Cinder block calculations

The number of cinder blocks required can be calculated in square feet. For example:

- Dimension of cinder block = 8 x 16 inches
- Area covered by a single cinder block = 1.125 sq.ft
- Total Cinder Blocks = (Area of Wall)/1.125

Note: The area of the wall is calculated by subtracting the area of walls and any opening provided.

- Area of Wall = Height of wall x length of wall

Provide a 5% increase in the above area to account for wastage.

Then,

- Area of wall = 1.05 (Length x breadth)

When you are finished with the calculations, let there be some margin of error with some extra material to account for fillers. This way you can meet any sort of uncertainties in your design.

Step 3: Preparing cinder block wall foundation

The foundation or footing is the base of the cinder block wall. The width of the foundation should be more noteworthy than double the width of the cinder block chosen. Along these lines, first, figure the width of the wall and afterward ascertain the footing territory. A tape is utilized to quantify and check the elements of the footing region on the ground.
A wall of width 3 ft can have a foundation with 9 m width and 6 m depth. The heavier and taller the wall, the more extensive should be the footing. The developed footing should be liberated from any potential water leaking or pooling. Along these lines, consistently plan the foundation to guarantee appropriate seepage.
Check the foundation plan and development with the neighborhood construction standards.

Step 4. Putting and Finishing the First Row of Cinder Wall

The footing surface is applied with a layer of cement. Give some surface over it so the primary layer of the cinder block can all the more likely stick to the solid. Begin laying the cinder block from one finish of the wall according to the stamped design until the main turn of the wall is reached.

Placing the blocks

Follow the edges of the block laid from one finish to the next. All the four sides of the cinder block should be followed. Presently take out the cinder block and spot it aside. Pour mortar inside the followed lines utilizing a scoop. The mortar should be spread at a thickness of 1 inch.

Put the main cinder block on top of the mortar layer. It is put upstanding over the readied base and delicately pounded with the goal that it plunks down into the mortar blend. Apply mortar on the two projections or spines toward one side of the cinder block. Along these lines, the spines of the new block can be associated with the ribs of the generally positioned cinder block.

Now drive the new block into the old or the base block. This mortar joint can have a thickness of 3/8 inches. A similar advance is rehashed till the primary layer of the cinder block is finished. Wipe any overabundance mortar jutting outwards from the joints occasionally. Do this after the arrangement of each couple of blocks, with the goal that the mortar doesn't solidify.

About corner blocks

When a total straight wall completes take a half cinder block or corner block. Spread the mortar on the footing zones and the distensions of the half block. Spot it straightforwardly on the highest point of the base block. Presently, keep on setting a full block, as referenced previously, along the line of the wall.

A corner block is utilized toward the beginning of the subsequent layer to keep away from in-line vertical joints. Keep using a level at regular intervals to check the degree of the blocks regarding the base block. Continuously check the level vertically and evenly.

For the third layer, a full cinder block is utilized toward the beginning, and a half block is utilized for the fourth layer and the other way around. This is followed until the wall has arrived at the ideal strength. At long last, strike the joints of the mortar utilizing a hammer or heavy hammer, which can assist with setting the block.

Step 5. Building a Corner Wall

When the straight in-line wall development has arrived at a stature of 3 to 4 blocks, at that point the turning can begin. Similar advances are rehashed by utilizing substitute half blocks one or the other way to dodge in-line vertical joints.

The half blocks should be already included in your cinder blocks set. However, be sure to check before buying from the vendor. A large level can be utilized to check whether the corners built are plumb and square.

Precast Concrete Explained: What is it and why should we use it

In the traditional method, we prepare the concrete structures on site, pouring fresh concrete in the place where the structure will be. But the prefabricated construction system works in terms of manufacturing the building components somewhere else and bringing them to site and assembling them. Today, we will try to explain Precast Concrete.

What is Precast Concrete

When individual concrete members that are supposed to fit a given whole structure are manufactured in one place and assembled in another, they are called Precast Concrete members. They can be of various shapes and sizes, targeted for various purposes.

Precast concrete members like beams, columns, slabs, etc. are manufactured in some sort of production area or factory, either in a designated manufacturing firm, or near the building site where accessible. Then they are moved to the actual location where the member will fit, using transports and heavy lifting machinery. When in position perfectly, they are assembled to the existing structure. Unlike the traditional cast-in-situ concrete, these members are not poured on site.

A great example of a building using precast concrete and prefabrication method is the t30 hotel in Lin Gang, China. Believe it or not, this 30-floor luxury hotel was built in just 360 hours! All thanks to prefabrication technology, it is also one of the most environmentally good and sustainable buildings in the world.

Pros of Precast Concrete

The concrete members created in the prefabrication system of construction, that is, the precast concrete, have some distinct advantages over traditional cast-in-situ concrete. We will line them up below.

A. The same formwork or shuttering can be recycled for the same type and specification of precast concrete members.
B. At a factory or production facility for precasting, much more vigilance can be kept over quality control, thus producing structural members of much better quality.

C. A production yard can incorporate processes to smoothen the outer surface of the precast members, negating the need for plastering over it.
D. A precasting factory or production yard is generally protected from weather and other elements that may disturb the work, so, production of precast concrete may go on any time all year round.
E. It is much harder on site to give shape to concrete and keep it in shape. A concreting yard will have facilities available to do this easier and faster.
F. Standardized procedures at the precasting factory directly translates to much faster work with better quality output.
G. Precast concrete members are assembled, not cast, so they can be dismantled and recycled.
H. Concrete curing is done much better at production yards.
I. The assembling process is easier than casting.
J. As a result of all these above reasons, a building constructed with precast concrete elements will rise much faster.

Cons of Precast Concrete

While there are tons of advantages (no pun intended) with precast concrete, there are some scenarios where cast in situ concrete would be much better.
They are:

A. Special kinds of transportation, handling, and support machinery are needed to build precast concrete structures. This is especially true when you are using particularly large or heavy members. That adds to the bill and the machines are subject to availability.
B. The heavily mechanized construction method requires highly skilled workers. Where such are not available, it is recommended that you go the traditional way.
C. Precast concrete members are vulnerable while being transported or lifted in place. Therefore if the ground situation is hazardous, it is better to stick to cast in situ concrete.
D. If the building is simple and doesn't vary much from portion to portion, it is easy to use precast members. But if the design is highly variable and requires a lot of different types of members, the difficulty of using precast concrete increases alarmingly.

Standardized dimensions of precast concrete elements

Let us say M denotes the dimension of the basic module. Then,

A. Floor or roof slabs: 3M x 1M x (multiple of M/4)
B. Beams: 3M x (multiple of M/4) x (multiple of M/4)
C. Columns:
    a) For heights up to 2.8 M: (multiple of 1M) x (multiple of M/4) x (multiple of M/4)
    b) For heights equal to or above 2.8 M: (multiple of 2M) x (multiple of M/4) x (multiple of M/4)
D. Staircase: width of 1M, and the rest of the dimensions will depend upon the scenario
E. Lintels: 1M x (multiple of M/4) x (multiple of M/4)
F. Sunshades: 1M, nominal

Best 6 Low-Cost Masonry Units for Cheaper Construction

Building cheap is everyone's dream, but that falls flat on its face when it encounters the solid market standards. However, if you are not the type that gets easily intimidated by market pressure, here are some of the best 6 low cost masonry units for building your home cheaper and stronger.

1. Compressed Earth Bricks

If you can access the local production facilities directly, there are few better options than the age-old, reliable, simple brick. A modification of this is the compressed earth brick, which are standard lime and cement clay passed through a manual press. With increased load bearing capacity, they are great for small lightweight residential construction.

The technology to produce compressed earth bricks, also known as 'adobe bricks', is cheap yet efficient. If you have a local manufacturer, then they become very much cost effective in your construction - especially if you're building something light, like walls or small houses.

2. Interlocking Bricks

Kind of like Lego, but in real life size and that much strong, interlocking bricks have a depression on one side that accepts a projection on the other side of another brick. This locks them together in place and greatly reduces the need for mortar to hold them in place.

Since the cement in the mortar is one of the most expensive things in your construction, these interlocking bricks reduce the building cost - indirectly, but effectively.
What's more, they are eco-friendly and have more or less the same properties of standard bricks. Meaning, they are fireproof, very durable, easily manufactured, and solid enough to uphold a certain amount of load by themselves.

3. Hollow Fly Ash Bricks

By-products of industry are easy to come by and generally a problem, so nobody wants them. When we found that some of those substances, especially the fly ash in this case, have excellent pozzolanic properties, it was a blessing in disguise for the construction industry visionaries looking for new ways.

Hollow fly ash bricks are made of mostly fly ash, sand, slag, and a bonding agent like cement, making it strong and durable. These bricks are water repellant to a good degree, sustainable and insulating, lightweight, and above all, at least 20% cheaper than traditional bricks.

The hollow inside the brick can be used in ingenious ways. When left alone, the hollow reduces the weight of the building and provides air-pockets for thermal insulation. However, you can also fill them up with low-strength cement to make the walls solid and much more durable. Furthermore, you can actually pass reinforcement bars through the hollows and pour strong concrete, making them incredibly strong and negating the requirement of columns entirely.

4. Prefabricated Construction Elements

A technology that is becoming increasingly popular among designers and constructors, prefabricated buildings are the new favourite. They are great for building general-purpose buildings that don't need to be customized.

In prefabrication technique, buildings are designed by blocks, and these blocks are manufactured in a construction factory or production yard. Everything from whole rooms or small apartments to precast concrete elements like beams and columns can be prefabricated. Then they are carried to the site and are just assembled together.

The best thing in this method is the low amount of on-site work, and the standardized manufacturing pipeline, both of which substantially reduce building costs. Furthermore, since these buildings are made of transportable parts, they are easy to repair or recycle. Most of the time prefabricated buildings are greatly environment friendly and sustainable as well, and can be built extremely quickly.

5. Concrete Blocks

Though each unit of concrete block is expensive, their size and their usage makes them cheaper than the alternative. Concrete blocks are very strong and very durable; to achieve the quality of a concrete block wall, you have to invest quite a lot of money - that is why concrete blocks, in their special application, are considered cheap.

For basement walls and foundations especially, concrete blocks are very effective. They are quite environmentally friendly, sustainable, and recyclable. They produce little emissions while manufacturing, and are termite, water, fire, and sound proof.

6. Fiber Reinforced Mud Bricks

Bricks are the oldest building materials available, and natural fibers like coconut fibers or straw makes them even stronger - all the time remaining affordable and easy to manufacture. In rural areas, the application of fiber reinforced mud bricks are increasing gradually.

The natural fibers that increase the strength of the brick are easily found in many local plants like coconut, bagasse, cereal straw, corn stalk, cotton stalk, kenaf, rice husk / rice straw, etc. Due to this reinforcement, the mud bricks become stronger, corrosion resistant, lightweight, and better in other ways - although it is recommended to keep them away from fire. The water resistance of a mud brick wall is provided by a sulphur coating.

Methods of Terrace Waterproofing

Preventing leakage and seepage of water from the roof of rooms is a major concern in the long run for every building, especially for those which are in rainy climates, or are adjacent to wet rooms like bathrooms. Today, we will discuss the methods of terrace waterproofing and how to make your terrace and roof stop soaking.

A standard cement terrace is not a bad repellant of water if it doesn't stagnate. That is why walls rarely soak even in rainy climates, because the water flows off the wall. However, water seepage and soaking of moisture starts when the water does not roll off the surface but stays there.

This can happen due to many causes, but mostly it happens because of wrong sloping of the roof or terrace, which leads to water stagnation in places. Of course, the quality of the slab plays a major role in the waterproofing quality of the terrace in question as well, but few concretes' quality can stand up to prolonged stagnation of water.

That is why we need to waterproof the terrace. So, without further ado, let's see in how many ways we can prevent water seepage from terraces and roofs. There are mainly four ways to waterproof a terrace, which are:

1. Plastic polyethene
2. Cementitious waterproofing
3. Chemical waterproofing
4. Bitumen waterproofing

Plastic polyethene waterproofing

It is possibly the cheapest and easiest way to waterproof small terrace areas of simple buildings, temporarily. The idea is simply to lay a large piece of polyethene or tarpaulin on top of the roof and then sealed with soil or other materials. Afterwards roof tiles are placed over it to make a rolling surface. Needless to say, this type of waterproofing can be done only on very basic types of roofing, like in rural buildings.

Cementitious waterproofing

A very common method of waterproofing, this method of waterproofing terrace is very popular around the world in warm climates like India. When you use cementitious waterproofing, you need to use chemicals and cement to waterproof the terrace. This is useful only for building parts with concrete slabs and concrete walls.

The process begins with cleaning up the slab first. clean the whole slab and make sure that there is no grease and oily substance on the slab which can make obstacles to set cement and chemical on the slab. If there exists any cracks, holes, and patches on the slab, then carefully fill the crack and holes with cement and waterproofing chemicals.

Now proceed to applying the waterproofing substance on the slab. There are plenty of those in the market, like waterproofing chemical Tapecrete, Tuffcrete, Acrylic additive, 301 URP, etc. Tapecrete seems to be the best choice for general-purpose such work; however, each substance has their own pros and cons and therefore you should always check what you need versus what you get.

Mix the cement and the waterproofing substance as described by the provider, then proceed to applying two coats of the mix to the slab. The coats should be drawn at right angles to each other, meaning if you have applied one coat by drawing the brush from east to west, the second coat should fall from north to south.

Let the coating dry for a day. Now you are ready to apply a mortar of 1:4 ratio to seal up the waterproofing, up to 10 mm only.

Chemical waterproofing

This is a better way to waterproof terraces, but it is definitely much more costly. But if you care about quality and the long run, you will choose this over other methods. It starts just as the previous method of waterproofing - by cleaning up the surface and patching up all cracks and holes.

The primary weapon here is a polyurethane waterproofing chemical, which is sold under many brands but more or less is the same thing everywhere. After patching up all the irregularities, clean up the slab a second time very carefully, and then start applying the chemical.

The chemical is applied directly and isn't mixed with anything. Read the instructions on the package carefully before you start the work; the particular brand may need some different ways. Either way, it should take 1 to 3 hours to dry and apply another coat perpendicular to the first coat draw. The slab may take a day to get usable.

Bitumen waterproofing

This method is a rather harsh but very effective way to cover large areas of terrace waterproofing. In this process, the surface is cleaned and fixed first, and then bitumen, tar, or coal film is applied to the slab.

The bituminous substance is first boiled in a drum and then spread over carefully. The first coat is a sprinkling of the substance rather than brushing, and then a mesh is applied over the first surface and then the second coat is applied with brushes. This is effective and long lasting, and cost-effective over large areas.

Tips & Tricks

Causes and Types of Slope Failures

The ground is seldom flat. There are natural slopes all around us on the ground, going up and down hills or valleys. Man-made slopes are used mostly in infrastructure construction like in roads and dams. But nothing is permanent and so slopes destabilize and fail as well. Today, we will talk about the causes and types of slope failures in this article.

Unstable Slopes

Natural forces like wind, water, and ice often create slopes on their own accord. And similarly, they also go on to destroy or at least erode the slopes they have created. This effect extends to man-made slopes as well, though they are engineered to be sturdier. Often unstable topography itself results in unstable slopes.

Slopes can fail in ways, depending upon how and when they fail. Sometimes the sloped ground collapses suddenly, causing major accidents and taking lives. Sometimes the sloped ground just settles slowly, over a long time. Sometimes only a smaller and weaker part breaks down, sometimes a whole hillside may come sliding down.

To prevent such mishaps, geologists and geotechnical engineers have to pay attention to many intricate details that determine the strength of the ground in the chosen place. The factors that determine this are geological features of the section of ground, groundwater presence, surface drainage, and most of all, shear strength of the soil - which directly depends upon the type and quality of soil.

Causes of Slope Failure

Erosion

Natural forces are always working to make the ground flatter and flatter. Water and wind are the two main culprits eroding off any ground features and artificial structures that come in their path. This can happen quicker and quicker as the forces get stronger.

Erosion is the main reason for most slope failures, and in more extreme cases, landslides. It continuously works to change the geometry of an area to make it as horizontal as possible, and works better on soil than rock. So, natural slopes and artificial slopes with a soil base are the most affected by erosion.

Rainfall

Rain is quite bad for all kinds of exposed soil, for it hits the ground to directly dissolve and wash away soil particles. It saturates the ground and fills up the soil with moisture, weakening it.

This is the reason why maintaining a natural slope in a rainy area is maddening, while the rain continuously attempts to wash it away.

While stony areas are somewhat more resistant to this, yet rainwater gets through cracks in rocks, weakening the ground from underneath and taking out the packed support. That's a major cause of most muddy landslides.

Earthquakes

When the very earth shakes with fury, few things can stay up, including slopes. Earthquakes introduce dynamic shear forces and many other forces at once on a geographical feature - natural or manmade. Few things can stand up to such a versatile battering.

One major player in this field is the pore water pressure. This causes the ground soil, especially coarse grained soils, to behave like viscous liquid. Whereas this isn't great for the structures on top of them - buildings love a solid ground - but the seismic waves do get softened when they encounter ground like this. Otherwise, earthquakes hit sloped ground quite hard.

External Loading

The loading of a slope directly determines the stability of the slope. Loads placed at the crest or the top side tend to weaken the ground underneath, gradually or suddenly leading to slope failure. Whereas, loads placed at the bottom of the slope, also called the berm zone, are much better handled by the slope.

Types of Slope Failures

Translational Slide

When the slope breaks along a specific line along the length of the slope on a weak zone, it is called a translational slide. The broken down part may remain largely intact and slide away some distance. This is found commonly happening with slopes built on coarse grained soil.

Rotational Slide

When a part or whole slope rotates down along an axis parallel to the slope, that is called a rotational slide. This type of slope failure often happens with slopes built on fine grained homogeneous soils. Sometimes an especially weak-soiled slope can settle its whole width, with the axis at the berm. That is called a base failure.

Flow Slide

Remember when we talked about some soil behaving like viscous liquid? When that happens a bit too much, the soil, like a liquid, flows down the slope. It flows down even shallow slopes, and spreads around widely, subtracting from the bulk of the slope. It can happen in both dry and wet soils.

Block or Wedge Slide

When the slope breaks up in blocks along weak lines due to pressure from adjacent ground, the wedge shaped blocks separate from the main mass of the slope and move. To us, it would look as if the slope was hit by a massive hammer and got shattered. This is called block or wedge slide.

On Site Plate Load Test

Testing the strength of the soil is extremely important in case of any kind of construction before the structure even gets designed. Without knowing the soil's load bearing capacity, you cannot put load on it on a guess - it may cause devastating structural failures. So, today we will talk about one of the best ways to determine the soil strength on site, namely the plate load test.

What is the Plate Load Test

The method of conducting a test on site to estimate the ultimate load bearing capacity of the soil on site by determining the settlement under a given load is called a Plate Load Test. This is performed on soil that is assumed or tested to be having an uniform kind of strata down to a reasonable depth in regard to the influence of stress. That can be verified by a boring or sounding test.

Components of a Plate Load Test

The following equipments and materials are needed to perform a plate load test:

1. Two hard metal plates, of square shape. Dimensions of the plates are generally 75 cm by 75 cm, and 45 cm by 45 cm respectively.
2. A hydraulic jack.
3. A steel joist.
4. Two dial gauges, indicated here by G1 and G2.
5. A method of loading the plates with the expected amount of load. We are using 60 tonnes of load by means of 1900 sand bags each of 35 kilograms.

Plate Load Test Procedure

A. Test Setup:

1. First, dig a pit on site at the depth in which the foundation is expected to form. This can be predicted by initial soil analysis. For common buildings, generally the test is performed at 3 meters depth.
2. At the center of the pit, make a depression to fit the large plate. Accordingly, it will be sized 75 cm by 75 cm. The bottom of the depression should match with the expected footing bottom.
3. The smaller plate (45 cm x 45 cm) should be placed right on top of the larger plate and they both should be machined on the sides.

B. Loading Platform:

A loading platform is made and fixed on top of the column that is made above the steel plates. This platform is meant to hold the test load. We will place the load we mean to test with on this platform. That is, now place the 1900 bags of sand each weighing 35 kg, totaling to 60 tonnes, on top of this platform, incrementally.

C. The test is prepared and loose material so that 75 cm x 75 cm plate resists horizontally in full contact with the soil subgrade.

D. A hydraulic jack is utilized that applies the load to the test plate. A central column takes the load and applies that on the soil through the plates at the bottom. As the pressure is applied, the whole assembly starts sinking down slowly in response to the load.

E. The dial gauges G1 and G2 are placed on two diagonally opposite sides of the test system, with a sensitivity of 0.02 cm at the very least. They will measure how much the plates have sunk down.

F. As the loads are increased in multiples of 5 tonnes (that is, place 5 tons, 10 tons, 15 tons, 20 tons, etc.), the plates are decreased and are measured.

Interpreting of Plate Load Test Results

LOAD	TIME (min)	G_1(mm)	G_2(mm)
5 tones	1	5.28	3.7
	2.15	5.3	3.73
	4	5.1	3.73
	6.25	5.31	3.74
	9	5.31	3.75
	16	5.23	3.75
	25	5.36	3.79

LOAD	TIME (min)	G_1(mm)	G_2(mm)
10 tones	1	4.12	2.5
	2.15	4.21	2.52
	4	4.24	2.55
	6.25	4.3	2.55
	9	4.37	2.567
	16	4.37	2.57
	25	4.38	2.59

This sort of results should go on for all the way up to 60 tonnes, we have only provided a couple of steps for example. When analyzed, we can figure out that the soil in this case has net allowable bearing capacity for design of shallow foundations may be considered as 25t/㎡ with minimum depth of foundation at 3.0 m with respect to the existing ground levels. So the gross bearing capacity of the may be considered **30 t/㎡.**

Why should you use Plate Load Test

Plate load test is great for figuring out the soil's capability of taking the weight of the structure! It provides data that enlightens the engineers about not only the shear failure of the soil on site, but also the settlement rate of the soil which are both extremely important about constructing a building there.

It is also good in the sense that the plate load test doesn't require any soil sample extraction, so it is a mostly clean process. It is also a relatively quick test. The loading test is done under conditions that are mostly similar to what would happen in reality, so the test results show a pretty clear idea of what would happen when the actual structure is erected in the scene.

RCC Frame Construction - Advantages, Types & Construction

Building a superstructure is not easy, and so you need a proper method to erect a building superstructure. The RCC frame construction is one of the most common and effective types of construction methodology. Today, we will talk about the types and advantages of the RCC Frame Construction.

What is RCC Frame Construction

In the reinforced concrete frame construction method, a superstructure consisting of both the horizontal and vertical structural components is erected, and then the walls and other stuff are created.

It is also known, casually, as the skeleton of the whole structure - indeed, it works just like a skeleton in a building. To fact, the RCC frame is responsible for carrying the whole weight of the structure. Therefore, it is the most important part of constructing any building that is planned this way. And the vertical load-bearing members, that is, the columns are even more important in this, since if a column is damaged, everything above it is in danger.

The RCC frame construction method is a monolithic construction methodology. That means, the whole frame structure is created as a single unit. The casting, however, has to be done in phases. However, the end result is one whole object - the frame of the building.
The 'RCC' part in the RCC Frame Construction phrase stands for 'Reinforced Cement Concrete'. Accordingly, the building frame is made out of concrete imbued with steel reinforcements. The compressive loads in the building and on the building are carried by the concrete part (mostly), and the steel bars counter the tensile forces generated.

Components of RCC Frame

1. Foundation

Resting on hard soil or rock, this is the bottom most part of the frame, on which everything else will stand. They are generally sunk under the ground level, in an excavation.

2. Columns

Columns are the vertical components that carry the loads from horizontal components to a footing or lower level columns.

3. Beams

A horizontal component, it carries loads from slabs to columns.

4. Slabs

The main horizontal component that provides the actual usable area in a floor.

5. Walls

In case the building is not big, or if a level needs substantial protection from outside, the walls can be cast of reinforced concrete and be a part of the RCC framework as well.

Advantages of RCC Frame Construction

Clearly the first and foremost advantage of constructing RCC frames for buildings is that they provide a robust, durable skeleton for the building around which other, softer portions of the building can be built. The reinforced frame holds all the load of the building and resists external forces, protecting the softer components.

The RCC frame of a building is also very economical, compared to other ways we might need to prop up the building of similar specifications. The RCC frame construction methodology is versatile enough to be used in many kinds of buildings from residential to industrial to recreational.

To be sure, with the construction method getting standardized, the RCC frames have become easy to erect as well. We have standardized codes for every reasonable situation we might need to consider and thus everything can proceed in a disciplined, tried and tested manner.

Construction of RCC Frame in Buildings

There are two kinds of RCC frames - cast in situ and precast. The precast system needs a factory and assembling, so we are not including that in this discussion today.

The cast in situ method, which is the traditional way to construct mostly anything, follows the steps described below:

Step 1: Build a formwork

A formwork or shuttering is a container-like shape created using planks or other stuff, intended to hold the semi-liquid concrete around the reinforcements and give it the desired shape. It is only a temporary part in construction.

Step 2: Fix reinforcement bars

Follow the engineering drawing carefully to place reinforcement bars inside the formwork exactly as intended, with ties and stirrups. This is the most important part of RCC framework construction and no error is excused here, since any misuse of rebar in concrete may cause catastrophic failure.

Step 3. Concreting

This step includes preparing the concrete and then pouring it in the formwork. Both steps need careful attention since it determines the quality of the concrete, thus the strength of the resulting structural member. It would take some time for the concrete to set (get solid).

Step 4. Wait for curing

Curing is the process of the concrete getting hardened over a period of time. How long, that depends upon the grade or type of concrete that was prepared. Curing needs water to be given on the solid concrete.

Series

Construction Progress Report Sheet Free Download

No matter where you are working - be it in a company office or in fieldwork, government sector or private, technical or non-technical - you have to report to your superiors about your work progress. Today, we will present to you a construction progress report sheet free download.

These sorts of reports work well when there are many employees at work and it isn't possible to supervise them each individually. This is especially true for large construction companies handling mass, repetitive projects.

The construction progress report sheet is presented monthly, usually within the first week of the month, to the project manager or the manpower superintendent. This enables the project to have a smooth command to output workflow, which results in better time management and resource management on the employer's side, and also better time management and performance handling on the employee's side.

Today, we will offer you the free download link of the construction progress report sheet. The sheet will be of immense value to supervisors and HR alike, when they need to track each employee's workflow minutely. This is especially useful if you are paying employees by hour.

Components of the Construction Progress Report Sheet

The construction progress sheet for free download has many parts that you need to understand in order to handle it properly. The main fields are described below in detail.

- Name: the name of the employee, contractor, or subcontractor submitting the report.
- SSN: the identification number of the employee, contractor, or subcontractor. This is commonly the social security number in the US, but it can be something else, even an employee number that was assigned by the company. This is used to uniquely identify the submitter.
- Craft: the basic job of the employee in which they are trained, or designated as. For example: mason, carpenter, plumbing contractor etc.
- Contract Number: The number that identifies the contract with the employee or subcontractor.
- Bundle Number: if applicable, the bundle number of the work assigned to the contractor.
- Month: Reporting month. This would be the previous month of the present date.
- Year: which year this report is being made in.
- Work Process: The list of main category work activities the employee or contractor was engaged in, in that month. Contractors and subcontractors need to divide up the contract into manageable subcategories. That is to say, you can't just indicate that you have spent 8 hours in 'masonry'; you have to divvy it up into 'mortar mixing', 'bricklaying', etc.
- Daily work hours record: This is the main record body which records the hours spent by the employee in each work process. Be careful when you fill this up; it can be frustrating.
- Total hours by date: The total amount of time you have worked on each day. This is a direct sum of the daily work record.
- Total hours by task: The amount of time you have worked in a particular work process.

Using the construction progress report sheet

The sheet is in a regular spreadsheet format compatible with MS Excel or most other offline or online spreadsheet editors. Therefore you can open it in any office application like MS Office or OpenOffice, or you can upload this to online office apps like google docs, office 365 or similar.

It would be best to save this construction progress report spreadsheet as a template, after you configure it to suit your tasks and company. Then you can quickly create every month's spreadsheet from template, instead of copying and pasting and clearing and configuring every time.

Download link: https://drive.google.com/file/d/0B_4PdKkYoZMWdmZqcUVGVmtjYUU/view

Excavation Calculation Excel Sheet Free Download

Are you constructing your own house? Or are you the engineer in a construction company? Either way, you will have to estimate the data about the excavation on the building site. Here is a very handy excavation calculation excel sheet free download.

Whether it's a residential, commercial, or industrial construction project, excavation work must be done to ensure a solid foundation. In addition, having robust groundwork will also prevent potential damages caused by weather disturbances and other natural calamities.

What is Excavation

To be sure, the word 'excavation' directly means making a cavity in the ground by cutting, digging, and scooping off the soil in that place. The process consists of moving earth, rock, soil, and other similar materials on a spot away from the building site, using hand or machine tools, specialized equipment like excavators, or by using explosives.

Why Do You Need Excavation

A building stands entirely on foundations, and they need to be placed deep enough so that they stand on some solid ground or bedrock. That is why excavation is so important before any construction work begins. A footing embedded in deep ground at the proper depth will ensure the load coming down on it is properly transferred to solid, stable ground.

Preparing for Excavation

You can't just get a shovel and start digging - there's a lot of work to be done before you begin your excavation process. Above all, you need to check how deep you need to dig before you can be sure the ground can safely support your building.
To figure this out, you have to analyse the soil on site and compare its qualities against the expected forces coming down from the structure that will stand on it. Only when this inspection passes, you can take onto the next four excavation preliminaries.

1. Site Clearing

First you have to clean out the construction site of all debris, rock, trees, and other stuff still on the ground. Moving trees is a special concern nowadays, which is 'replanting' instead of 'removing'.

2. Site Preparation

Next, all the equipment and materials have to be gathered and assembled on site, so that the excavation process can go smoothly. The proper process of outbound soil dumping is to be prepared as well.

3. Drainage and Trenching

Trenches must also be dug for the sewer drainage pipes. This is a vital step in the process as the sewer drainage pipes are very important to the excavation process.

4. Driveway Excavation

A proper driveway needs to be cleared out as well for the outbound soil trucks and inbound equipment.

Types of Excavation

There are many types of excavations that are done for construction purposes, depending upon type and material. They are as follows:

- Bridge
- Borrow
- Channel
- Drainage/Structure
- Dredge
- Earth
- Footing
- Muck
- Roadway
- Rock
- Stripping
- Topsoil
- Underground

Using the Excavation Calculation Sheet

You need to have the following before you can use the excavation calculation sheet:

1. Plan
2. Elevation
3. Section
4. Footing Detail Drawing

Let us take an example. Say,

- Number of Footing Same Size = 6 Nos.
- Size of Footing = 1400 mm x 1400 mm
- Size of P.C.C = (150 + 1400 + 150) x (150 + 1400 + 150) = 1700 mm x 1700 mm
- Size of Soling = Same as P.C.C = 1700 mm x 1700 mm
- Excavation of Height as per Drawing from E.G.L (Existing Ground Level) = 3500 mm + 150 mm
- Excavation of Height as per Drawing from E.G.L (Existing Ground Level) = 3650 mm
- Excavation size of area L x B = (Extra length of 500mm for working space + Length of P.C.C + Extra length of 500mm for working space) x (Extra length of 500mm for working space + Breadth of P.C.C + Extra length of 500mm for working space)
- Excavation size of area L x B = (500 mm +1700 mm + 500 mm) x (500 mm + 1700mm + 500mm)
- Excavation size of area L x B = (2700 mm) x (2700 mm)

Excavation Estimation Quantity Table						
Item Description	No.	Length (m)	Breadth (m)	Height (m)	Qty	Unit
Footing Excavation						
Footing Length	1	1.4	1.4			
P.C. C Extra Both Side (150 mm +150 mm)	1	0.3	0.3			
Extra Excavation for footing concrete and shuttering (500 mm + 500mm)	1	1	1			
Total Length and Breadth	1	2.7	2.7			
Excavation Hight from E.G.L (Existing Ground Level) (3500+150)	1			3.65		
Footing Excavation	6	2.7	2.7	3.65	159.651	Cu.m
No of Footing = 6 Nos.						
Total Excavation					159.651	Cu.m

Download Link:
https://civiljungle.com/excavation-calculation-in-excel-sheet/

Top 20 Structural Engineering Spreadsheets Free Download

Structural and civil engineers have to learn a lot, and it's hard to remember all the specifics. And then there are giant building code books which simply cannot be remembered. So, there are simplified and useful spreadsheets for doing structural work. If you're working in the construction industry, then you will need the below top 20 structural engineering spreadsheets, almost all your working life.

We have divided the top 20 structural engineering spreadsheets into five distinct categories depending upon which portion of the construction they may be used in. These are: Foundations, Reinforced Concrete, Steel, Composite, and Steel Connections. Each of the spreadsheets have download links associated with them, as well their descriptions, and the codes they are based upon.

A. Spreadsheets for Foundation

Wall footing design and analysis

- **Building Code**: ACI 318-2002
- **Download link**: http://www.psnconsulting.com/wall-footing
- **Data required**:
  - Wall width
  - Applied Axial loads
  - Surcharge Loads
  - Cover
  - Reinforcement size
  - Wall stress
  - Allowable soil pressure
  - Footing dimensions
  - Footing thickness
- **Data generated**:
  - Min required reinforcement
  - Bearing pressure
  - Shear checks
  - Checks for min reinforcement
  - Bearing strength at interface checks

Design and analysis of spread footing

- **Building Code**: n/a
- **Download link**: http://www.psnconsulting.com/spread-footing
- **Data required**:
  - Allowable soil pressure
  - Footing dimensions
  - Applied loads
- **Data generated**:
  - Applied shear
  - Applied moment
  - Stability checks
  - Soil pressure distribution
  - Min required reinforcement

B. Spreadsheets for Reinforced Concrete

Design of rectangular RC sections under bi-axial shear, bending, compression or tension

- **Building Code**: BS 8110-1
- **Download link**: http://www.technouk.com/Programs/Beam-Column-Tie_20120804-.zip
- **Data required**:
  - Applied axial load

- Column dimensions
- Area of reinforcement
- Cover
- Rebar arrangement
- Shear links
- Option of singly or doubly reinforced section

- **Data generated**:
  - Biaxial bending check
  - Shear checks
  - Reinforcement requirement checks
  - Stress and strain of steel above x and y axis

Design of concrete structures that retain aqueous liquids

- **Building Code**: BS 8007, BS 8110
- **Download link**: http://www.technouk.com/Programs/RC8007010108-.zip
- **Data required**:
  - Reinforcement type
  - Concrete grade
  - Depth of section
  - Concrete cover
  - Reinforcement size
  - Reinforcement spacing
  - Crack width

- **Data generated**:
  - Serviceability limit state checks
  - Max moment capacity
  - Max shear capacity
  - Crack requirement checks
  - Reinforcement requirement checks
  - Steel ratio required for control of thermal and shrinkage cracking

Design of RC rectangular beam

- **Building Code**: BS 8110: Part 1&2
- **Download link**: http://www.technouk.com/Programs/RC981220p.zip
- **Data required**:
  - Concrete grade
  - Reinforcement grade
  - Concrete section dimensions
  - Area of reinforcement
  - Area of stirrups
  - Design moment

- **Data generated**:
  - Span/depth ratio design and limit
  - Max bending capacity
  - Max shear capacity of concrete
  - Max shear capacity of stirrups

- Torsion capacity

Design of RC columns

- **Building Code**: BS 8110
- **Download link**: http://www.technouk.com/Programs/Rect-Column_20091211-.zip
- **Data required**:
    - Braced or unbraced conditions
    - Applied axial load
    - Concrete grade
    - Steel grade
    - Section size
    - Support conditions
    - Effective length
    - Reinforcement size
    - Reinforcement arrangement

- **Data generated**:
    - Column slenderness check
    - Max axial capacity
    - Reinforcement reinforcement checks
    - Max bending capacity

Design for rectangular, T-shaped, or circular RC columns

- **Building Code**: Eurocode 2
- **Download link**: http://www.yakpol.net/ShortColEC2_down.html
- **Data required**:
    - Material properties
    - Section properties
    - Reinforcement sizes
    - Number of reinforcement
    - Reinforcement spacing
    - Reinforcement position based on coordinates
    - Applied loads

- **Data generated**:
    - Crack width control analysis
    - Capacity checks against axial load and moment
    - Static equilibrium checks
    - Interaction diagram of P vs M

Design of RC circular columns

- **Building Code**: n/a
- **Download link**: http://www.technouk.com/Programs/RoundCol000104-.zip
- **Data required**:
    - Concrete grade
    - Steel grade
    - Section diameter

- Applied axial load
- Applied moment
- Braced or unbraced conditions
- Effective length
- Cover

- **Data generated**:
    - Max axial capacity
    - Reinforcement requirement checks
    - Column slenderness check
    - Min diameter checks

Design of Retaining Wall due to Lateral and Vertical LOads

- **Building Code**: n/a
- **Download link**: http://www.technouk.com/Programs/RetWall20150415-.zip
- **Data required**:
    - Surcharge loads
    - Wall height
    - Wall thickness
    - Base thickness
    - Heel and toe length
    - Wall density
    - Earth density
    - Angle of repose
    - Coefficient of friction
    - Ground pressures in vertical or horizontal direction
    - Water Loads
    - Water table level
    - Applied point or line loads
    - Option of including passive earth pressure

- **Data generated**:
    - Stability checks for sliding and overturning
    - Checks for restoring and eccentric moment
    - Ground bearing checks

C. Spreadsheets for Steel

Compression Resistance for UKB, UKC, and Hollow sections

- **Building Code**: BS EN 1993-1-1
- **Download link**: http://bcsatools.steel-sci.org/Compression/Input
- **Data required**:
    - Steel grade
    - Member size
    - Buckling length

- **Data generated**:

- Compression capacity

Bending Resistance for UKB, UKC (against major axis)

- **Building Code**: BS EN 1993-1-1
- **Download link**: http://bcsatools.steel-sci.org/BendingUKBUKC
- **Data required**:
    - Steel grade
    - Member size
    - Buckling length
    - C1 shape factor

- **Data generated**:
    - Bending capacity
    - Lateral torsional buckling resistance

Combined Bending and Axial Compression Check for UKB, UKC

- **Building Code**: BS EN 1993-1-1
- **Download link**: http://bcsatools.steel-sci.org/CombinedAxialCompressionBendingUKBUKC

- **Data required**:
    - Steel grade
    - Member size
    - Buckling length
    - Axial compression
    - Max and min bending moments

- **Data generated**:
    - Interaction factors between bending and axial compression is verified

- **Note**: Assumes same lengths for major axis buckling, minor axis buckling and lateral torsional buckling

D. Spreadsheets for Composite

Simply supported composite beams

- **Building Code**: BS EN 1994-1-1
- **Download link**: http://bcsatools.steel-sci.org/CompositeBeam
- **Data required**:
    - Steel framing arrangement based on beam type, location, and spacing
    - Slab details (depth, concrete grade, deck profile)
    - Stud details
    - Steel section details (size and grade)
    - Loading values

- **Data generated**:
    - Bending checks

  - Shear checks
  - Lateral torsional buckling checks
  - Checks for concrete strut shear
  - Checks for mesh reinforcement
  - Serviceability (deflection and steel stress)

E. Spreadsheets for Steel Connections

Shear and Tying Resistance of End Plates

- **Building Code**: BS EN 1993-1-8
- **Download link**: http://bcsatools.steel-sci.org/FlexEndPlateDesigner
- **Data required**:
  - Steel grade
  - Beam size
  - Plate thickness and width
  - Bolt rows
  - Bolt distances

- **Data generated**:
  - Bolt shear resistance
  - Bearing resistance
  - Group bolt resistance
  - End plate shear resistance
  - Weld resistance
  - Beam web shear resistance
  - Tying resistance of bolt, end plate, beam web, and weld

Base Plate Design

- **Building Code**: BS EN 1993-1-1
- **Download link**: http://bcsatools.steel-sci.org/BasePlateDesigner
- **Data required**:
  - Column size
  - Concrete grade
  - Baseplate size
  - Steel grade
  - Thickness of plate

- **Data generated**:
  - Axial resistance
  - Max plate cantilever

- **Note**: Only applies to UKB, UKC, or hollow sections

Vertical Shear and Tying Resistance of Fin Plates

- **Building Code**: BS EN 1993-1-8
- **Download link**: http://bcsatools.steel-sci.org/FinPlateDesigner
- **Data required**:

- Steel grade
- Beam size
- Plate thickness
- Bolt rows
- Bolt distances

- **Data generated**:
    - Bolt shear resistance
    - Bolt bearing resistance in fit plate and beam web
    - Beam web shear resistance
    - Fin plate shear resistance
    - Bearing resistance
    - Tension resistance
    - Weld resistance

Compression resistance of gusset plates

- **Building Code**: n/a
- **Download link**: http://bcsatools.steel-sci.org/GussetPlateDesigner/GussetPlateTool.html
- **Data required**:
    - Steel grade
    - Setting out (bracing angle)
    - Bolt distances
    - Tab and gusset plate geometry properties

- **Data generated**:
    - Bolt resistance
    - Gusset plate resistance
    - Tab plate resistance

- **Note**: Gusset plates for use of diagonal bracing can input one edge gusset plate (for roof bracing) or two edges (bracing at beam-to-column connection).

Design of weld groups according to shear, bending, and torsion

- **Building Code**: BS 5950-1:2000
- **Download link**: http://www.technouk.com/Programs/WeldCalc20141217-.zip
- **Data required**:
    - Applied moment
    - Weld group geometry
    - Applied axial load
    - Design strength

- **Data generated**:
    - Strength check
    - Centroid of weld group
    - Stress and force results of weld lengths
    - Load eccentricity moments at centroid

    - Resultant moments to weld group
    - Weld coordinates

Design of bolts and welds

- **Building Code**: BS 449: Part 2
- **Download link**: http://www.technouk.com/Programs/Fasten449000527-.zip
- **Data required**:
    - Bolt heads
    - Shear plane position
    - Bolt grade
    - Grade of connected part

- **Data generated**:
    - Table that has tension capacity, shear capacity, bearing capacity of respective bolt diameters
    - High strength friction grip bolts under specified slip factor
    - Combined tension and shear capacity for each bolt diameter
    - Table of capacities of fillet welds

Resources

Homebuilding Cost Estimate Sheet Free Download

At the point when we consider developing another house likely there is one inquiry hit in our brain that might be the cost of construction. This normal inquiry emerges in our psyche when we take the choice of building another house. So, here is a homebuilding cost estimate sheet free download.

To know the rough cost of construction we begin looking for a source where we can figure or get the cost of construction. There are numerous reasons we won't realize that the cost. For example:

1. Do we have enough stores for construction?
2. Would it be a good idea for us to need to take advance for construction?
3. What number of assets are missing for construction?
4. Does the construction cost give an earlier plan to mastermind the store?

Here and there, we need to realize the construction cost for looking at the cost given by contractual workers and it is the correct perspective to think about cost. Since numerous contractual workers tell an excessive amount of significant expense than the genuine cost of construction. In any case, with legitimate information about house construction cost and how it is determined, we can stay away from this sort of misrepresentation.

In this way, Weam going to support you and all who need to know what will be the inexact cost of construction of their house. Weam sharing sous self-experience information and examination so you can see how the cost is determined.

How Construction Cost is Calculated

As you choose to assemble another house scan for temporary workers to get data about the construction rate in your general vicinity. What is the construction rate? it is cost or cash charged by a developer or contractual worker for 1 sq. ft. construction in your general vicinity.

Construction rate per sq. ft. are changed from area to area depending upon the accessibility of nearby construction material. For in the event that you are developing a house in an urban zone where construction materials are effectively accessible at a serious rate, the pace of construction territory decreases.

Then again, in the event that you are developing any structure in a rustic zone where the accessibility of construction material is less and there is a requirement for transportation, the pace of construction will go higher.
For instance, the normal cost of construction is around 800 to 1200 Rs. per sq. ft. Now and again it parts into the accompanying classes
,

- For Normal Quality Construction = 800 Rs./Sq. ft.
- For usdium Quality Construction = 1000 Rs./Sq. ft.
- For High Quality Construction = 1200 to 1500 Rs. /Sq. ft.

Along these lines, in the event that you are having 800 sq. ft zone and you need developing a typical quality construction the pace of construction per will be associated with 1000 rs. per sq. ft.

Cost of construction

= Area of plot x Construction rate per Sq. ft.
= 800 x 1000
= 8,00,000 Rs.
(counting all work and materials cost)

On the off chance that someone needs to know how this cost couss and gets sous information about what is the cost of materials and work, at that point we have to figure out the material amount independently.

Step by step instructions to Use Homebuilding Cost Estimate Excel Sheet:

1. Enter your plot territory like length and width in feet.
2. Change Your Construction cost per sq ft rate in a given field.
3. Change the pace of the material. Include your neighborhood rate in the field to get precise outcomes.
4. Check your construction cost of the house. There will be 60% Material cost, 30% Labor cost and 10 % contractual worker benefit.
5. Thus, the Total Cost of Construction will be Rs. 8 Lakhs.

Homebuilding Cost Estimate Sheet Free Download Link
https://civiljungle.com/house-construction-cost-calculator-for-ground-floor/

Multimedia

Beam, Types, Usage, How to Calculate

In building construction, a beam is a component of structure which resists the load of the beam's axis. Beam is also called a lintel.

Types of beam

Simply supported beam

This type of beam is supported at its both ends is known as simply supported beam. This is used mainly in 2 to 3 storeyed buildings.

Cantilever beam

This type of beam is fixed at one end and free at the other end is also known as cantilever beam. This beam is used mainly for supporting the sunshade of a bigger span of the building. This type of beam is used for the maximum shear forces & moments developed at the support section, that is a reinforced concrete column.

Overhanging beam

In this type of beam the end part of the beam is stretched beyond the support then it is called overhanging beam.

Fixed beam

In this type of beam, the both ends are fixed in walls, also known as fixed beam.

Continuous beam

This type of beam provides more than two supports known as continuous beam. This type of beam is mainly used in multi storeyed buildings.

Propped cantilever beam

In this type of beam the free end is placed on a roller support. It is a modification of a cantilever beam.

Lintel beam

This type of beam is used to open the windows and doors. This type of beam behaves like a guard of windows.

There is another type of beam in construction.

- **According to the cross section**.
    1. I beam
    2. T beam
- **According to geometry**
    1. Curved beam
    2. Tapper beam

Usage of beam

Beam bear the vertical gravitational force. They also carry the horizontal loads. Beam is also very useful for taking bending loads. The cross section of beam and the orientation of beam is also very helpful. By using beam section workers make the structure stiff by increasing the moment of inertia by disturbing the area away from the neutral axis thus increasing moment of resistance.

Calculate the beam size

the standard size of the concrete beam at least **230 mm x 230 mm (9" x 9")**. According to their span the standard size of the depth of the beam is increased or decreased.

S. NO.	BEAM NAME	SPAN
1	Cantilever	7
2	Simply supported	20
3	continuous	26

Calculation of minimum size of R.C.C beam size as per IS 456: 2000
Effective depth =Span/Basic value
Total Depth = Effective depth + dia./2 + Clear Cover
Width = Depth/1.5 (width should not be less than 200 mm)

Note:
As per IS – 13920,
The width to depth ratio should be more than 0.3.
Width/Depth >0.3
Depth of beam shall not be exceeded ¼ of the clear span.

Example- For simply supported beam
Where,
Le = Effective length
D = Total depth of the beam
d = Effective depth of the beam
b = width of beam

Span of simply supported beam = 5 m
Then effective depth of beam = 5000 / 20
d = 250 mm
Total depth = effective depth + diameter of bar/2 + clear cover
Assume diameter of bar = 16 mm
D = 250 + 16/2 + 25
D = 283 mm ≈ 285 mm

And width = D/1.5
Width = 285 /1.5
b = 190 mm
So, we will take 200 mm for width

Then,
Width / Depth = 200/ 285 = 0.7 > 0.3, SAFE

Then,
we can check depth of beam = ¼ of span
= ¼ x 5000
= 1250 mm > 285 mm, SAFE

Example- For a cantilever beam
Span of cantilever beam = 2 m
Then effective depth of beam = 2000 / 7
d = 285 mm
Total depth = effective depth + diameter of bar/2 + clear cover
Assume diameter of bar = 16 mm
D = 285 + 16/2 + 25
D = 318 mm ≈ 320 mm

And width = D/1.5
Width = 320 /1.5
b = 213 mm
So, we will take 230 mm for width
Then,
Width / Depth = 230/ 320 = 0.71 > 0.3, SAFE

Then,
we can check depth of beam = ¼ of span

= ¼ x 2000
= 500 mm > 320 mm, SAFE

Example- For continuous beam
Span of continuous beam = 5 m
Then effective depth of beam = 5000 / 26
d = 192.3 mm ≈ 200 mm
Total depth = effective depth + diameter of bar/2 + clear cover
Assume diameter of bar = 16 mm
D = 200 + 16/2 + 25
D = 233 mm ≈ 235 mm

And width = D/1.5
Width = 235 /1.5
b = 156.67 mm
So, we will take 200 mm for width
Then,
Width / Depth = 200/ 235 = 0.85 > 0.3, SAFE

Then,
we can check depth of beam = ¼ of span
= ¼ x 5000
= 1250 mm > 235 mm, SAFE

Check for lateral stability or buckling:
(As per IS 456:2000, page no.39, clause 23.3)
For Simply Supported or Continuous Beam

Allowable L = 60 b
Allowable L= 250. b^2 / d
Take the least value of L
If beam span is less than L allowable, then the beam will be safe from lateral stability or buckling.

Where,
b = width of beam
d = effective depth of the beam

Example-
Allowable L = 60 b
Allowable L = 60 x 200
Allowable L = 12000 mm = 12 m
And
Allowable L = 250 b2 / d
Allowable L = 250 x 2002 / 285
Allowable L = 35087.7 mm = 35.087 m
Therefore,
Allowable L = 12 m
Here, Allowable L = 12 m > 5m, SAFE

Thumb rule method

calculate the depth of the beam according to the method
1 foot (span of the beam) = 1Inch (depth of beam)
If the span of the beam is 16 feet, then the depth of the beam will be 16 inches.

To get more details, go through the following video tutorial.
https://www.youtube.com/watch?v=09P1YWBX6-k&t=50s

Types & Causes of Concrete Cracks

RCC structures are very much dependent on the concrete in them for supporting the loads, so any kind of cracks in the concrete is cause to worry. If left unattended, these can lead to massive structural failures, taking a lot of lives with it. Therefore, any civil engineer worth his salt should know everything there is to know about the types and causes of concrete cracks.

Concrete Cracks - what are they

Although ominous, it should be noted that concrete cracking is quite a common thing to see, even expected. Those concrete cracks that can be expected aren't by design much of a problem. However, the cracks that were unforeseen - those spell trouble.

Unexpected cracks in concrete, caused mostly by improper casting or unanticipated environmental conditions, represent the prime natural threat to a structure. Not presumed in the design phase, these concrete cracks can reduce the integrity of the structure, affecting its durability.

Types of Concrete Cracks and What Causes Them

Depending upon the root cause, cracks in concrete can be classified into four main categories, each having unique characteristics. These are described as follows.

Flexural Cracks

When the designer fails to calculate the expected tensile stress across a concrete member, expect flexural cracks to develop. This is simply the concrete getting pulled apart, and are commonly seen in horizontal slabs for the most part. Especially those that are resting on a rather soft ground.

Purely a design issue, flexural cracks can be stopped from appearing by placing reinforcements where the tension will appear in the member. For example, this is the very reason why we place bars at the bottom of a beam. A few well-placed steel bars across the tensile zone will prevent the concrete from getting flexural cracks.

Dry Shrinkage Cracks

Happening after the hardening of concrete, dry shrinkage cracks are results of miscalculation in curing needs. As concrete dries and the water evaporates, its volume reduces and tensile forces generate, which pulls the concrete apart. This is mitigated by keeping the concrete constantly in contact of water and placing contraction joints.

Drying shrinkage cracks may form to be full length, map cracking, or may follow certain patterns. This type of cracking should be well anticipated and the designer should handle it by placing reinforcements, using contraction joints, and above all, a good curing process.

Thermal Cracks

Everything contracts and expands with changes in heat levels, and concrete is no exception either. Moisture and heat levels both cause changes in volume in concrete. Since it has a great degree of resistance to compressible forces, the expansion events go mostly unnoticed. But the contraction events are what causes the thermal cracks in concrete.

If the concrete is left free to contract freely as temperature drops, then there shouldn't be thermal cracks. But if the concrete is restrained from inside or outside, then tensile forces will generate which will pull the concrete apart, generating cracks. Happening mostly during hardening, thermal cracks can be so big that one crack may render the whole member useless.

Plastic Shrinkage Cracks

Another common type of cracks found in concrete slabs, plastic shrinkage cracks are comparatively shorter in length and spread. This happens during the hardening process, before the concrete has attained its tensile strength.

Plastic shrinkage cracks happen due to moisture evaporation from concrete. When the moisture evaporates, it leaves behind a porous structure within the mix that wants to reduce itself in volume. This creates tensile microforces and ends up getting cracked. The trick to keep it from happening is to use measures to prevent the concrete drying too quickly.

Whitewash Quantity Calculation: What you Need to Know

White washing and shading washing of the surfaces of buildings is vital on both sterile and stylish reasons. To acquire a spotless, perfect and uniform completion, it is important to embrace appropriate strategy for both readiness of surface to get white wash or shading wash and for utilization of white wash or shading wash.

Planning of White Wash

White wash is set up from fat lime. The lime is slaked at the site and blended and mixed with around five liters of water for 1 kg of unslaked lime to make a slim cream. This ought to be permitted to represent a time of 24 hours, and afterward ought to be screened through a clean coarse material.

One kg of gum diluted in water may likewise be added for each 10 kg of lime. Now and then, rice is utilized in the spot of gum. The use of sodium chloride (regular salt) to lime-wash helps in snappy carbonation of calcium hydroxide making the covering hard and rub-safe. Little amount of super marine blue (up to 3 gm for each kg of lime) might be added to the last two layers of white wash arrangement.

Arrangement of Surface

The new surface ought to be completely wiped off all soil, dust mortar drops and other unfamiliar issues before white wash is to be applied. Old surfaces effectively white-washed or shading washed ought to be broomed to eliminate all residue and soil. All free sizes of lime wash and other unfamiliar issues ought to be eliminated.

Where hefty scaling has occurred, the whole surface ought to be scratched perfect, any development of molds greenery ought to be eliminated by rejecting with steel scrubber and ammoniacal copper arrangement comprising of 15 gm of copper carbonate disintegrated in 60 ml of alcohol smelling salts in 500 ml of water, ought to be applied to the surface and permitted to dry altogether prior to applying white or shading wash.

Use of White Wash

White wash is applied with moonj or other brush, to the predefined number of coats (by and large three). The activity in each coat should comprise a stroke of the brush given from top down-wards, another from the base upwards over the first before it dries. Each coat ought to be permitted to dry before the following coat is applied. The white washing on the ceiling ought to be down preceding that on walls.

Calculating White Wash

Working out the quantities of lime and glue of three coats for a plastered wall with length 15 m and height 5 m.
To determine the entire area for white washing, multiply both length and height of the wall as follows,
White washing area
= 15 m x 5 m
= 75 m2
We know, 3.5 kg per 10m2 (surface area) of white fat line is necessary for a triple coat white washing, and 0.12 kg glue is needed. Now we proceed to calculating the whitewash quantity as follows:

The quantity of white unslaked lime
= 3.5 kg/10m2 x 75 m2
= **26.25 kg**
The quantity of glue
= 0.12 kg/ 10m2 x 75 m2
= 0.9 kg or **1 kg** (approx)

What Experts Say

According to Gaurav Gaur (chemist at wall putty & primaaxx quality):

"The coverage depends on surface smoothness, water quantity added during mixing and application. The standard coverage of wall putty in 2 coats is 14 -16 sq ft/kg. So calculation of estimation of wall putty count area of wall and divide it to 14/15/16. Suppose the wall area L is 10ft & H is 15 ft. Then your area is 150 sq ft divided by 15, the answer is 10 kg putty required for the wall."

According to Ravi Chandran (Marketing Professional in Construction Industry):

"As per manufacturer, 1 kg of wall putty will give 18 - 20 sq.ft coverage, in 2 coats, under standard conditions. But in reality, the coverage depends on surface smoothness, mix of the putty and application and above quoted coverage is far from reality."

According to Karunesh Jamwal (Sr Contracts Expert at Ayesa India):

"Take it as about 400 sft of wall coverage with a bag of 40 Kg for first time plastered walls. 2 coats making about 1 mm thick coating."

2021 Tallest Buildings under Construction in Each Continent

Humans have always wanted to build tall and build strong. And so came the skyscrapers, taller and taller, till they defined the skylines and became identities of the cities. There are lots of supertall buildings under construction right now around the world. And here we are with the list of 2021 tallest buildings under construction in each continent.

1. Central Park Tower

North America, 472 meters/1550 feet

On Billionaires Row, in New York, the tallest of the under-construction buildings is taking shape, slowly but surely. It's facade is almost complete - and a retail store also opened on the ground floor. But the construction is halted now, due to the recent pandemic situation.
When complete - expected in late 2021 - the Central Park Tower will have 179 apartments and other office and retail space. The skyscraper will be a shining tall icon not only in the midtown New York skyline but will also be so in the struggling real estate market of America.

2. Yachthouse Residences Club

South America, 280 meters/919 feet

In Brazil, there stands the mighty twin towers of the Yachthouse Residences Club, defining the skyline of the city of Balneario Camboriu. They are the tallest buildings under construction as of yet in the whole South Americas.
Construction started at the Yachthouse Residences Club in 2014 as hollow concrete structures, but the recent pandemic situation has marred their progress and it is halted now. Construction is scheduled to resume soon, health conditions permitting, and the opening should be some time this year since the glass facades have started to rise up.

3. One Tower

Europe, 405 meters/1330 feet

The supertall One Tower in Moscow became the tallest structure under construction after the Akhmat Tower project was scrapped in late 2019. The 108-story megatower is designed to have both retail and office spaces, with rich income group apartments at the top portion.

The location of the One Tower in Moscow requires a tapering, slender design, and so the One Tower is being built in an iconic, beautiful shape dominating the Moscow skyline. However, with the recent pandemic and the market collapse in Russia, this beautiful building is laboring under an uncertain future.

4. Iconic Tower

Africa, 385 meters/1263 feet

Egypt has historically been an architectural wonder with its pyramids and palaces, and now it is once again spreading the wings in the construction industry. Set in the center of the new administrative capital of Egypt (near Cairo), this megabuilding is expected to become the tallest building in the whole Africa when completed.

Being built among 20 other skyscrapers in the business district of the 58 billion dollar city, the core of the tower has risen above a 100 meters already and the construction work is going on well. Not yet completed, but the Iconic Tower already defines the city from afar and from air. With great care and social distancing and the use of modern technology, the construction work is continuing through 2020-21, and is expected to meet the deadline set at 2022.

5. Merdeka PNB118

Asia, 644 meters/2113 feet

This title should have been claimed by the Jeddah Tower in Abu Dhabi. That building is designed to be the world’s first 1km+ structure. But since we are not seeing any significant movement on-site since 2018, we have to award the title of the tallest building under construction in Asia to the Merdeka PNB118 in Malaysia.
This

mixed use tower already dominates the skyline of Kuala Lumpur, and is set to host the world's highest observation decks. The building is designed to contain offices, apartments, hotels, retail spaces, and entertainment zones. Indeed, with the addition of a 144-meter tower, it will become the world's second tallest building and the tallest building in Eastern Asia overtaking the Shanghai Tower.

6. Australia 108

Oceania, 317 meters/1039 feet

Construction is near completion at the Australia 108 tower in Melbourne. The temporary supports, formwork, and screens are mostly removed, revealing the building's shiny facade, dominating over other skyscrapers in the historic city.

The skyscraper is adorned with LED lighting that is giving it and the whole area a distinctive cyberpunk look, which are being tested now. With the pandemic situation, the construction work is going slower than normal that is the reason for the slight delay in finishing. It should get opened soon.

World's 10 Most Impressive Constructions

We humans have always aspired to build tall and build great. And we have been truly at it for as long as the construction industry existed - well back at the time of pyramids. Today, we will look at the constructions that awe and inspire us today. Here are the world's 10 most impressive constructions.

1. Great Pyramid of Giza

One of the seven wonders of the world, the Great Pyramid of Giza is the largest among the three legendary pyramids at the place. It was the tallest construction in the world for 3,800 years - take a moment to think how much that means.

Many experts estimate that 5.5 million tonnes of limestone, 500,000 tonnes of mortar and 8,000 tonnes of imported granite were used to make it. Experts also estimate that it would cost around $5 billion to build a replica today.

2. Great Wall of China

Another member of the seven ancient world wonders, the Great Wall of China still remains the longest wall in the world and one of the most popular tourist attractions in the world. With a history of more than 2,000 years, The Great Wall stretches from Dandong in the east of the country to Lop Lake in the west.

All in all, the great wall of China is 13,171 miles long, counting all its branches and unconnected parts. It is very hard to say how much it would cost to build a copy of the Wall today - but experts put the estimate somewhere around 13 billion USD. And some say it could take five times as much as that.

3. The Colosseum

The world's largest amphitheater to date is one of the greatest architectural feats in the ancient world as well. The 2,000 year old sports complex is so recognizable that it has become a veritable icon for its hosting city - Rome.

Estimated to seat 50,000 and rumored to fit

80,000 people inside, the huge structure is one of the greatest cultural tourist attractions in the world. Sadly, it has collapsed partially now, giving it the signature lopsided look.

4. Brooklyn Bridge

The Brooklyn Bridge enjoys the reputation of being the first suspension bridge in the world, and it was a marvel of engineering at the time. Which would be as far back as 1883! Spanning the East River, the Brooklyn Bridge connects Manhattan to the borough of Brooklyn.

The bridge was designed and completed by two generations of engineers, John August Roebling and his son Washington Roebling. It was originally called the New York and Brooklyn Bridge, costing around 15 million USD to build at the time.

5. Itaipu Dam

It would be hard to understand the size of this huge dam unless you see it from air. Stopping the mighty Parana river in its track, there lies the Itaipu Dam on the border of Paraguay and Brazil. It is the world's largest river dam and houses the biggest hydroelectric power plant in the world.

This mega-dam produces more hydroelectric energy than any other dam in the world – measuring in at an immense 103,098,366-megawatt-hour (MWh). The energy produced by the dam is split evenly between Paraguay and Brazil.

6. Hoover Dam

The second famous dam on our world's 10 most impressive construction list is the Hoover Dam. It was constructed during the Great Depression, in the Black Canyon on the Colorado River. The dam impounds the greatest inland water reservoir in the US - the Lake Mead.

The Hoover Dam project was so large that it created several small temporary towns in the vicinity, some of which still remain in some capacity. The dam cost the equivalent of over $660 million to build and was completed in five years, two years ahead of its schedule.

7. Golden Gate Bridge

The iconic Golden Gate Bridge would surely show up on most of the modern world wonder list, should anyone make one these days. Spanning the Golden Gate strait for a full whopping mile, it connects the city of San Francisco with Marin County, carrying two highways on its back.

The 27 million dollar project is a mile-long suspension bridge - one of the most beautiful bridges by the world, according to the hordes of tourists who visit here. For almost three decades after its opening in 1937, the Golden Gate Bridge remained the longest bridge in the world.

8. English Channel Tunnel

Instead of focusing on building above, the British and the French dug deep underground and shook hands in the middle of the English Channel Tunnel. From the shore of Kent in the UK with Pas-de-Calais in France, the tunnel connects two nations, two economies, and two cultures.

The Tunnel has the longest undersea portion of any tunnel in the world, at 23.5 miles (37.9km). At its deepest point, it is 75 metres (250ft) below the sea bed and 115m (380ft) below sea level. It is designed to carry high-speed Eurostar passenger trains, international goods trains and a shuttle for road vehicles, making it the largest transport system of its kind in the entire world.

9. Burj Khalifa

Standing 830 meters tall, the Burj Khalifa towers over any other structure in the world, enjoying being the tallest manmade structure ever. The building's incredibly tall design inspired the creation of the 'buttressed core', an engineering structural system with a hexagonal core which helps to support higher buildings than ever before.

The supertall skyscraper cost 1.5 billion USD to construct, much of which was supplied by the ruler of Dubai, after whom the building is named. It is one the most featured buildings in modern film culture, appearing in several international blockbusters.

10. Lake Pontchartrain Causeway

When you talk about the longest bridge of the world, this lesser known but well built bridge has to be mentioned, because, so far the Lake Pontchartrain Bridge is the single longest continuous stretch of bridge in the world.

Spanning the whole width of the Lake, the Causeway is 38.35 kilometers long (23.83 miles). Its construction was finished in 1959, which was done by means of 9,500 pilings. The strong bridge has withstood several minor and major hurricanes robustly.

Top 10 Ancient Architecture Wonders

Humanity and construction work has been together since the dawn of civilization, and people have always aspired to leave their creations behind as legacy. They built big, they built tall, they built wonders. Today, we look at the top 10 ancient architecture wonders that still awe us, questioning how on earth people made these structures so far back in time!

The first list of man-made wonders were made by ancient Hellenic tourists. Alas, none of these wonders stand now except the Great Pyramid of Giza - they were destroyed by natural or political reasons. Since then, many other lists were made of the world's architectural wonders - here is our shot at that.

10. The Perthenon

432 BC / Greece

The Perthenon was constructed on an older temple, and was intended to be the new place of worshipping the goddess Athena, the patron goddess of the Ateneans. It is the most prominent surviving building of ancient Greece. Completed in 438 B.C., the structure has changed hands many times, serving as a temple, a church, a treasury, a mosque, and even an ammo dump.

The Perthenon is one of the oldest examples of fine Greek architecture. Constructed mostly of posts and lintels, there are 8 columns at either end, and 17 columns at either side. They all surround an inner masonry structure called the cella. The Perthenon enjoys the reputation of the most perfect Doric temple ever built.

9. Moai Statues

Easter Islands, 1250

More commonly known as the Easter Island Statues and the source of many conspiracy theories, the Moai or *Mo'ai* are huge monolithic human figures on Easter Island in Polynesia. They are intended to be "living faces" of the long gone and "deified ancestors" of the *Rapa Nui* people, who built these statues.

Each statue has overly large heads over a small body, and there are over 900 of them all around the island. The head-to-body ratio is 3:5, which underlines the Polynasian belief of the dominance of brains over brawns. The largest of the Moai, called *Paro* is almost 33 feet tall, weighing over 80 tons! One of the unfinished statues, if completed, would be about 70 feet tall. How were they made and transported still remain a topic of hot debate in many circles.

8. Taj Mahal

India, 1653

This iconic structure of India petrified the symbol of love on the shore of river Yamuna, where emperor Shah Jahan built this awesome marble palace to house the tomb of his beloved wife, Noorjahan. The tomb of the emperor himself is also placed in this structure. The palace stands in the center of 42 acre land which includes beautiful gardens and a crenellated wall to boot.

Construction of the Taj Mahal finished officially in 1643, but extra work went on for a decade after that. Considered the finest example of Mughal architecture in India, it cost $956 million USD (today's value) to build the Taj Mahal. Ustad Ahmad Lahauri was the lead architect with 20,000 artisans and countless laborers under him.

7. Colosseum

Italy, 80 AD

The world's largest ancient age sports structure is so popular that it has become the icon of the city of Rome. The Colosseum is the largest amphitheater even to date, located right beside the Roman Forum. Emperor Vespasian started the construction of the megastructure and the next emperor Titus finished it, and emperor Domitian made some modifications on it.

The world-famous man-made wonder is made of limestone, volcanic rock, and brick-faced concrete. The elliptical structure is 157 feet tall, 615 feet long and 510 feet wide, covering 6 acres of land. It was planned to hold about 87,000 people by that time - though large portions have collapsed since then.

6. Angkor Wat

Cambodia, late 12th Century

The largest religious monument in the world (by land coverage) stands on 402 acres of land in Cambodia. Though it is now a buddhist monastery, it was originally dedicated to the Hindu god Vishnu when the Khmer king Suryavarman constructed it some time in the late 12th century.

Angkor Wat is the finest example of the classical Khmer architecture and it is now a symbol of Cambodia itself. Designed to represent Mount Meru (the mountain of the gods), three galleries sit on top of each other within a moat three miles long. The architecture seems to hold special meaning with the positioning of the sun since many towers and viewports are strategically placed to allow sunrays only on sunrise or sunsets in specific days of the year.

5. Step Pyramids of Teotihuacan

Mexico, 200 AD

In the valley of Mexico, right at the beginning of the first millennium, there lived an industrious people, forming the city of Teotihuacan. They built the beautiful city and the great step pyramids, forming the religious center of the region and the largest city in pre-discovery Americas. What's left of it can be found about 40 kilometers northeast of Mexico City.

The greatest achievements of this Mesoamerican civilization have to be the great step pyramids, even before the Mayan or Aztec civilizations rose. The biggest of these is the Sun Pyramid which is the largest ancient building in both Americas. It is 234 feet high and 733 meters long on each side. A lava cave goes beneath this great pyramid, believed to lead to the location of the human origin.

4. Petra

Jordan, 5-4th century BC

An entire city carved out of rock, that's how you describe Petra - the word literally meaning 'rock' in Greek. Around 20 thousand people lived in this city, mostly arabic nomad groups settling in to trade. Petra flourished in the 1st century when its iconic structure, the Al-Khazneh, was built. Petra is enclosed by towering rocks and watered by a perennial river, and was famous as not only the trade center of the whole region, but also for it's wondrous water control system, which manipulated flash floods for advantage with dams, conduits, and cisterns. It was the capital of the Nabataean Kingdom until it fell to Romans in 106 AD.

3. Machu Picchu

Peru, circa 1450

No list of wonders can be complete without this Peruvian mountain city, the height of Incan architecture. Constructed around 1450 by the Inca emperor Pachacuti, it was often mistaken as the Lost City of the Incas. The river Urumbaba flows past it, keeping the weather warm and supplying the water needed for survival.

The city is built in fine Incan style with polished dry stone walls. Much of the city was ruined but they have been restored to the most possible original condition. The main buildings in the city are the Intihuatana, the Temple of the Sun, and the Room of the Three Windows. The city is divided in two ways - the upper and lower town, and the urban and agricultural sectors.

2. Great Wall of China

China, 7th BC to 16th century AD

This ancient wonder is so big that it can be seen from space! The Great Wall of China was built to provide protection from various nomadic groups from the Steppe region. This wall is still the longest one in the world, stretching a whopping thirteen thousand miles! The construction of this huge wall has happened throughout two thousand years.

The earliest portions of the wall were built with rammed earth, stone and wood. Bricks appeared in the wall from the Ming dynasty, as well as tiles, lime, and stone. The defences of the wall were increased by constructing battlements and crenellations, watchtowers, barracks, smoke signals, and border controls. It is as wide as 16 feet or more in many places.

1. Pyramids of Giza

Egypt, circa 2500 BC

The only great wonder of the world still standing from the oldest recorded historical lists, the Pyramids of Giza include the Great Pyramid of Giza, the Pyramid of Khafre, and the Pyramid of Menkaure, along with their associated pyramid complexes and the Great Sphinx of Giza, and several cemeteries and a laborers' village.

The Great Pyramid of Giza is the largest ancient pyramid in the world, and the Khafre pyramid comes close. The pyramids are a wonder not only due to their size, but also because of the time they were constructed. Because of the time period, their method of construction still remains a huge debate. The pyramids were constructed to house the remains of the pharaohs, and their families and/or favourites.

Top 10 Big Engineering Projects Around the World

Even though the pandemic has hit us hard, mankind's dream of building big and building powerful structures and facilities cannot be dominated. Today we will talk about the top 10 big engineering projects around the world. These massive projects are prides of their developers and of the people of the region they are built in as well.

1. Large Hadron Collider, France

A hundred meters below the border of France and Switzerland, there lies a giant of cutting-edge science. The Large Hadron Collider of France is 28 kilometers long and is possibly the largest and most complex piece of engineering in a single facility in the world.

The project is basically a giant underground ring, with superconducting magnets inside it around the tube to propel particles along the length of the tube. When working, the inside of the tube becomes the emptiest place in the whole known universe - having literally nothing inside it.

2. Three Gorges Dam, China

The world's largest hydropower project is located on the mighty Yangtze River in the Three Gorges section and is capable of generating as much energy as 18 nuclear power plants! The giant dam spans 1.3 miles and is 600 feet tall, with 32 main turbines and auxiliary buildings. It is used to control the flooding of the Yangtze river valley.

The Three Gorges Dam is an awesome example of heavy construction engineering. Built to withstand major earthquakes of 7 Richter scale, it is able to hold back the pressure of the water of a reservoir that allows movements of 10,000-ton freighters in and out of mainland China.

3. Gotthard Base Tunnel, Switzerland-Italy

The Gotthard Base Tunnel is known as the deepest and longest tunnel in the world. Running between Zurich and Milan, the tunnel goes right under the Alps mountain range. It is extremely important in terms of economy of both countries, taking most of the passenger and commercial traffic clogging up existing traditional overland connections.

The tunnel is 95 miles long and has two tubes each carrying one railway track, which are connected every 325 meters. The tunnel took 14 years to build and has been active since December 2016.

4. Andasol Solar Plant, Spain

Is it a power station? Is it a farm? The world's largest solar power station is located in Andasol, in Andalusian Spain. Over six hundred thousand solar panels are installed over two spreads of land totaling 126 acres, supplying power to around 450,000 people in Spain.

The Andasol Solar Power Plant consists of solar fields, thermal storage systems, heat exchangers, steam turbines, generators and condensers. It uses tanks full of molten salts to store energy for the time when the sun isn't shining.

5. T30 Hotel, China

While not a large project, this hotel in Lin Gang, China has taken place on our list of top ten engineering projects in the world because of the superb engineering factor. This 30 level hotel was built in just 360 hours, believe it or not! The technology used here is prefabricated building blocks and structural elements.

Not only fast, the T30 Hotel building was designed to be efficient as well. It saves a lot of energy - a similar building built in the conventional design will burn 5 times more energy than this! Also, this environment friendly building generates only a fraction of wastes than others in the same area.

6. London Crossrail, UK

One of London's most ambitious construction projects, the Crossrail project is considered the largest construction project in the whole Europe, such is its spread. It is a high-tech high-capacity high-speed underground railway system weaving in and out of the existing London tube.

Expected to build nine new stations to begin with and at least 42 kilometers of new tunnelling work to be done, the London Crossrail is the first new complete underground line to be completed in almost 30 years. It would relieve a lot of congestion on existing passenger transport systems, carrying 1.5 million people across London in 45 minutes.

1. ## Boston Big Dig, USA
   Complicated to the level of maddening, the Boston Big Dig is a project to reduce the nightmarish traffic congestion in the city. It is basically a superhighway to be constructed

under an existing highway and an extra third tunnel under Boston Harbor. All of this is supposed to interact with the existing system seamlessly.

Appalling in its design complexity, the project has been steeped with complications from the very beginning. An included plan to connect Boston's two main train stations had to be ditched right at the beginning. Add to that a myriad of issues consisting of criminal actions, leaks, use of bad materials, poor execution, and political challenges to boot - and it's a wonder how the project finished at all in 2007.

8. Marmaray Project, Turkey

One of the longest single transport constructions in the world, the Marmaray project is a 48 mile long intercontinental commuter rail line from Istanbul. Going as a twin tunnel under the Bosphorus strait along the sea of Marmara, it runs between Halkali and Gebze, connecting Europe and Asia by railway.

The Marmaray Project comprises four major segments as the underwater railway tunnel, improvement of the Gebze-Haydarpasa and Sirkeci-Halkali suburban railway lines, electrical and mechanical works, and the procurement of new rolling stock. The mile-long tunnel is earthquake proof, and connects the whole 48 miles of the rail project.

9. Masdar City, UAE

The UAE is not new to conjuring up whole cities out of nothing. Still under construction in Abu Dhabi, this particular massive project will be the world's first zero-carbon city. Running entirely on renewable energy, the city will not allow any private cars or small automobiles, relying entirely upon mass transit and personal rapid transit systems.

The city will be run entirely on renewable energy, supplied by the biggest solar farm in the middle east and many wind farms. The water situation which is already tough in the deserts will be supported by robust recycling mechanisms.

10. Eko Atlantic City, Nigeria

Not to be outdone by UAE, the Nigerian government is building a city in the state of Lagos on reclaimed land from the ocean. This planned commercial city is expected to be an awesome seafront city, housing 250,000 and commuting 150,000 people daily.

The idea is to transform Lagos into a mega city-state that rivals Dubai, the Eko Atlantic City is expected to rejuvenate the economy of Lagos, especially in the real estate sector. Tons of supporting businesses are expected to pop up once the city is functional with its luxury flats, marinas, retail centers, and high-tech offices.

Top 10 Longest Roads in the World

If the civilized surface world is some kind of animal, then surely roads are the blood vessels in its body. Highways, freeways, motorways, expressways - call them by any name, they are still the primary means of transportation between far-off places. Today, we will get to know which are the top 10 longest roads in the world.

10. Interstate 80

USA, 4664 km

The I-80 is one of the most discussed highways in American culture and modern literature. Passing through many dramatic areas, it is considered to be one of the quite dangerous highways in the world by accident count. Only the stretch in Wyoming has caused over 2600 mishaps, and counting.

The construction of the fabled I-80 took 30 years and it was opened to the public fully in 1986. The highway runs between San Francisco and Teaneck, and touches major industrial and business cities like Sacramento, Reno, Omaha, Salt Lake City, Toledo, and Des Moines.

9. Interstate 90

USA, 4861 km

Ranking just above the I-80, the I-90 is another famous and very busy highway in the USA. It is the longest interstate highway in the country, combining with existing roads like the New York State Thruway, the Massachusetts Turnpike, Indiana Toll Road, and Jane Addams Memorial Tollway. Furthermore, some of the most interesting bridges in the USA are a part of this road as well.

Construction started on the I-90 in 1956 and was completed in 1985. The road runs between Seattle to Boston. While on the way, it waters major cities like Spokane, Billings, Sioux Falls, Madison, and many more!

8. US Route 6

USA, 5148 km

Taking up the eighth place on our top 10 longest roads in the world, the US Route 6 is another well-known highway in America. It was previously called the Grand Army of the Republic Highway (that was the association of the veterans in the American Civil War). It was also called Route 3 in the beginning.

Running between California's Bishop to Massachusetts' Provincetown, Route 6 is also one of the most prominent roads in US culture, because of its association to the civil war. From 1936 to 1964, it was the longest single routing in the country.

7. US Route 20

USA, 5415 km

Another American road occupies the 7th slot in our top ten roads list. US Route 20 is a coast to coast highway running parallel to I-90. It is the single longest road in the whole United State and thus is quite busy as well, especially with freight traffic.

The Route 20 goes between Newport, OR to Boston, MA, running through the states of Oregon, Idaho, Montana, Wyoming, Nebraska, Iowa, Illinois, Indiana, Ohio, Pennsylvania, New York, Massachusetts. It originally ended at Yellowstone National Park, though, but it was extended to the coast in 1940.

6. China National Highway 010

China, 5700 km

The 6th entry in our list of the longest roads in the world is also the longest road in China. It starts at Tongjiang, Heilongjiang and ends at Sanya, Hainan. It was originally called the Tongsan Expressway, which included both the north-south and east-west main routes of China. On its way, it goes through the provinces of Heilongjiang, Jilin, Liaoning, Shandong, Jiangsu, Shanghai, Zhejiang, Fujian and Guangdong.

5. The Golden Quadrilateral

India, 5846 km

The Golden Quadrilateral Highway Network in India is the fifth longest highway in the world and is also the longest in India. First starting construction in 2001, the roads were finished in 2012. The Golden Quadrilateral touches the 4 major cities in India (Delhi to the north, Kolkata to the east, Mumbai to the west, Chennai to the south) in the form of a quadrilateral, hence the name.

The states covered by this huge road are Andhra Pradesh, Uttar Pradesh, Rajasthan, Karnataka, Maharashtra, Gujarat, Odisha, West Bengal, Tamil Nadu, Bihar, Jharkhand, Haryana & Delhi. Andhra Pradesh bears the largest segment of the road.

4. Trans-Canada Highway

Canada, 7821 km

Hopping ahead, the Trans-Canada is the longest road in Canada and also the longest road in the continent of North America. Construction of this major highway went on in segments between 1949 to 1972. This route is famous for being the only highway in the world which has free charging stations on the way for electric vehicles.

This distinguishable highway has route markers in the form of a maple leaf on a green board. The coast to coast network is so large that it goes through all ten states of Canada, and had to be constructed by both the federal and provincial governments.

3. Trans-Siberian

Russia, 11000 km

Spanning the entire length of Russia, this massive highway is the longest in the country and also in Asia. It's not an official name, though - it is rather a combination of road networks in Russia. A large part of the route that's going through the Asian Highway Network is named AH6.

The Trans-Siberian Highway (not to be confused with the Trans-Siberian Railway), is also another coast to coast network, running from St. Petersburg beside the Baltic Sea to Vladivostok on the Sea of Japan.

2. Highway 1

Australia, 14500 km

The pride of Australia and Oceania, and the longest road in Australia too, the simply-named Highway 1 is the longest national highway in the world. Developed over the local roads and tracks, Highway 1 finished construction in 1955.

The sole route for connecting all the states and territories of Australia (except the Australian Capital Territory), the Highway 1 is a quite scenic route. It runs through many geographical features such as big cities, coastlines, forests (tropical and temperate), swamps, desserts, and scrublands.

1. Pan American

USA to Guatemala, 48000 km

The longest road in the world connects the americas in both hemispheres. The Pan American Highway runs through 14 countries; United States of America, Canada (British Columbia, Yukon, Alberta), Mexico, El Salvador, Nicaragua, Honduras, Panama, Costa Rica, Chile, Peru, Ecuador, Argentina, Columbia, and Guatemala.

Part of the road is called Inter-American Highway. We will go into details of this road in another article altogether.