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Q1) Characteristics of earth used for manufacturing of brick.

(ANS). A brick is a type of block used to make walls, pavements and other elements in masonry construction. Traditionally, the term *brick* referred to a unit composed of fired clay but it is now used to denote rectangular units made of clay-bearing soil, sand, and lime, or concrete materials. Bricks can be joined together using mortar, adhesives or by interlocking them. Bricks are produced in numerous classes, types, materials, and sizes which vary with region and time period, and are produced in bulk quantities. Two basic categories of bricks are *fired* and *non-fired* bricks.

Methods of manufacture

Three basic types of brick are un-fired, fired, and chemically set bricks. Each type is manufactured differently.

Mudbrick

Unfired bricks, also known as mudbrick, are made from a wet, clay-containing soil mixed with straw or similar binders. They are air-dried until ready for use.

A mudbrick or mud-brick is an air-dried brick, made of a mixture of loam, mud, sand and water mixed with a binding material such as rice husks or straw. Mudbricks are known from 9000 BCE, though since 4000 BC, bricks have also been fired, to increase their strength and durability.

Fired brick

Fired bricks are burned in a kiln which makes them durable. Modern, fired, clay bricks are formed in one of three processes – soft mud, dry press, or extruded. Depending on the country, either the extruded or soft mud method is the most common, since they are the most economical.

Normally, bricks contain the following ingredients:

1. Silica (sand) – 50% to 60% by weight
2. Alumina (clay) – 20% to 30% by weight
3. Lime – 2 to 5% by weight
4. Iron oxide – ≤ 7% by weight
5. Magnesia – less than 1% by weight

Shaping methods

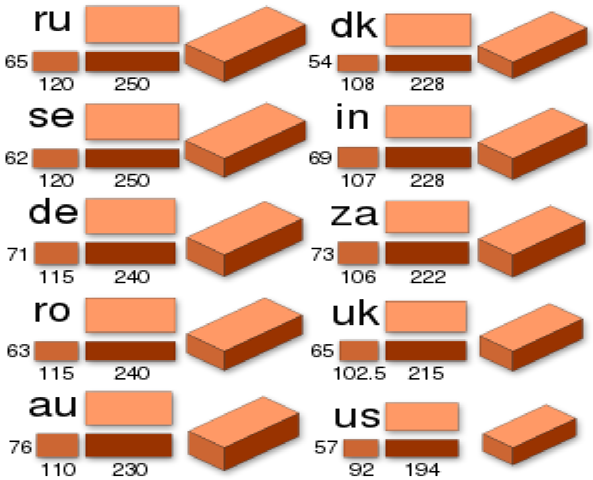
Three main methods are used for shaping the raw materials into bricks to be fired:

Molded bricks – These bricks start with raw clay, preferably in a mix with 25–30% sand to reduce shrinkage. The clay is first ground and mixed with water to the desired consistency. The clay is then pressed into steel moulds with a hydraulic press. The shaped clay is then fired ("burned") at 900–1000 °C to achieve strength.

Dry-pressed bricks – The dry-press method is similar to the soft-mud moulded method, but starts with a much thicker clay mix, so it forms more accurate, sharper-edged bricks. The greater force in pressing and the longer burn make this method more expensive.

Extruded bricks – For extruded bricks the clay is mixed with 10–15% water (stiff extrusion) or 20–25% water (soft extrusion) in a pugmill . This mixture is forced through a die to create a long cable of material of the desired width and depth. This mass is then cut into bricks of the desired length by a wall of wires. Most structural bricks are made by this method as it produces hard, dense bricks, and suitable dies can produce perforations as well. The introduction of such holes reduces the volume of clay needed, and hence the cost. Hollow bricks are lighter and easier to handle, and have different thermal properties from solid bricks. The cut bricks are hardened by drying for 20 to 40 hours at 50 to 150 °C before being fired. The heat for drying is often waste heat from the kiln.

Optimal dimension , characteristic, and strength



For efficient handling and laying, bricks must be small enough and light enough to be picked up by the bricklayer using one hand (leaving the other hand free for the trowel). Bricks are usually laid flat, and as a result, the effective limit on the width of a brick is set by the distance which can conveniently be spanned between the thumb and fingers of one hand, normally about 100 mm (4 in). In most cases, the length of a brick is twice its width plus the width of a mortar joint, about 200 mm (8 in) or slightly more. This allows bricks to be laid *bonded* in a structure which increases stability and strength (for an example, see the illustration of bricks laid in *English bond*, at the head of this article). The wall is built using alternating courses of *stretchers*, bricks laid longways, and *headers*, bricks laid crossways. The headers tie the wall together over its width. In fact, this wall is built in a variation of *English bond* called *English cross bond* where the successive layers of stretchers are displaced horizontally from each other by half a brick length. In true *English bond*, the perpendicular lines of the stretcher courses are in line with each other.

A bigger brick makes for a thicker (and thus more insulating) wall. Historically, this meant that bigger bricks were necessary in colder climates (see for instance the slightly larger size of the Russian brick in table below), while a smaller brick was adequate, and more economical, in warmer regions. A notable illustration of this correlation is the Green Gate in Gdansk; built in 1571 of imported Dutch brick, too small for the colder climate of Gdansk, it was notorious for being a chilly and drafty residence. Nowadays this is no longer an issue, as modern walls typically incorporate specialised insulation materials.

The correct brick for a job can be selected from a choice of colour, surface texture, density, weight, absorption, and pore structure, thermal characteristics, thermal and moisture movement, and fire resistance.

Face brick ("house brick") sizes, (alphabetical order)

Standard	Imperial	Metric
Australia	9 × 4⅓ × 3 in	230 × 110 × 76 mm
Denmark	9 × 4¼ × 2¼ in	228 × 108 × 54 mm

Germany	9 × 4¼ × 2¾ in	240 × 115 × 71 mm
India	9 × 4¼ × 2¾ in	228 × 107 × 69 mm
Romania	9 × 4¼ × 2½ in	240 × 115 × 63 mm
Russia	10 × 4¾ × 2½ in	250 × 120 × 65 mm
South Africa	8¾ × 4 × 3 in	222 × 106 × 73 mm
Sweden	10 × 4¾ × 2½ in	250 × 120 × 62 mm
United Kingdom	8½ × 4 × 2½ in	215 × 102.5 × 65 mm
United States	7⅝ × 3⅝ × 2¼ in	194 × 92 × 57 mm

Limitation Starting in the 20th century, the use of brickwork declined in some areas due to concerns with earthquakes. Earthquakes such as the San Francisco earthquake of 1906 and the 1933 Long Beach earthquake revealed the weaknesses of unreinforced brick masonry in earthquake-prone areas. During seismic events, the mortar cracks and crumbles, and the bricks are no longer held together. Brick masonry with steel reinforcement, which helps hold the masonry together during earthquakes, was used to replace many of the unreinforced masonry buildings. Retrofitting older unreinforced masonry structures has been mandated in many jurisdictions.

Q1B) Suggest a good building stone of your area and give the technical reason for its using.

(ANS). Good Building Stones

Every building stone which is used for construction, cannot satisfy all the ideal requirements. For example, when the stone satisfies the requirement of strength and durability, it may not do the same with other necessities such as ease of dressing. Hence it is the job of the site engineer to look into the properties which are required for the specific work and select the stone accordingly.

Construction Aggregate Properties

A good building stone should have the following qualities:

Appearance:

Building Stones used for the face work of the building should have fine, compact texture. Light colored stone is usually preferred as dark colors are prone to fade out with time. They should be free from clay holes, bands or spots of color.

Structure:

A stone when broken, should not be dull in appearance and should show uniformity of texture. It should be free from cavities, cracks, and patches of loose or soft material. Stratifications, which are usually found in sedimentary rocks should not be visible to naked eye.

Strength:

Stones used in construction should be strong and durable to withstand the disintegrating action of weather. Generally the stones can withstand the forces they encounter in usual constructions but in case of constructions where the forces encountered are unusual, they should be tested for its strength. Stones with compact fine crystalline texture are stronger. Compressive strength of building stones in practice, range between 60 to 200 N/mm^2.

Specific gravity:

The specific gravity of Building stone is directly proportional to its weight and strength. Hence the stones having higher specific gravity should not be used for dams, retaining walls, docks and harbours. Specific gravity of a good building stone lies between 2.4 to 2.8.

Hardness:

When stones are utilized for floors, pavements, aprons of bridges and weirs of rivers, the stones are subjected to abrasive forces which are caused by the wear and friction. Hence the stones which are to be used in such places should be tested for hardness.

Toughness:

It is the measure of impact that a stone can withstand. When the stones are supposed to undergo vibrations of machinery and moving loads, they should be tough.

Porosity and Absorption:

The porous building stones are not suitable in construction especially for exposed surfaces of structures. The rain water which comes down carry some acidic gases forming light acids which gets soaked on the surface. Acids react with the constituents of stones causing them to crumble. In cold regions water freezes in the pores of stones. This water causes the disintegration of stones because of its increase in volume on freezing.

Stones should be tested for porosity and porous stones should be used only at places where they don't encounter frost, rain or moisture in any form. Water absorption is directly proportional to the porosity of the rock. The more porous the rock is, the more water it will absorb and leads to the damaging of stone.

The types of some of the stones and their maximum limit of water absorption (%) is as follows:

- Sandstone : 10
- Limestone : 10
- Granite : 1
- Trap : 6
- Shale : 10
- Gneiss : 1
- Slate : 1
- Quartzite : 3

Seasoning:

All freshly quarried stones contain a certain amount of moisture known as *quarry sap,* which makes them soft and easier to work upon .Good stones should be free from quarry sap. They are allowed to get rid of quarry sap by the action of nature. This process of removing quarry sap is called seasoning. A period of 6-12 months is generally enough for proper seasoning.

Weathering:

It is the extent to which the face of a stone resists the action of weather. Stones with good weathering properties only should be used in the construction of important buildings.

Workability**:**

Stones are said to be workable if the wok which is involved in their cutting, dressing and shaping is considered as economical and easy to conduct. Know_the_Current_House_construction_cost

Fire Resistance:

Building Stones should be free from calcium carbonate, oxides of iron, and minerals having different coefficients of thermal expansion. Igneous rock undergo major disintegration because of quartz which disintegrates into small particles at a temperature of about 575 °C. Limestone, however, can withstand a little higher temperature; i.e. up to 800 °C after which they disintegrate.

Q2A) Give the uses of Copper, Lead, Tin, Zinc, Aluminium in different civil engineering works.

(ANS). Copper in construction

Copper in civil engineering works; It is commonly used in the construction industry to form pipes and tubing for potable water distribution and heating and cooling systems, as it is malleable and joints can be easily formed by soldering. It is commonly used in the construction industry to form pipes and tubing for potable water distribution and heating and cooling industry, as it is malleable and joints can be easily formed by soldering. The ease with which it can be made to form complex shapes means it is also used as a cladding and flashing material for gutters, downpipes and coping. Electrical and communications cables are often formed with copper wire. From cathedrals to castles and from homes to offices, copper is used in many products: low-sloped and pitched roofs, soffits, fascias, flashings, gutters, downspouts, building expansion joints, domes, spires, and vaults. Copper is also used to clad walls and other surfaces in the exterior and interior environment

It can be hot and cold worked, and joints can be formed by soldering or welding, using mechanical fasteners, by brazing, or with adhesives. It can specified according to the temper levels; soft, half-hard, hard, spring and extra-spring.

Copper is a pinkish-orange colour when first exposed, but can oxidise to a blue green colour. This oxidisation is sometimes allowed intentionally to create a characteristic green cladding. It can also be given a range of brown colours.

It is generally recyclable, and this combined with its long life means it has relatively low life cycle impacts.

It is a naturally available metal in the form of ores which contain small amount of iron and sulphur.

After removing impurities, it is processed electrolytically to get purest metal. This metal is almost indestructible. Copper scrap can be processed to get original copper.

Properties of Copper;

1. It is having reddish brown colour.

2. Its structure is crystalline.

3. It is highly ductile and malleable.

4. It resists corrossion.

5. It can be welded easily at red heat condition.

6. Dents on the copper can be hammered out.

7. It has high electric and thermal conductivity.

8. Its melting point is at 1083°C.

Uses of Copper;

1. It is used as electric wire and cable.

2. It is used as lighting conductor.

3. For water proofing the construction joints copper plates are used.

4. Copper tubes are used for hot and cold water supply, gas and sanitation connections.

5. It forms a major construction of brass and bronze.

Lead in civil engineering works; More recently, lead and lead compounds were used for roofs, cornices, tank linings, electrical conduits, cladding, flashing, gutters, and parapets. lead based paint inhibits the rusting and corrosion of iron and steel, and continues to be used on steel sructures such as bridges, railways, lighthouses, and so on. Lead times for construction. Lead times are a measure of the amount of time that elapses between initiating a process and completing that process. It is crucial that long lead time items are identified as early in a project as possible as they may affect the critical path for the project. Lead is easily extracted from its ores prehistoric people in Western Asia knew of it. Galena is a principal ore of lead which often bears silver. Interest in silver helped initiate widespread extraction and use of lead in ancient Rome. Lead production declined after the fall of Rome and did not reach comparable levels until the Industrial Revolution. In 2014, the annual global production of lead was about ten million tonnes, over half of which was from recycling. Lead's high density, low melting point, ductility and relative inertness to oxidation make it useful. These properties, combined with its relative abundance and low cost, resulted in its extensive use in construction, plumbing, batteries, bullets and shot, weights, solders, pewters, fusible alloys, white paints, leaded gasoline, and radiation shielding.

In the late 19th century, lead's toxicity was recognized, and its use has since been phased out of many applications. However, many countries still allow the sale of products that expose humans to lead, including some types of paints and bullets. Lead is a neurotoxin that accumulates in soft tissues and bones; it damages the nervous system and interferes with the function of biological enzymes, causing neurological disorders, such as brain damage and behavioral problems. In the second half of the 18th century, Britain, and later continental Europe and the United States, experienced the Industrial Revolution. This was the first time during which lead production rates exceeded those of Rome Britain was the leading producer, losing this status by the mid-19th century with the depletion of its mines and the development of lead mining in Germany, Spain, and the United States. By 1900, the United States was the leader in global lead production, and other non-European nations Canada, Mexico, and Australia—had begun significant production; production outside Europe exceeded that within. A great share of the demand for lead came from plumbing and painting lead paints were in regular use. At this time, more (working class) people were exposed to the metal and lead poisoning cases escalated. This led to research into the effects of lead intake. Lead was proven to be more dangerous in its fume form than as a solid metal. Lead poisoning and gout were linked; British physician Alfred Baring garrod noted a third of his gout patients were plumbers and painters. The effects of chronic ingestion of lead, including mental disorders, were also studied in the 19th century. The first laws aimed at decreasing lead poisoning in factories were enacted during the 1870s and 1880s in the United Kingdom.

Tin in civil engineering works; Tin has many uses. It takes a high polish and is used to coat other metals to prevent corrosion, such as in tin cans, which are made of tin-coated steel. Alloys of tin are important, such as soft solder, pewter, bronze and phosphor bronze. A niobium-tin alloy is used for superconducting magnets.

Applications and uses for tin sheet ; Tin has been around for thousands of years and was most commonly used for the manufacturing of bronze, which is a tin and copper alloy. Today, most people would associate tin with the tin can found on grocery store shelves. However, tin and its alloys are used for far more than the making of bronze and the storing of food. Tin sheets are often used for the creation of decorative elements for homes, countertops and the making of jewelry.

Industries that use tin sheet; Tin sheets are used in a variety of industries, including the aerospace, construction and home decor, electronics, jewelry manufacturing and telecommunications. Tin sheets are made from tin and other alloying metals, like lead, copper, nickel and zinc, depending on the desired characteristic needed for the sheet metal. Tin if often preferred by these industries because it is corrosion resistant, available in several colors and finishes and cost-effective when compared to other types of metals, like gold, silver, copper and platinum. Tin is also preferred because it is easy to cut and form around objects.

Residential and commercial interior décor; Tin is often used in exterior and interior home decor for its aesthetic value, durability and resistance to corrosion. It's also often more economically friendly than other types of sheet metal, like copper and stainless steel.

Custom ceiling and walls; In luxury homes, tin sheets are often stamped and formed into custom tin tiles that are then used to create custom walls and ceilings for a completely unique interior look and feel. The tin sheet may also be available in several colors, depending on the composition of the sheet metal. Common colors include gray or silver, red or copper colored or even gold colored.

Custom backsplashes; Due to tin’s resistance to corrosion, water-resistance and easy to clean properties, it’s often used in kitchens as either a stamped or flat panel backsplash instead of tile or satin paint where uniqueness and durability are required.

Custom counters;Tin sheets can be used as custom countertops in residential kitchens and bathrooms and in industrial settings where corrosion resistance and durability are needed for workspaces, break rooms and dining areas.

Jewelry manufacturing; Tin is often used in jewelry manufacturing to create custom trinkets and pendants. This is because small sheets of tin are easily cut into various shapes, like circles, stars and diamonds, then stamped with intricate designs. These pendants and trinkets can then be added to necklaces, earring posts and loops and bracelets to create custom jewelry.

Tin sheets from Belmont metals; Here at Belmont Metals, we sell tin sheets for a variety of applications and uses. We offer grade A Tin 99.85 minimum sheet in .50-.055” by 7.65” by 12.25” as well as other tin products, including tin powers, ingots, bars and shot. If you need tin sheets for your industrial or manufacturing business or another type of tin metal or alloy, let us know.

Zinc in civil engineering works; In the construction world in particular, it is is most commonly used for roofing and zinc panels. Perhaps zinc's best known benefit is its ability to keep away corrosion. In fact, thanks to this attribute, zinc is used for coating, or galvanizing, iron and steel to inhibit corrosion. Since the 18th century, zinc has been commonly used in France, Belgium, Germany, Holland and other European countries as a building material for covering roofs and facades, as well as for gutters and downpipes. When laid correctly as a roof covering, it has lasted in excess of 100 years.

For construction applications, the zinc used is usually in sheet form of 99.9%+ purity but with very small concentrations of titanium and copper. It is typically applied in sheet thicknesses of 0.7mm. The two main application methods are roll-cap (the traditional method) and standing seam. This is the traditional system that has been used by skilled craftsmen in continental Europe and requires no complicated tools or procedures. The roof is divided into longitudinal bays (parallel to the slope) by trapezoidal-shaped timber battens with sloping sides. Zinc sheet (typically 400-500mm wide) with upstands on either side is cut to size to fit within each bay. the upstands abutting the timber battens are secured in place with concealed clips. Zinc capping pipes are placed over the battens to cap the upstands and create a weathertight finish.

Traditionally, especially in France, Belgium and Germany, zinc sheet has been applied to a cold roof, where the insulation (if it existed at all) was immediately above the ceiling level and the roof was therefore 'cold' (usually with ventilation in the roof void). Also, the zinc was applied directly to a deck of close-boarded timber planks with gaps of around 10mm in between. This had the effect of ensuring adequate ventilation to the underside of the zinc, ensuring a service life in excess of 100 years.

Modern construction has tended to favour 'warm' roof constructions where the insulation is typically in or above the roof structure, and sometimes with an inadequately ventilated roof space. This, taken with the fact that the zinc may have been laid on continuous ply with no ventilation gaps, could lead to condensation and consequent corrosion on the zinc underside and therefore a reduced service life.

When the zinc is to be laid on a continuous substrate (eg 18mm plywood sheets with no ventilation gaps), contemporary practice typically installs a continuous, self-sealing vapour barrier and breather membrane to prevent moisture from condensing on the underside of the zinc.

Substrates other than ply can be used, such as insulated metal-faced panels, rigid insulation and cellular glass foam. Accessories such as zinc roof vents, finials, gutters and downpipes are normally used in conjunction with zinc roofs. Zinc tiles, usually diamond-shaped, can also be used for cladding facades.

Benefits of zinc; Benefit 1: Durability and Corrosion Resistance Perhaps zinc's best known benefit is its ability to keep away corrosion. Due to iron and steel (an alloy of iron and carbon), people have this general idea that metals used for construction are prone to moisture and rust. That is not so with materials made from zinc. That's because zinc forms a thin layer called patina. This patina covers the material and thus protects it from weather elements, such as air and water. In fact, thanks to this attribute, zinc is used for coating, or galvanizing, iron and steel to inhibit corrosion. Another thing that patina does is repair the roof's scratches and other imperfections. Europeans started using zinc to make roofs in the 19th century, and they still remain in great shape after all these years because of the self-repairing abilities of the metal. So, ultimately zinc is a very durable metal to use for construction.

Benefit 2: Availability and Workability; Available in five variants, or isotopes, zinc is the 24th most abundant element in the Earth's crust. Moreover, alongside iron, aluminum, and copper, zinc is now one of the most commonly used metals in the world. So, zinc is rarely ever scarce; it is always available locally, and it has several applications in the modern world that go beyond construction. Zinc is also a favorite of home builders and architectural firms due to its ease of use; people find it very easy to form or manipulate.

Benefit 3: Qualification as "Green" Material; These days, going "green" (environmentally friendly) is all the rage. Individuals and companies are always looking for ways to reduce energy costs and reduce or eliminate harmful impact to the environment. Zinc is great for eco-friendly construction for two reasons. Once, it requires less energy for production than other metals, such as aluminum and copper, due to its lower melting point. And two, zinc is complexly recyclable, since it can be produced from recycled materials taken from demolished or re-roofed structures.

Aluminum in civil engineering works; Aluminum in the Building and Construction Industries. Aluminum is widely used in building because of its intrinsic properties of lightness and corrosion resistance. Aluminum is used in external facades, roofs and walls, in windows and doors, in staircases, railings, shelves, and other several applications.

Benefits of Aluminum in Building Construction; Following are the benefits of Aluminum in building construction,

- Alloys;

Pure aluminum is a low-strength metal and consequently not suitable for building applications but thanks to the addition of alloying elements such as copper, manganese, magnesium, zinc etc. and thanks to specific production processes, it changes its physical and mechanical properties to meet requirements of a large number of applications.

- Durability;

Aluminum alloys for Building are resistant to water, corrosion and immune to the harmful effects of UV rays, thus ensuring a lasting endurance

- Low maintenance costs

Aluminum does not require any special kind of maintenance, whether it is raw or lacquered aluminum

- Finishes;

Aluminum can be anodized or lacquered in any color, so it’s possible to get the most varied effects and thus meet the designer’s decorative needs. Aluminum treatments can increase the durability of the material and its corrosion resistance

- Reflective properties;

Aluminum is widely used for light management: its reflective properties help to reduce energy consumption for lighting and heating.

For example, it’s possible to reduce the use of air conditioning in summer season by using aluminum shielding devices.

- The impact of aluminium in the construction industry

Certified studies have proved that the alloys, the surface treatments (coatings) and the materials used are all neutral. Aluminum used in the construction industry does not have any negative impacts either on the quality of the air inside buildings, on land or water.

These are just a few of the benefits of using aluminum, in a technical and technological development view the extraordinary properties of this metal will offer (potentially) endless possibilities for building engineering applications.

Q2B) What precautions must be observed while blasting in quarrying.

(ANS). Blasting precautions you must take

Blasting is essential to the mining industry.

Explosives provide the energy to break and loosen the rock necessary for processing. To effectively blast rock, a tremendous amount of energy must be released in a very short period of time. If not done correctly, this energy release can cause damage, injury or death.

The challenge in blasting is to control the energy to break and move the rock without causing flyrock, high vibration or airblast.

Proper planning

When blasting, there are at least two major safety concerns. One is premature detonation. The other is flyrock.

Premature detonation involves an unplanned detonation during the loading or tying-in procedures, or while awaiting scheduled firing. Explosives require heat or shock energy to begin the detonation process. Therefore, preventing contacts with these sources of energy is of utmost importance.

Examples of unwanted contact could include explosives being run over by equipment, being exposed to a fire on the blast pattern, being exposed to lightning strikes or having a drill intersect a loaded hole. To prevent such hazards, consider the following:

Using cones or berms, demarcate the blast site (the area where holes are loaded or in the process of being loaded).

Within the blast site, have only the personnel and equipment necessary to load the blast.

Complete drilling prior to commencement of loading, or have the drill at a distance where it cannot possibly intersect a loaded hole. Also, consider drills have been prone to fires when hydraulic lines burst onto a hot engine or compressor.

Regardless of the initiation system being used, always evacuate the area at the approach of an electrical storm. Have an evacuation plan in place, and make sure everyone is familiar with it.

Avoiding flyrock

A second blasting safety concern is flyrock. Flyrock is more common than premature detonation and poses a threat not only to those on the quarry property, but also to those in surrounding communities. This is why tremendous emphasis is placed on preventing flyrock by training and technological advancements.

Rock is fragmented and moved by applying explosives energy to the rock. The relationship between the energy and the volume or weight of rock is called powder factor. It is stated in either tons of rock per pound of explosives or pounds of explosives per cu. yd. of rock.

Industry standards define the range of powder factor based on geology and/or the type of blasting being performed. The powder factor of the overall blast is important, but the powder factor of every hole segment drives the possibility of flyrock.

Most flyrock incidents are a result of a high powder factor in a localized area of one or several holes. This may cause rock to be thrown more than 2,000 ft.

The cause of the high-localized powder factor usually occurs as a result of light burdens on the front row of holes. Burden is the measurement from the hole to the nearest free face.

In most cases, due to either geology or backbreak from a previous blast, burdens are variable along the length of the explosives charge. Adjusting the explosives charge to match the amount of rock (burden) is key to maintain a proper localized powder factor and prevent flyrock.

Over the past couple of decades, technology was developed to aid in measuring this variable burden. Two-dimensional and three-dimensional laser profilers, photogrammetry and now drones can accurately measure burden and display it to the blaster in graphic and table form.

To use these technologies, the open face must be completely clear and visible prior to loading holes. In fact, for best results, the face should be mucked out prior to layout so holes can be placed in the proper position and require less loading adjustments.

Another reason for a high-localized powder factor may be that the amount of rock present may be proper, but too much explosives charge is present in an area due to cracks, seams or voids.

The proper action to prevent this is to maintain an accurate drill log. No high technology here – just accurate note-taking of these conditions by the driller. The drill log should also provide information on the amount of loose or soft material in the collar zone so the blaster can make loading adjustments and prevent vertical flyrock.

Other details to consider

Improper blast area security during a blast event has been responsible for a number of injuries and fatalities over the years. The blaster and quarry management should develop a plan ensuring that, prior to the blast, an inspection is made to determine that the area is evacuated, that guards are posted at all entrances to the pit, and that the guards are in communication with the pit foreman and blaster.

Recently, it seems more operations rely on cell phones for communication during a blast event. Personally, I believe that two-way radios are a better choice for communication with the guards, pit foreman and blaster. This allows for instant access to the blaster should a breach in security be detected just prior to detonation.

As in any venture, the quality control and attention to detail put into a task will directly affect the results. Blasting safety is no different. Properly trained blasters, accurate measurements and proper attention to every safety regulation will ensure consistent, safe blasts.

Q3A) Compare Brick masonry and Stone masonry.

(ANS). Comparison of Brick Masonry and Stone Masonry

Comparison of Brick Masonry and Stone Masonry,Brick masonry,Stone masonry, Masonry is the art of the construction in brick or stone. Except in dry masonry some mortar is used to bind the bricks or blocks of stones, with each other. There are in general two types of masonry, *viz.,* Brick Masonry and Stone masonry. Brick masonry is that in which bricks are used while in stone masonry, stone blocks are used.

Comparison of Brick Masonry and Stone Masonry

1. Generally brick masonry is cheaper than stone masonry and can be easily constructed.
2. The minimum, thickness of wall in stone masonry can be 35 cm whereas, in brick masonry, walls of 10 cm thickness can be constructed.
3. The brick masonry construction proceeds very quickly whereas the stone masonry construction proceeds vary slowly, as the bricks are handy whereas stones are not.
4. Skilled masons are required for stone masonry construction, whereas unskilled laymen can do the brick masonry work.
5. Brick masonry requires less mortar whereas stone masonry requires more mortar which cannot be easily estimated.
6. Stone masonry is stronger and more durable brick masonry.
7. It is not essential to plaster the stone masonry walls whereas brick walls have to be plastered or painted, when exposed to the open atmosphere.
8. Bricks are of an absorbent nature and no absorbing moisture make the buildings damp, but stones are less adsorbent, and hence stone masonry walls or buildings are more damp proof.
9. Brick masonry work cannot be allowed to come in contact with urine, sewage etc., without protecting them, whereas this is not the case with stone masonry.
10. Brick masonry is more fire-resistant than stone masonry.
11. Good ornamental work can be cheaply and easily done in plaster in case of brick masonry, but it is not possible in stone masonry.
12. Being uniform and regular in shape, proper bond can be easily obtained in case of bricks as compared with stones. Similarly, obtuse and acute angle joints can be easily provided with brick in masonry than stone masonry.
13. Brick absorbs less quantity of heat than stone, therefore in not climates, during nights, stone walls emit mere quantity of heat and make sitting in the room uncomfortable.

Q3B) Difference b/w plastering and pointing;

Ans; Difference b/w plastering and pointing; Plastering is used to protect the exposed surface of masonry. However, in pointing only joints are properly filled with mortar.

Cement, sand and lime are used in plastering. In pointing, we use just cement mortar.The plastering is done at both sides of surface (both inside and outside). However, pointing is done only at the outer side of the wall.

In plastering work, we use the large amount of materials. However in pointing, we use less amount of mortar.

After the plastering, the defects of the masonry are not visible. However, after the pointing, the surface does not become smooth and plain.

When we plaster the wall, after the plastering work, the surface becomes smooth and plain. However, after pointing, the defects of masonry can be seen.

Pointing; It is the art of finishing the mortar joints in exposed brick or stone masonry with suitable cement or lime mortar, in order to protect the joints from weather effects and also to improve the appearance of building structure. Often an entire wall, or even a whole structure, is pointed because defective points cannot easily be detected, and adjacent joints may also be in need of repair. The mortar is packed tightly in thin layers and tooled to a smooth, concave, finished surface.

- Scope of pointing Maintaining the joints of the structures. Pointing being cheap can be adopted in places of low rainfall. Where the natural beauty of materials, viz., stone blocks, bricks etc, is desired to be exhibited. Gives resisting power to the bricks and stones used in construction towards weather conditions.
- Method of pointing. All the mortar joints (on the masonry face required to be pointed) are raked out by a special pointing tool to a depth of 15 to 20 mm, so as to provide an adequate key for the fresh mortar used for pointing.All the loose mortar and dust are removed by brushes. The joints and wall surface are washed with clean water, and then kept wet for few hours.The joints so prepared, are filled with suitable mortar with a small trowel. The mortar is well pressed into the joints to form a close contact with the old interior mortar joints. All excess mortar sticking to the sides is scraped away.The finished pointing work is kept wet for about 3 days when lime mortar is used for pointing and for 10 days when cement mortar is used for pointing.

Plastering ; The most commonly used finishes of plaster are nerru finish and sand faced finish. The nerru finished plaster is usually preferred for the surfaces, which are not directly exposed to weathering. The sand faced finish plaster is usually preferred for the surfaces, which are directly exposed to weathering.

REQUISITES FOR PLASTER WORK:

1.

1. Raw materials: – cement, sand, sanla, water and admixtures.
2. Scaffolding materials.

PREPLANNING PROCESS:

1. After completion of brickwork, mark guideline dots (thiyya) in line, plumb diagonals and levels
2. Complete concealed electrical piping and fixing of concealed boxes. The face of concealed boxes should be flush with plaster surface.
3. The chiseled grooves for pipe and boxes should be finished with cement mortar.
4. Fix the chicken mesh of 24 gauge and 12mm x 12mm size openings at all the joints of RCC, Masonry and for all electrical pipes.
5. Dress all the surfaces to be plastered, with wire brush to remove the dust and loose particles.
6. Preparation of freestanding scaffolding without holes through walls, with extra supports to the scaffolding shall be done.
7. The surface to be plastered should be thoroughly watered.
8. Sand should be sieved with screen of 10 holes/cm2.

9. The trays for mixing of mortar and water storage tank shall be made available at workplace.

NEERU FINISH PLASTER:

Plaster work shall be started only after, all the prerequisites are fulfilled.

1. Mixing of mortar shall be done in a tray only.
2. Usually the mortar mix for internal plaster is: –

1. Ceiling C.M. 1:4.
2. Walls C.M.1: 6.
3. Cement and sand should be dry mixed properly before adding water.
4. Required quantity of water shall be added to achieve workable mix.
5. Admixtures, if any, shall be added to the mortar.
6. The mortar mix should be consumed within half an hour from mixing. The quantity of mortar shall be mixed accordingly.
7. Plastering work shall be started from ceiling, in C .M. 1:4 and then proceeded further with walls.
8. Trowelling of excessive C.M. is done for bringing the surface in level/line & plumb.
9. Finish all surfaces in level, line with respect to guideline dots.
10. Finish all the edges, corners and offsets in plumb, right angle and level.
11. Check sizes of all the openings for right angles.
12. Neeru shall be soaked atleast for two hours in water, before application

1. All the electrical points shall be finished neatly.
2. Desired quantity of cement shall be added in nerru for stiffness of edges.
3. A thin film of nerru shall be applied over the plastered surface and shall be finished smoothly.
4. The entire surface where dado tiles are to be fixed and shall be marked and made rough.Neeru shall not be applied on this surface.
5. The portion of the side walls, where the skirting of the tiles is to be fixed; shall not be plastered. If some mortar is stuck there, then it shall be scrapped properly upto 0.15 m from the top of the floor slab.
6. Curing should be done after 24 hours and carried out atleast for 14 days.

SAND FACED PLASTER:

1. Proper erection of scaffolding should be carried out with the help of skilled workmen. It should be erected on firm base and should have sufficient working space. It must be strong enough to sustain the moving load and should be designed for all safety aspects.
2. Mark the guide line dots in line, level and plumb.
3. Complete all the elevational brickwork. Fill all the gaps and holes if any, with rich cement mortar. Insert metal, at all junctions of R.C.C. & brickwork.
4. Fix chicken mesh of 24 gauge and 12mm x 12mm holes at all the joints of RCC and masonry.
5. Dress all the RCC/masonry surfaces for any projections.

6. Rub the entire surface to be plastered, with wire brush for removing dust and loose particles.
7. Surface to be plastered should be thoroughly watered.
8. Sand should be sieved with screen of 10 holes/cm2. For finishing coat, use the sand sieved from screen of 13 holes/cm2.
9. Confirm all the elevational and plastering details given by architect/ consultants.
10. Mixing of mortar to be done in a tray only.
11. Usually the mortar mix for external plaster is C.M.1: 4.
12. Cement and sand should be dry mixed properly before adding water.
13. Add required quantity of water to achieve workable mix. Admixtures shall be used, if specified.

The mortar mix should be consumed within half an hour and mix the quantity accordingly;

1. Ensure that tray for mixing of mortar and water storage tanks are available at work place.
2. Plastering work to be started from inside the parapet wall. Avoid the joints on top of parapet walls and proceed downwards.
3. Trowelling of excessive C.M. is done for bringing the surface in line & plumb.
4. Apply C.M.1:4 using sand sieved from sieve of 13 holes/cm2 for minimum thickness. Use sponge to achieve proper effect of sand faced plaster with uniform grains.
5. Finish the entire surface in line &plumb with respect to guideline dots.
6. Finish all the edges, corners and offsets in plumb, right angle and level.
7. Check all the openings for sizes and diagonals.
8. Clean all the mortar splashed on door frames, window frames, railing and all floors, thoroughly.
9. Curing should be done after 12 hours and shall be carried out atleast for 14 days.

PRECAUTIONS DURING THE EXTERNAL PLASTER:

1. Before starting plaster work, place plastic sheets/empty cement bags underneath the area to be plastered, to collect the falling mortar.
2. No supports for scaffolding should be taken from M.S. windows, frames, railings and grills etc. If unavoidable take supports by making holes at skirting level only.
3. Necessary precautions and safety measures are to be taken while removing the scaffolding, shifting of wooden planks and other scaffolding material.
4. All the workers working near the scaffolding area should wear helmet and safety belts. Safety belts to be tightened to firm supports only.
5. Fill the pocket holes of scaffolding supports with well soaked bricks and rich cement mortar with proper compaction and finish on the external as well as internal surfaces..
6. Utmost care should be taken to cure soffits of chajjas, cantilever portion, hidden portions etc. Refer Sketches for Various Plaster Details of chajja with drip mould :-

MISCELENEAOUS PLASTER WORK:

1. Butt finish: – It is a process of plastering the surface in between skirting top and previously left plaster, Necessary care shall be taken to match the surfaces. Proper curing and cleaning shall be carried out.
2. Minor repairs: – All minor repairs shall be carried out by skilled mason only. The curing of the repaired works shall be done properly.

• Requirement of the good plaster It should be hard and durable. It should be possible to apply it during all weather conditions. It should adhere to the background and should remain adhered during all climatic changes. It should be cheap and economical. It should offer good insulation against sound and high resistance against fire. It should effectively check the entry or penetration of moisture from the surfaces.

• Methods of plastering; The plaster may be applied in one or more coats, but the thickness of a single coat should not exceed 12 mm. In the case of inferior or cheaper type of construction, the plaster may usually be one coat. For ordinary type of construction, the plaster is usually applied in two coats, whereas for superior type of works it is applied in three coats. The final setting coat should not be applied until the previous coat is almost dry. The previous surface should be scratched or roughened before applying the next coat of plaster. In plastering, the plaster mix is either applied by throwing it with great force against the walls or by pressing it on the surface

• Types of plasters; Lime plaster Lime plaster is a mixture of calcium hydroxide and sand (or other inert fillers) in 1: 1 ratio. Carbon dioxide in the atmosphere causes the plaster to set by transforming the calcium hydroxide into calcium carbonate (limestone). In order to improve building properties of lime plaster, gugal (a kind of fragrant gum) @ 1.6 kg/m^3 of mortar , is added when the mortar is being ground. In order to improve adhesive and tensile properties of lime mortar, sometimes, small quantities of chopped hemp (i.e., vegetable fibers) @ 1kg/m^3 are added to the lime mortar. The lime mortar thus prepared is usually kept for 2 days before use.

• Cement plaster: Cement and sand in required proportions (1:3 or 4) are first thoroughly mixed in dry conditions and then water is added to form a paste of required consistency. Generally it is mixture sand, Portland cement and water mixed in a suitable proportion. This prepared mortar for plastering should be consumed within 30 minutes after the addition of water. Gypsum plaster (plaster of Paris) Gypsum plaster, or plaster of Paris, is produced by heating gypsum to about 300 °F (150 °C). $2CaSO_4\cdot H_2O + \text{Heat} \rightarrow 2CaSO_4\cdot \tfrac{1}{2}H_2O + H_2O$ (released as steam) When the dry plaster powder is mixed with water, it re-forms into gypsum. The setting of unmodified plaster starts about 10 minutes after mixing and is complete in about 45 minutes but not fully set for 72 hours.

• Water proof plaster of Mortar: This mortar consists of 1 part of cement, 2 parts of sand and pulverized   alum @ 12 kg/m^3 of sand. To this dry mix, the soap water containing about 75 g of soft soap/L of water , is added to obtain the waterproof mortar. Heat resistant plasters. It's purpose is to replace conventional gypsum plasters in cases where the temperature can get too high for gypsum plaster to stay on the wall. Heat resistant plaster should be used in cases where the wall is likely to exceed temperatures of 50°C .Heat resistant plaster is a building material used for coating walls and chimney breasts.

- Defects in plastering; The following defects may arise in the plaster work: Blistering of plastered surface: This is the formation of small patches of plaster swelling out beyond the plastered surface, arising out of late slaking of lime particles in the plaster. Cracking: it is the formation of cracks in the plaster work due to the following reasons: Structural defects in building. Movements in the background due to its thermal expansion or rapid drying . Movements in the plaster surface itself, either due to expansion or shrinkage.

Q4A) What is meant by seasoning of timber? Briefly describe the various methods of seasoning.

(ANS). Seasoning of timber is the process by which moisture content in the timber is reduced to required level. By reducing moisture content, the strength, elasticity and durability properties are developed. A well-seasoned timber has 15% moisture content in it.

Methods of Seasoning of Timber

There are two methods of Seasoning of timber which are explained below

1. **Natural seasoning**
2. **Artificial seasoning**

Natural Seasoning of Timber

Natural seasoning is the process in which timber is seasoned by subjecting it to the natural elements such as air or water. Natural seasoning may be water seasoning or air seasoning.

Water Seasoning

Water seasoning is the process in which timber is immersed in water flow which helps to remove the sap present in the timber. It will take 2 to 4 weeks of time and after that the timber is allowed to dry. Well-seasoned timber is ready to use.

Air Seasoning

In the process of air seasoning timber logs are arranged in layers in a shed. The arrangement is done by maintaining some gap with the ground. So, platform is built on ground at 300mm height from ground. The logs are arranged in such a way that air is circulated freely between logs. By the movement of air, the moisture content in timber slowly reduces and seasoning occurs. Even though it is a slow process it will produce well-seasoned timber.

Artificial Seasoning of Timber

Natural seasoning gives good results but takes more time. So, artificial seasoning of timber is developed nowadays. By artificial seasoning, timber is seasoned with in 4-5 days. Here also different methods of artificial seasoning are there and they are as follows.

- Seasoning by Boiling
- Chemical seasoning
- Kiln seasoning
- Electrical seasoning

Seasoning by Boiling

Seasoning of timber is also achieved by boiling it in water for 3 to 4 hours. After boiling timber is allowed to drying. For large quantity of timber boiling is difficult so, sometimes hot steam is passed through timber logs in enclosed room. It also gives good results. The boiling or steaming process develops the strength and elasticity of timber but economically it is of heavier cost.

Chemical Seasoning

In case of chemical seasoning, timber is stored in suitable salt solution for some time. The salt solution used has the tendency to absorb water from the timber. So, the moisture content is removed and then timber is allowed to drying. It affects the strength of the timber.

Kiln Seasoning

In this method timber is subjected to hot air in air tight chamber. The hot air circulates in between the timber logs and reduces the moisture content. The temperature inside the chamber is raised with the help of heating coils. When the required temperature is obtained moisture content and relative humidity gets reduced and timber gets seasoned. Even though it is costly process it will give good results strength wise.

Electrical Seasoning

In the method of electrical seasoning timber is subjected to high frequency alternating currents. The resistance of timber against electricity is measured at every interval of time.

When the required resistance is reached seasoning, process is stopped because resistance of timber increases by reducing moisture content in it. It is also called as rapid seasoning and it is uneconomical.

Q4B) Suggest the remedial measures for the failure of foundation.

(ANS). There can be different types of foundation failures on soil due to movement and settlement which can cause the building to collapse. Failure of foundation causes different defects in buildings such as cracks leading to failure or collapse. Foundation is the first element of a building where the construction starts. Repair of defects in foundations are most difficult and very costly, so it is most important to understand the types of foundation failure to avoid them by taking necessary steps before construction starts.

Functions of Foundation in Buildings;

There are three main functions of a building foundation:

- To sustain and safely transmit the loads from building / structure to the ground in such a way that it does not impair the stability or cause damage to the building or surrounding buildings.

- The construction of foundations must safeguard the building against damage by physical forces generated in the subsoil.

- Foundations must resist the chemical compounds present in soil to prevent corrosion to reinforcement.

Types of Foundation Failures; Following are the different types of the failure of foundation.

- Foundation failure due to Soil Movement;

When water present between soil particles is removed, the soil tend to move closer together. When water is absorbed by soil, the soil starts to swell. This movement of soil is based on the type of soil. Large movement is seen with clayey soils than sandy soils. These kind of movement of soil due to change in water content affects the foundation settlement. Foundation tends to settle to and excessive settlement of foundation may lead to differential settlement and damage to the structure.

Remedies for foundation failure due to soil movement:

1. Use of pile foundations where the soil is shrinkable, so that forces are transferred to the hard strata or rock.

2. Taking the foundation levels down to avoid foundation on shrinkable soils.

3. The vegetation is removed from the construction site and its roots are removed. Any cavity due to roots of vegetation shall be compacted and filled with concrete.

4. Presence of any mining areas needs to be inspected and professional help shall be taken while construction new buildings in such areas.

Foundation failure due Settlement of Soil Fill;

If the building is constructed on a newly developed land by soil filling, the foundation on such soils tend to settle more with time as long time is needed for such soil to settle and become compact to resist the loads from the building foundation.

Remedies:

It shall be ensured that such soils are adequately compacted before construction begins on them. The foundation depth shall be increased to the hard strata or rock below the filled soil or pile foundations shall be used to prevent subsidence of foundation.

1. Unequal settlement of sub-soil. Unequal settlement of the sub-soil may lead to cracks in the structural components and rotation thereof. Unequal settlement of sub-soil may be due to (i) non-uniform nature of sub-soil throughout the foundation, (ii) unequal load distribution of the soil strata, and (iii) eccentric loading. The failures of foundation due to unequal settlement can be checked by : (i) resting the foundation on rigid strata, such as rock or hard moorum, (ii) proper design of the base of footing, so that it can resist cracking, (iii) limiting the pressure in the soil, and (iv)avoiding eccentric loading.

2. Unequal settlement of masonry. As stated earlier, foundation includes the portion of the structure which is below ground level. This portion of masonry, situated between the ground level and concrete footing(base) has mortar joints which may either shrink or compress, leading to unequal settlement of masoray. Due to this, the superstructure will also have cracks. This could be checked by (i) using mortar of proper strength, (ii) using thin mortar joints, (iii) restricting the height of masonry to 1 m per day if lime mortar is used and 1.5 m per day if cement mortar is used, and (iv) properly watering the masonry.

3. Sub-soil moisture movement. This is one of the major causes of failures of footings on cohesive soil, where the sub-soil water level fluctuates. When water table drops down, shrinkage of sub-soil takes place. Due to this, there is lack of sub-soil support to the footings which crack, resulting in the cracks in the building. During upward movement of moisture, the soil (specially if it is expansive) swells resulting in high swelling pressure. If the foundation and superstructure is unable to resist the swelling pressure, cracks are induced.

4. Lateral pressure on the walts. The walls transmitling the load to the foundation may be subjected to lateral pressure or thrust from a pitched roof or an arch or wind action. Due to this, the foundation will be subjected to a moment (or resultant eccentric load). If the foundation has not been designed for such a situation, it may fail by either overturning or by generation of tensile stresses on one side and high compressive stresses on the other side of the footing.

5. Lateral Movement of sub-soil This is applicable to very soft soil which are liable to move out or squeeze out laterally under vertical loads, specially at locations where the ground is sloping. Such a situation may also arise in granular soils where a big pit is excavated in the near vicinity of the foundation. Due to such movement, excessive settlements take place, or the structure may even collapse. If such a situation exists, sheet piles should be driven to prevent the lateral movement or escape of the soil.

6**. Weathering of sub-soil** due to trees and shrubs. Sometimes, small trees, shrubs or hedge is grown very near to the wall. The roots of these shrubs absorb moisture from the foundation soil, resulting in reduction of their voids and even weathering. Due to this the ground near the wall depresses down. If the roots penetrates below the level of footing, settlements may increase, resulting in foundation cracks.

6. **Atmospheric action**. The behaviour of foundation may be adversely affected due to atmospheric agents such as sun, wind, and rains. If the depth of foundaion is shallow, moisture movements due to rains or drought may cause trouble. If the building lies in a low lying area, foundation may even be scoured. If the water remains stagnant near the foundation, it will remain constantly damp, resulting in the decrease in the strength of footing or foundation wall. Hence it is always recommended to provide suitable plinth protection along the external walls by (i) filling back the foundation trenches with good soil and compacting it, (ii) providing gentle ground slope away from the wall and (iii) providing a narrow, sloping strip of impervious material (such as of lime or lean cement concrete) along the exterior walls.

Q5A)What sort of method will you suggest for preventing dampness in building at your home town. Explain with a valid reason

Ans**; Method for preventing dampness in building;**

Prevention of Dampness;

The following are the remedies for making a building damp-proof :

1. By providing a layer of damp-proofing material between the foundation and the plinth, to check the rising of mois¬ture from the sub-soil.
2. By plastering the external walls which are subjected to showers of rain by cement mortar, so that rain water may not percolate in.
3. By providing copings on the top of walls and parapets. This will prevent descending of moisture from the top of the walls.
4. The building should be properly oriented so that, each room should have sufficient ventilation and may get sufficient sunshine

Effects of dampness;

The following are the effects of dampness :

1. A damp building creates unhealthy conditions for the inhabitants.
2. It disintegrates the structure.

3. Unsightly patches, called efflorescence are formed on the surface of walls.
4. Decay of timber takes place rapidly in the damp climate.

Sources of Dampness;

The various causes which are responsible for causing dampness in a building are as **follows :**

Rising of moisture from the ground;

The subsoil moisture, present below the ground level, rises through the foundation beds due to capillary action.

From the external walls;

If the faces of walls are subject to heavy showers of rain, or if they are not being protected properly, the water will percolate in and causes dampness.

Top of walls;

Parapet and compound walls also become a source of dampness as the rain water descends down the wall and causes dampness.

Condensation;

When warm humid air is cooled, conden¬sation takes place. Due to condensation, moisture is deposited on the walls, floors and ceilings and causes dampness.

Dampness in a building may occur due to faulty construction, the use of poor-quality building materials or bad architectural design. Dampness affects the lifespan of a building or structure, but it also creates unhygienic conditions. Mold and fungi love to grow in damp conditions, so it is best to fix any signs of wet concrete as soon as possible. One of the most important requirements .of a building is that it should remain dry, that is, damp proof. If this condition is not satisfied, it is likely that the building may become unhygienic to the inhabitants and unsafe from the structural point of view, because dampness breeds germs of certain diseases and disintegrates the structure

The measures taken to prevent water from leaking into a roof is usually called waterproofing. The treatment given to a structure to keep its basement, floor and walls dry is called damp proofing. Some of the problems caused by dampness in a building include the disintegration of bricks, stones, tiles; the softening and crumbling of plaster; the corrosion of metals; the warping, buckling and rotting of timber; the presence of termites; deterioration to electrical fittings and the bleaching and flaking of paint with the formation of coloured patches.

What causes dampness in a building;

The absorption of moisture by building materials is one of the main causes of dampness. This can be caused by faulty structure design, bad workmanship or the use of defective structures or materials.

Sources of dampness in buildings include the rising of moisture through the foundation walling; splashing rainwater which rebounds after hitting the wall surface; penetration of rainwater through unprotected tops of walls, parapets or compound walls; gutters which allow rainwater to descend through the top supporting wall. In the case of buildings with flat roofs, inadequate roof slopes, improper rainwater pipe connections and defective junctions between roof slabs and parapet walls can also cause dampness.

Types to prevent dampness in a building;

Membrane damp proofing;

This involves placing layers of water-repellant materials between the source of dampness and the structure. This type of material is commonly known as damp proof course (DPC). It could be made from materials like plastic or polythene sheets, cement-based concrete, bituminous felts or asphalt. Applying DPC in a basement is usually referred to as tanking and can prevent ground moisture from seeping into the concrete walls.

Integral damp proofing;

This form of damp proofing involves adding certain waterproofing compounds to the concrete mix to increase its impermeability (resistance to absorbing moisture). The compounds made from sand, clay or lime help to fill the voids in concrete and make it waterproof. Compounds such as aluminium sulfate, calcium chlorides and alkaline silicates chemically react when mixed with concrete, producing waterproof concrete.
Surface proofing;
This type of treatment involves filling up the pores of the surfaces subjected to dampness. Water repellent metallic soaps such as calcium and aluminium oleates and stearates are often used for this purpose. Cement coating, transparent coatings, paints, varnishes and bituminous solutions also fall under this category. Another economical option for damp surface treatment is lime cement plaster. This effectively prevents dampness in walls as a result of rain.

Guniting;

For this type of damp-proofing, a cement gun machine is used to deposit a layer of rich cement mortar over the surface. The surface must be completely cleaned of dirt, dust, grease or loose particles by wetting it properly. Cement and sand (or fine aggregates) are then fed into the machine. This mixture is finally shot onto the prepared surface under a pressure of 2 to 3 kg per square centimetre by holding the nozzle of the cement gun at a distance of 75 to 90 cm from the working surface.

Cavity wall construction;

This form of damp-proofing consists of protecting the main wall of a building by an outer wall, leaving a cavity between the two walls. The cavity prevents moisture from spreading from the outer to the inner wall.
These five methods of damp-proofing will help to protect concrete structures from excess moisture, which can lead to mold, fungus, rot and damage to buildings. Contractors and homeowners must always inspect their buildings for any signs of stress and damage, such as dampness, which could affect the integrity and durability of the structure.

Q5B) Explain the different methods of fastening with rope.

(ANS). The following methods are standard safe methods to be used in cable fastening: Short splices, eye to eye splices, cat's paws, knots, molles and rolled eyes are not recommended, except for temporary purposes. They should not be used where they are subjected to strain. Eye splices in all "regular lay" lines should be tucked at least three times. Eye splices in "lang lay" lines should be tucked four times. Splices other than eye splices in "lang lay" lines are not recommended.

Cable clips 80% of rated rope strength will be considered developed by the use of U-bolt type clips properly attached and in conformity with number and spacing as given in the following table:

Clips should be spaced at least six rope diameters apart to get the maximum holding power and shall always be attached with base or saddle of the clip against the stress-bearing or standing strand of the rope. End fastenings The rated efficiency of various types of end fastenings shall be as follows: Sockets - poured zinc 100 Pressed or Swaged (Factory made) 100 Open-wedge Sockets 80 to 90 Clips ("U" bolt type) 80 Spliced-in Thimbles: 1/4 inch diameter and smaller 90 5/16 inch diameter 89 3/8 inch diameter 88 1/2 inch diameter 86 5/8 inch diameter 84 3/4 inch diameter 82 7/8 inch diameter and up 80

Making long splices in wire rope The safe margin of line to be used in making a long splice is indicated in the following table. The full length of the splice will be twice the length "to be unraveled".

Attaching wire rope sockets The following recommendations of wire rope manufacturers should be followed in attaching sockets or similar end fastenings.

1. Serve the rope with soft tie wire before cutting. Place two additional servings at a distance from the end equal to the length of the basket of the socket. For ropes of over 1-1/4" these servings should be several inches wide. This is important as it prevents loosening of the lay. If the lay becomes untwisted it means unequal tension on the strands and loss of strength when load is applied.

2. Take off the end serving. Leave other servings in place at distance from end equal to length of basket. Cut out hemp center back to serving. Untwist and broom out wires.

3. Clean the broomed wires thoroughly, for the distance they are to be inserted in the socket, with benzine, naphtha or gasoline. Then dip broomed wires into commercial muriatic acid to a depth of three-quarters of the length of the cleaned wires. Time in the acid 30 seconds to 1 minute or until acid has thoroughly cleaned every wire. Do not let acid touch the hemp or any other part of the rope. Dip wires in boiling hot water containing small amount of soda to neutralize the acid.

4. Draw the ends of the cleaned wires together with soft wire. Insert tied wires into basket of socket. Be sure the socket is lined up with axis of rope otherwise there will be uneven pull on strands.

5. Cut the temporary tie wire-broom out wire in basket of socket. Seal up base of socket with clay, putty or something similar. Pour molten zinc into the basket until it is full. Tap side of socket with hammer while zinc is still molten.

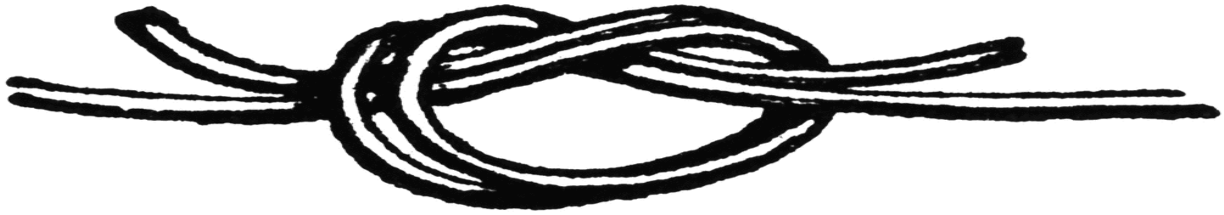
6. Use pure zinc only (not babbit nor lead). If these are used, strength of fastening will be less than strength of rope.

7. Zinc must not be too hot or it will anneal wires. Temperature should not be above 830° Fahrenheit. Use pine stick test. If pine stick chars but does not ignite zinc is ready to pour. If zinc is too hot it has red color and stick will catch fire

Knots and Splices

Knots and splices include all the various methods of tying, fastening, and joining ropes or cords. Generally, the requirements of a useful knot may be stated to be that it should neither ‘slip’ nor ‘jam’– I. e. that, while it holds without danger of slipping while the strain is on it, when slackened it should be easily untied again. A simple method of fastening a rope to a hook is the blackwall hitch (9), where the strain on the main rope jams the end so tightly against he hook that it cannot slip. “—(Charles Leonard-Stuart, 1911

Knots and Splices



“Knots and splices include all the various methods of tying, fastening, and joining ropes or cords. Generally, the requirements of a useful knot may be stated to be that it should neither ‘slip’ nor ‘jam’– I. e. that, while it holds without danger of slipping while the strain is on it, when slackened it should be easily untied again. A useful method of uniting large ropes is shown in figure 15: tie a simple knot on the end of one rope and interlace the end of the other, and draw taut. This tie may also be made with the figure of 8 knot."—(Charles Leonard-Stuart, 1911)