**UNIT III SPECIFICATION AND TENDERS**

 **TWO MARKS**

1. **Define Arbitration. (April/May 2017)**

Arbitration is the settlement of a dispute by the decision not of a court or law but of one or more persons chosen by the parties themselves involved in the dispute.

1. **State tender. (April/May 2017)**

Tender is an offer given in writing to execute specified articles or materials at a certain rate, within a fixed time, under certain conditions of agreement between the contractor and the party, which may be a government department or an individual

1. **What are methods to be adopted for volume calculating?**
	* From cross-section
	* From spot level
	* From contours
2. **Define analysis of rates*.* (Nov/Dec 2015)**

Determination of rates of works from the qualities and cost of materials and labours required is termed as analysis of rates.

1. **Define a tender. (Nov/Dec 2016)**

Tender is an offer given in writing to execute specified articles or materials at a certain rate, within a fixed time, under certain conditions of agreement between the contractor and the party, which may be a government department or an individual.

1. **Define ‘contract’ (Nov/Dec 2013)**

Contract is merely an agreement being enforceable by law between two persons or parties.

1. **The actual expenditure incurred in the construction of a school building which have a total length of main walls 140m is Rs.4.97lakhs.Estimate the approximate cost of a similar school building which will have 180m length of main walls.**

Total expenditure = Rs.4,97,000

Total length of main walls = 140m

Rate per m length of main wall = 4,96,000/140= Rs.3550/-

Length of main walls in the proposed building = 180m

Approximate cost = 180 x 3550 = Rs.6,39,000/-

1. **Write the essentials requirements of contract.**
	* There must be an offer of one party, and its acceptance by the other party to make an agreement.
	* There must be an intention of both the parties to create legal relation.
	* The object of the contract must be legal, and it must not be opposed to any policy of the government or company.
	* The agreement to make a contract should be supported by consideration, or recognized by law.
2. **What are the types of contract? (May/June 2014)**

1. Lump-sum contract

2. Cost plus percentage of cost contract

3. Item rate contract

4. Labour contract

5. Integrated contracting system

1. **What are the important legal implications of a contract?**
	* Agreement should not violate the provisions of law.
	* It should not have any adverse effect on the morals of the society
	* The form of contract should be in writing and each page of the documents of the contract should of the contract should be signed by both the parties.
	* A contractor who refuse to carry out the work before completion can be sued in a court of law for breach of contract.
2. **Describe general or brief specification**

General specification gives the nature and class of work and materials in general to be used in the various parts of the works, from the foundation to the superstructure.

General specifications give idea of the whole work or structure and are useful for preparing the estimate.

1. **Describe detailed specification**

The detailed specifications form a part of the contract document. The detailed specification of an item of the work specifies the qualities and quantities of materials proportion of mortar workmanship, the method of preparation and execution and method measurement. The detailed specifications of different items of work are prepared separately which description what the work should be and how they should executed and constructed.

1. **What are the types of penalties that are imposed on a contract and why are they imposed?**

 Penalties may be imposed for non-fulfillment of conditions of contract such as not maintaining progress, deley in completion and unsatisfactory work etc. The penalty may be fixed sum per day or a percentage of the estimated cost upto 10%

1. **What is a tender notice?**

Tender notice is the publicity of offer to the contractor to quote their rates for construction for construction work or supplied. Sealed tenders are invited in the most open and public manner. It is made public by advisement in leading newspaper, in the government gazette or by notice in English and in the regional languages in public places.

1. **What informations should a contract document contain?**

1. Title page

2. Index page

3. Tender notice and tender forms 4.Schedule of quantities 5.Drawings

6. General specifications

7. Detailed specification

8. Schedule of issue of materials

9. Conditions of contract

1. **What are types of termination of contract?**

Agreement

Breach

Performance

Impossibility of performance

Operation of provision of law

1. **What are the conditions of contract?**

Conditions relating to documents

 Conditions relating to the execution of work

 Conditions relating to labour and personal

1. **Define Engineer.**

He is the person appointed by the owner. He is technically very sound in work an his job is to see that the work is being done by contractor entirely according to drawings and specification.

1. **Define Owner.**

The person of behalf of which work is to be done. He may be an individual or firm or organization .

1. **Define Site.**

Site means the place where the work is to be executed

1. **Define Drawings.**

The section, map, plans etc… which completely define the construction work geometrically is known as drawings

1. **Define work.**

It means the work is to be carried out under this contract.

1. **What is called Tender Notice?**

The notice inviting tender is called tender notice.

1. **Define Specification:**

The drawings of a structure show the propositions and its relative position of its various parts is called specification.

1. **What are the object of specification? (May/June 2014)**
	1. Quality
	2. Instruction
	3. Aim of the project
2. **What are the types of specifications?**
	1. Brief Specification.
	2. General specification.
3. **Define Arbitration.**

Arbitration is the settlement of a dispute by the decision not of a court or law but of one or more persons chosen by the parties themselves involved in the dispute.

1. **Define Arbitrators.**

The persons chosen have the right to take decision are called arbitrators.

**27 What are the types of Arbitration?**

* 1. Arbitration without intervention of court.
	2. Arbitration with intervention of court and there is no suit pending
	3. Arbitration is suits.

 **28. Define analysis of rates*.* (Nov/Dec 2014)**

Determination of rates of works from the qualities and cost of materials and labours required is termed as analysis of rates.

**29. What are the data necessary for the preparation of tenders? (Nov/Dec 2014)**

The preparation of tender and contract documents, including all survey and design work needed to prepare quantities and guideline costings, should take place in good time.

**30. List the reasons for rejection of all tenders. (April/May2015)**

 (i)The tenders with incomplete information are liable to be rejected.

(ii)The tender is liable to be rejected in limini for not complying with necessary tender conditions.

**31. List the qualities of an arbitrator. (April/May2015)**

An arbitrator should have knowledge and expertise in the matters over which he presides. Competence is demonstrated either through academic qualifications, professional expertise in the matters that are in dispute or previous arbitration experience. A good arbitrator quickly and accurately grasps the issues in dispute and applies his knowledge in the area to make an award that conclusively ends the matter. The arbitrator should also be well-versed in arbitration rules and practices to render satisfactory decisions.

**SIXTEEN MARKS**

* 1. **Write a detailed specifications of the followings (April/May 2017)**
1. **Excavation of foundations**
2. **Cement concrete**
3. **Reinforced cement concrete**
4. **Damp proof course**
5. **EXCAVATION OF FOUNDATIONS**

Equality of pressure should be aimed at in designing foundations. The foundation Trenches shall be taken down to the exact width of the widest part of the foundation. The trenches where possible shall always be taken down to a few cms into good hard soil. In order to ascertain the nature of the soil, it is essential to dig trial pits at each of the four corners of the proposed site of a building before starting the construction.

The bottoms of all trenches shall be well watered and rammed. The soft and defective place shall be filled with concrete or with any other hard material as directed by the Engineer-in-charge.

If, however, rocky surface is met, it shall be made as leveled as possible and any small in equalities shall be filed with concrete

1. **CEMENT CONCRETE**

Ingredients

Cement, sand, brick or stone aggregate, gravel or shingle and water

**Cement**

Cement shall be Portland cement of the Indian standard Specifications as perIS: 269. All cement shall be brought to the site of work in bags with the seals in tack. Fresh and from moisture. All cement shall be gauged by weight and shall be added at the mixture in whole 50kg.bags.

**Fine Aggregate (Sand)**

It shall consist of clean, hard, uncoated grains of natural sand or crushed stone sand rushed gravel sand or combination of any of these free clay, loam, silt, organic or other deleterious substances. The sand shall be washed before using Fig.8.1 shous the trough for washing sand.

**COURSE AGGREGATE**

Coarse aggregate (bajri or grit ) shall consist of good hard tough and clear water worn bajri obtained from natural streams. The girl shall be free from dirt, clay, leaves or other organic matter and soft or decayed

stone and shall be of the gauge specified according to the nature of the work.

**WATER**

Water used in construction shall be clean, free from earthly, vegetable or organic impurities: like alkalis, salts etc. which cause efflorescence and affect setting time of mortar.

1. **REINFORCED CEMENT CONCRETE**

The standard mix for reinforced cement concrete is (1:2:4).

In addition to this, round steel bars are embedded to make the structure strong to take up all the tensile stresses.

**MIXING**

The two ingredients i.e. cement and sand shall be hand mixed dry, three or more times until the mix comes to a uniform colour. The measured quantity of coarse aggregate shall then be added to the mixture and whole mixed dry thoroughly.

 **Reinforcement**

Round steel bars as far as possible shall be used in preference to square bars. The bars shall be thoroughly cleaned of rust, scale and of coatings that might destroy or reduce bond. The ends of all bars shall be properly hooked and bends shall be made as per drawing and design supplied. In case of joints in reinforcement an overlay of not less than 40 diameters shall be given for tension member. Figs.8.3,8.4 and 8.5 show the method of bending and overlapping the steel bars.

 **MIXING CEMENT CONCRETE (1:2:4 OR 1:3:6)**

1. The two ingredients i.e. cement and sand shall be mixed dry, three or more times until the mix comes to a uniform colour. The measured quantity of coarse aggregate shall than be added to the mixture and whole mixed dry thoroughly. The required quantity of water shall then be added with a rose

 **DAMP PROOF COURSE**

In order to prevent water absorption form the soil and thus causing dampness in the walls, a continuous layer of an impervious material is provided. Such a material is known as a horizontal damp proof course. It consists of cement concrete 1:2:4, I part cement washed sand and 4 parts shingle (gauge 6mm to 20mm,) Unless and otherwise specified, the damp proof course shall consist of 4 cm, thickness of cement concrete with one coat of bitumen laid hot @ 1 kg. per square meter of Damp proof course and be sanded immediately.

* 1. **Briefly explain the each and every heading and items for the preparation of contract document? (April/May 2017)**

Contract Document

Before the work is given out on contract an arrangement or bond is prepared. The following document sit shall be attached to the concrete agreement or bond which should be duly endorsed and sealed. Each page shall bear the signature of the contractor and the accepting and all corrections shall be similarly installed:-

1. title page – having the name of work, contract bond number, tc

2. Index page – having the contents of the agreement with page reference

3. Tender notice – giving brief description of the work, estimated cost of work, date and time of the tender, amount of earnest money and security money, time of completion, etc earnest money, usually 2% of the estimated cost, is deposited along with tender

4. Tender form; giving the bill of quantities, contactors rates, and total cost of works, and time for completion, progress of works, security money, penalty clause etc.

5. Bill of quantities or schedule of quantities – giving quantities and rates of each item of work and cost of each item of work and the total cost of the whole work.

6. Schedule of issue of materials giving list of materials to be issued to the contractor with rates and place of issue

7. General specification -= specification the class and type of works in general

8. Detailed specification – of each item of work, and of each materials to be used in the work

9. Drawings – Complete set of drawings including plans, elevations sections detailed drawing etc and site plan all fully dimensioned

10. Condition of contract – containing the terms and conditions of contract in detail. The conditions specify the following :-

(i) Rates inclusive of materials, transport, labour, T and P all other agreements necessary for completion of work

(ii) Amount of the security money,

(iii) Time for completion of the work

(iv) Progress to be maintained

(v) Penalty for unsatisfactory and bad work

* 1. **Explain the** **General Specifications of First Class Buildings**

 **(May/June 2014, Nov/Dec2016)**

**Foundation and Pliath** :- Shall be of first class burnt bricks in lime or cementmortar(1:6)over a bed of cement concrete. (1:6:12 or 1:8:16)

**Superstructure:-** Shall be of first class burnt brick work in lime or cementmortar (1:6)

**Damp Proof Course**:- Shall be of a cm thick cement concrete (1:2:4) with on-layer ofbitumen laid hot or any other specified water proof material.

**Roofing:-** Shall be of R.C.C. slabs (1:2:4) covered with two coats of bitumenlalid hot and a layer of lime or cement concrete 8 cm. thick over it with a tile flooring with cement flush with cement flush pointed on the top.

**Flooring:-** Shall be of TERRAZO in drawing, dining, bath and W.C., 4 cm thickplain conglomerate polished floors in bed rooms and in other rooms.

**Doors and Windows**:- Doors and windows shall be of teak wood, paneled orpaneled and glazed with gauze shutters to outer doors and fixed wire gauze to windows and ventilators Fittings shall preferably of brass or good quality metal.

**Finishing:**- The inside and outside walls shall have 1.25 cm. thick cementplaster. Drawing, dining and bed rooms inside of walls shall have 2 coats of distemper and other rooms shall have three coats of white washing. The outside of the wall shall have two coats of colour washing over one coat of white washing.

**Painting:**- Doors and windows shall be given three coats of white lead whereexposed and white zinc or cream or grey silicate paint elsewhere.

**Miscellaneous:-**

First class buildings shall be provided with first class sanitary and water supply fittings and electrical installations. A plinth protection 1.50 m. wide of bricks sloped away from the building shall be provided all round the building.

Plinth Area Rate

Rs. 4500.00 to Rs. 5,500 per sq. meter. (Rates variable)

* 1. **Explain the General Specifications Of Second Class Buildings**

**Foundation and Plinth**:- All walls shall be built of first class burnt bricks laid inmud mortar over a bed of lime concrete or cement concrete. Top course of the plinth shall be laid in cement motar(1:6)

**Superstructure:** - All walls shall be built of first class burnt bricks laid in mudmortar.

The Following portions to be built in cement mortar (1:6.)

* 1. Shills of windows, C. windows and almirahs.
	2. Back of almirahs.
	3. Top course of parapet.
	4. Jambs of doors, windows, C. windows and almirahs.
1. Drip course, cornice and weather course etc.
2. Two courses below the R.C.C. slab and roof battens.

**Damp proof Course**: - Damp proof course 4 cm thick shall be of Portlandcement concrete (1:2:4) with one coat of bitumen laid hot.

**Roofing:-** All main rooms shall have R.B. roof or R.C. roof and first class orsecond class mud roofs over other rooms.

**Floors:-** the main rooms shall have conglomerate floors and verandahs shall haveflat or brick on edge floors over cement concrete and sand.

**Doors and Windows:-** Interior and exterior surface of wall shall be cementplastered 1.25 cm thick, covered with three coats of white washing.

**Painting:** - Doors and windows shall be painted with three coats of chocolatepaint or any other approved paint.

**Miscellaneous:-** Roof drainage shall be carried by means of Gargolyes andkhassi parnalas. Plinth protection1.50 m. wide of bricks shall be provided all round the building.

Plinth Area Rate: Rs. 2500 to Rs.3000 per sq.m

**5.** **Explain the** **general specification for third class buildings**

**Foundations and Plinth**: - All walls shall be built of second class burnt laid inmud mortar over bed on lime concrete.

**Superstructure: -** All walls shall be built of second‟s class burnt bricks laid inmud mortar.

**Roofing:-** All rooms shall have second class mud roof and the verandahs shallhave G.I. sheet roof.

**Floors:**- Floors everywhere shall be of brick over mid concrete and cement

pointed.

**Doors and Windows: -** Doors and windows shall be of kail, Chir, Mango or anyother soft wood, ledged, battened and braced type.

**Finishing: -** Interior surface of walls shall be mud plastered and covered withthree coats of white washing. The outside surface shall be flush lime pointed.

**Painting: -** Doors and windows shall be give two coats of ordinary chocolate

paint.

Plinth Area Rate: - Rs. 1500.00 to Rs. 1800.00 per sq.m.

**6.** **Explain the** **general specifications of fourth class buildings**

**Foundation and Plinth**:- All walls shall be built of se3cond class brick work laidin mud mortar.

**Superstructure:** - All walls shall be built of sand molded sun dried bricks laid inmud mortar with the exception of the following which shall be built in second class brick work in mud.

1. Two courses underneath the roof battens.
2. Jambs of doors and windows.
3. Pillars under the roof beams.
4. Sills of windows, C. windows and almirahs.

**Roofing:**- Third class mud roof.

**Floors: -** Mud floors(2.5cm) mud plaster over the rammed earth

**Doors and Windows**:- Doors and windows shall be of kail, chir or any other softwood battend doors.

**Finishing:**- mud and mud plaster inside and outside. **Painting:** Two coats of ordinary paint.

**Plinth Area Rate**:- Rs. 800.00 to Rs. 1000.00 per sq.m.

7**. Explain the detailed specifications of constructions and specify the nature of work. (Nov/Dec 2015, May/June 2013)**

***1.*** **EXCAVATION OF FOUNDATIONS**

Equality of pressure should be aimed at in designing foundations. The foundation Trenches shall be taken down to the exact width of the widest part of the foundation. The trenches where possible shall always be taken down to a few cms into good hard soil. In order to ascertain the nature of the soil, it is essential to dig trial pits at each of the four corners of the proposed site of a building before starting the construction.

The bottoms of all trenches shall be well watered and rammed. The soft and defective place shall be filled with concrete or with any other hard material as directed by the Engineer-in-charge.

If, however, rocky surface is met, it shall be made as leveled as possible and any small in equalities shall be filed with concrete.

**2.** **EARTH FILLING**

Earth used for filling shall be free from saltpeter and white ants and only foamy and clayey soil free from clods shall be used. It shall be laid in 15 cm layers and each layer shall be well watered and rammed with iron rammers. In case of high embankments, the layers shall not exceed 30 cm depth and the settlement allowances shall be made @ 10% of the height of uncomapacted fills.

**3.** **Concrete in foundations**

Lime concrete or cement concrete shall be used in foundations to be a base for the super structure.

**LIME CONCRETE**

Ingredients

Lime, Surkhi, Sand, Brick ballast or stone ballast and water.

 **Lime**

Lime is always used as putty lime of class „B‟ [semi – hydraulic or quick lime form] and Class „C‟ [Non- hydraulic in hydrated or quick lime form], shall be used as directed by the Executive Engineer.

The hydrated lime used should be thoroughly mixed with water in suitable container. It shall then be stirred into thick consistency and left undistributed for not less than 36 hours. Extra water should be drained out and putty should be bused. Similarly quick lime should be converted into putty. The volume of lime putty shall be taken as equal to the volume of dry slaked lime.

**surkhi**

Surkhi shall be obtained by pounding fully bricks or bats. It shall be free from admixture of claly, dust or foreign matter. No un burnt bricks or bats shall, be used for grinding in to surkhi.

 **Aggregate**

The brick aggregate shall be broken from first class or second class bricks or their bats, or from dense over burnt bricks. The gauge of the ballast shall be 2 cm to 4 cm.

The stone aggregate shall consist of good hard tough broken stone, gravel or shingle of the gauge specified. It shall free from dirt, leaves or any other organic, or admixture of soft or decayed stone.

**Water**

Water used in construction shall be clean, free earthly, vegetable or organic impurities, like alkalis, salts etc. which cause efflorescence and affect setting time of mortar.

1. **Mixing And Laying**

The aggregate previously well soaked, shall be measured and laid on a clean platform of brickscyut 555 or wood. The platform shall be sufficient size to give ample room for mixing 23 to 28 cub.m. of concrete. Lime and surkhi shall be measured and laid on the aggregate. The whole dry and wet mix is then turned over three or four times so that it shall be thoroughly mixed concrete shall be laid slowly and gently in layer of 15 cm (not thrown from a height) and thoroughly consolidated with 5.5 kg. Rammers shall be used for consolidating the edges.

**5.** **Tests**

The consolidation of a concrete is said to be complete if (a) a stick end ways from a height of I m rebounds with ringing sound. (b) The second test is by digging a hole in the concrete and pouring water in the hole. If the consolidation in complete, the water shall not be absorbed in the.

**6.** **Curing**

The concrete shall be kept wet for a period of at least ten days no brick work masonry shall be laid on the concrete for at least seven days after laying.

**PERMISSIBLE SAFE LOADS OF FOUNDATIONS.**

|  |  |  |
| --- | --- | --- |
| SOIL |  | Lonnes per sq.m. |
| Ordinary earth | …… | 5.46 |
| ….. |  | 5.46 |
| Make up ground, well consolidated | …… | 5.46 to 10.93 |
| …… |  | 8.20 to 16.40 |
| Soft clay | …… | 16.40 to 21.86 |
| …… |  | 21.86 |
| Loamy soils and sand mixed clay | …… | 32.80 to 43.70 |

**7. USE OF COARSE AAGAGREGATE FOR DIFFERENT TYPES OF**

**CONCRETE**

(I) 65mm, Nominal size:

For unreinforced mass concrete word on ordinary work.

(ii) 40mm, Nominal size:

For unreinforced mass work of cement concrete on small jobs over 15 cm minimum dimensions. For reinforced works, it shall be used where the dimension of members exceed 45cm.

(iii) 20mm Nominal size:

Unless otherwise mentioned, if will be used as under-

1. Unreinforced cement concrete work between 5cm minimum size.
2. Conglomerate floor.
3. R.C.C. works exceeding 12cm but not exceeding 45cm in minimum dimension.

(iv) 15mm Nominal size.

Unless otherwise mentioned and specified, this aggregate shall be used in cement concrete works of the following description.

* 1. R.C.C. lintels and slabs under12cm and more than 5cm.
	2. R.C.C. posts and battens less than 40cm sectional area.
1. **CEMENT CONCRETE**

Ingredients

Cement, sand, brick or stone aggregate, gravel or shingle and water

**Cement**

Cement shall be Portland cement of the Indian standard Specifications as perIS: 269. All cement shall be brought to the site of work in bags with the seals in tack. Fresh and from moisture. All cement shall be gauged by weight and shall be added at the mixture in whole 50kg.bags.

**Fine Aggregate (Sand)**

It shall consist of clean, hard, uncoated grains of natural sand or crushed stone sand rushed gravel sand or combination of any of these free clay, loam, silt, organic or other deleterious substances. The sand shall be washed before using Fig.8.1 shous the trough for washing sand.

 **COURSE AGGREGATE**

Coarse aggregate (bajri or grit ) shall consist of good hard tough and clear water worn bajri obtained from natural streams. The girl shall be free from dirt, clay, leaves or other organic matter and soft or decayed

stone and shall be of the gauge specified according to the nature of the work.

**WATER**

Water used in construction shall be clean, free from earthly, vegetable or organic impurities: like alkalis, salts etc. which cause efflorescence and affect setting time of mortar.

**8.** **MIXING (CEMENT CONCRETE 1:6:12 ETC)**

In all proportions of cement concrete except 1:1 ½:3, 1:2:4 and 1:3:6, the measured quantity of cement is to be placed on top of the measured quantity of the aggregate (fine and coarse) and the whole mass mixed three or four times so that it shall be thoroughly incorporated. The required quantity of water (clean, rather drinking water) shall then be added and the entire wet mass shall be turned over unto the homogeneous mixture of the required consistency is obtained.

**9.** **LAYING AND CONNSOLIDATION OF CEMENT CONCRETE IN FOUNDATIONS**

Concrete shall be handed from the mixing platform to the place of final deposit as rapidly as possible. It shall be laid slowly and gently in layers of 15cm (not thrown from a height) and thoroughly consolidated with 5.5 kg. Rammers.

**10. FARMA OR BATCH BOX**

The design of the farma (Fig. 8.2) is given below

15” x 15” x 9 x 5”/8 = 1.25 cft.

Or 38cm x 38 cm x 25cm = .036m

**11. REINFORCED CEMENT CONCRETE**

The standard mix for reinforced cement concrete is (1:2:4).

In addition to this, round steel bars are embedded to make the structure strong to take up all the tensile stresses.

**12. MIXING**

The two ingredients i.e. cement and sand shall be hand mixed dry, three or more times until the mix comes to a uniform colour. The measured quantity of coarse aggregate shall then be added to the mixture and whole mixed dry thoroughly.

**13. Reinforcement**

Round steel bars as far as possible shall be used in preference to square bars. The bars shall be thoroughly cleaned of rust, scale and of coatings that might destroy or reduce bond. The ends of all bars shall be properly hooked and bends shall be made as per drawing and design supplied. In case of joints in reinforcement an overlay of not less than 40 diameters shall be given for tension member. Figs.8.3,8.4 and 8.5 show the method of bending and overlapping the steel bars.

**14. MIXING CEMENT CONCRETE (1:2:4 OR 1:3:6)**

The two ingredients i.e. cement and sand shall be mixed dry, three or more times until the mix comes to a uniform colour. The measured quantity of coarse aggregate shall than be added to the mixture and whole mixed dry thoroughly. The required quantity of water shall then be added with a rose.

**15. PLACING AND HANDLING THE CONCRETE**

Concrete shall be handled from the mixing platform to the final deposit as rapidly as possible. After depositing, the concrete is to be ridded, vibrated, tamped or worked to ensure that no hollow places are left.

**16. FORMS AND CENTRING**

Forms wherever required shall be sufficiently rigid and strong to withstand the weight placing and putting of concrete and the movement of labor, material and plant. Forms shall be sufficiently water right to prevent leakage of mortar. Forms shall be supported or fixed by wedges of the load being eased and the forms removed without sock to the work and without hammering.

**17. LAYING**

Before depositing the concrete, the reinforcement shall be correctly laid in position and secured against displacement by tying with soft iron wire. The bars shall remain in position 20 mm. above the surface of centering.

**18. CURING**

The concrete when laid shall be carefully protected from the extremes of weather and temperature and from unequal or too repaid drying. It shall be thoroughly kept wet for at least 15 days.

**19. EXPASION JOINTS**

In every long lengths of slab work, expansion joints shall be provided at intervals of about 9 m. to 12m.

**20. BEARING**

The bearing of slabs not be less than the thickness of the slab with a minimum of 12cm.

**21. DAMP PROOF COURSE**

In order to prevent water absorption form the soil and thus causing dampness in the walls, a continuous layer of an impervious material is provided. Such a material is known as a horizontal damp proof course. It consists of cement concrete 1:2:4, I part cement washed sand and 4 parts shingle (gauge 6mm to 20mm,) Unless and otherwise specified, the damp proof course shall consist of 4 cm, thickness of cement concrete with one coat of bitumen laid hot @ 1 kg. per square meter of Damp proof course and be sanded immediately.

**8. Explain about the detailed specifications of roads**

* 1. **Earth filling (Embankment)**

Before any earth work is commenced, the ground be cleaned of all trees jungle and roots of every description. The embankment shall be made from borrow pits on either side of the road.

The earth work should be laid in layers of 15 cm. to 23 cm. and consolidated by rollers, preferably sheep‟s foot rollers. The final compaction may be ordinary power roller.

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**II. Soling coat**

1. Soling shall always be provided under the wearing coat except when the road is founded on a very hard natural surface such as on rock.
2. **Width**

The width of the soling shall always be 30 cms. More than the proposed width of the carriage way. For instance, if the carriageway is 3.60 m., the width of soling shall be 3.90 m. In case where bricj on end edging is provided the width of soling shall be same as that of the width of carriageway.

**III. Collection of soling**

Where soling coat of bricks is to be provided, all bricks shall be fully burnt or over burnt. The bats which are less than half a brick in size shall not be used.

**4. Stacking**

The bricks or stones collected shall be stacked parallel to the centre line of the road and clear from the formation width. Gaps at least 1.5 m. wide must be left in every line of the bricks, for drainage etc.

**5. Stone**

The stone shall be hard, durable and tough in texture and be obtained from an approved quarry.

**6. Kankar**

The kankar shall be tough and heavy, with a bluish fracture. After digging, it must be spread out for at least a month before being brought to the road side.

**7. Laying**

The soling shall be laid at a stretch, the depth of which be equal to the depth of soling. The trench shall be filled and the camber should be the same as that o the finished surface.

The soling shall be laid carefully, hand packed with interstices filled with smaller pieces of the same material. Before laying the soling coat the sub-grade shall be thoroughly leveled and care shall be taken to see that the subgrade is hard and well consolidated and there are no soft pots and depressions.

**8. Kankar**

After lying the soling, earth or sand shall be spread over it to a thickness of

* 1. cm. so that joiners of the soling may be filled up by sand or earth.
1. **Measurement**

In case of soling of stone boulders, stacks shall be measured 35 cm. high but paid as 30cm. to allow for loose stacking, in case of kankar, the stacks shall be measured 32.5 cm. high but shall be paid as 30cm.

**IV. Wearing coat (consolidation**).

**10**. The metal shall be broken from hard durable tough stone of uniform texture from an approved quarry. Where metal has been broken from water worn boulders, no individual boulder shall weigh less than 3.6 kg. a piece.

**11. Measurement**

In order to allow for loose stacking, shall be 32.5 cm. high but shall be paid as 30 cm.

**V. Wearing coat (consolidation)**

**12. Preparation of surface**

The surface of the soling shall be thoroughly cleaned of all dirt and brought to the camber that the finished road is to have. Two parallel bunds of clay puddle, 23 cm. wide and 15cm. deep shall be made along the other edges of the medaling.

The bunds shall be strong enough to prevent the new metal from spreading as well as to retain the water used in consolidation.

**13. Spreading of metal**

The stone metal shall then be spread over the surface true to the template Fig. 8.9. The metal shall be carefully packed, the bigger pieces being placed below and the smaller pieces on the interstices of the bigger pieces. The templates shall be used at a distance of approximately 7.5 m. from one another.

***14. Rolling and consolidation***

The metal shall then be rolled with a road roller commencing at the edges and working towards the centre. The metal is to be rolled dry until well compacted and there is no appreciable wave in front of an advancing roller.

The whole medaling shall then be thoroughly water and kept saturated rolling continued until the consolidation is finished to the satisfaction of the engineer-in charge.

**15. Bajri binding**

After the consolidation is practically complete, the binding material such as fine bajri obtained from screening or from a quarry shall be spread and the rolling and watering continued to such an extent that the binding material is formed into slurry and is grouted into interstices.

**16. Camber**

The camber of the template shall be 1 in 60 if the road is intended to be painted, 1 in 72 if a cement concrete surface is to be provided. .

**9. Explain in detail about the preparation of tender notice (Nov/Dec 2015, May/June 2013)**

**Procedure for works**

Condition (vi) date time and place of tender; (vii) Amount of earnest money and security money; (viii) Validity of tender, etc \tender notice is posted in the notice board of the department and for major work tender notice in brief is also given is the newspaper.

A typical tender notice inviting tenders is given below The blank spaces are to be filled up as required

**Tender notice**

1. Sealed tenders will be received up to ................. A.M/P.M on the................. of 19................. by the executive engineer................. division for the following work.................

Name of work .................Estimated cost Rs .................

2. The work must be completely finished to the satisfaction of the executive engineer within ................. months from the data of the order to commence the work.

3. The tender form with complete sets of blank forms of contract can be obtained from the office of the excutive engineer .................Divisions at ................. every day (expect Sunday and holiday) from ................. A.M. to ................. P.M at a charge of Rs ................. per set.

4. Each tender must be accompanied by a deposit of Rs ................. as earness money. Such earnest money may be of the following forms;-

(i) Cash Treasury challan

(ii) Post office savings bank pass – book having the requisite amount in the account, pledged to the executive engineer

(iii) deposit receipt of state bank or other approved bank pledged to the executive engineer.

(iv) national plan loan or national saving certificate pledged to the executive engineer

5. The tenders will be opened all ................. A.M/P.M on the ................. day 19 by the executive engineer or this authorised agent at the office at

6. Power is reserved to reject any tender or all tenders without assigning any reason or given any explanation

7. Unless the person, whose tender has been accepted signs the contract and deposits the security specified within ................. days the earnest money deposited by him will be forfeited and the acceptance of his tender will be withdrawn

8. The tendered rats shall be for the complete work and shall include all quarrying charges, royalty, testing, screening, tools and plants, carriage of materials to site, removal and changes of rejected materials all taxes, income – tax, sales – tax, octopi charges, materials, labours etc

9. The tender rates will remains valid for a period of three months from the date of opening tenders

10. The quantities in the bill of quantities are approximate and liable to variation or cancellation or which contractor will not be entitled to any compensation. The quantities of any item or items and te total cost may vary by 20% for which rates shall not be altered.

11. The rate should be quoted in the bill of quantities, legibly both in figures and words

**10 . Explain in detail about the contract document (May/June 2013, Nov/Dec 2012)**

**Contract Document**

Before the work is given out on contract an arrangement or bond is prepared. The following document sit shall be attached to the concrete agreement or bond which should be duly endorsed and sealed. Each page shall bear the signature of the contractor and the accepting and all corrections shall be similarly installed:-

1. title page – having the name of work, contract bond number, tc

2. Index page – having the contents of the agreement with page reference

3. Tender notice – giving brief description of the work, estimated cost of work, date and time of the tender, amount of earnest money and security money, time of completion, etc earnest money, usually 2% of the estimated cost, is deposited along with tender

4. Tender form; giving the bill of quantities, contactors rates, and total cost of works, and time for completion, progress of works, security money, penalty clause etc.

5. Bill of quantities or schedule of quantities – giving quantities and rates of each item of work and cost of each item of work and the total cost of the whole work.

6. Schedule of issue of materials giving list of materials to be issued to the contractor with rates and place of issue

7. General specification -= specification the class and type of works in general

8. Detailed specification – of each item of work, and of each materials to be used in the work

9. Drawings – Complete set of drawings including plans, elevations sections detailed drawing etc and site plan all fully dimensioned

10. Condition of contract – containing the terms and conditions of contract in detail. The conditions specify the following :-

(i) Rates inclusive of materials, transport, labour, T and P all other agreements necessary for completion of work

(ii) Amount of the security money,

(iii) Time for completion of the work

(iv) Progress to be maintained

(v) Penalty for unsatisfactory and bad work.