

## TECHNICAL SPECIFICATIONS

### Location

H-Type colony, Rinchentse, Darla, Chukha



The work has to be executed in line with drawings, Bill of Quantities & technical specifications as detailed below:

### **1. DEMOLITION WORK**

#### **General**

Dismantling implies careful removal of materials from a structure or a part of it without damage. Demolition implies breaking up whole or part of work, structure etc. The work consists of removing any structure(s) which are in place but interfere with the new construction or are not suitable to be in place, and of salvaging and disposing of the resulting materials and back filling the resulting trenches and pits.

The scheme for dismantling (generally in the reverse order of the one in which the structure was constructed) shall be approved by the Engineer before starting the work. Necessary propping, shoring, underpinning, shielding and fencing of areas shall be carried out so that no damage is caused to adjoining work, people or property, in any manner. Temporary enclosures, partitions etc shall be provided as required. Nuisance of dust shall be kept down to the minimum. Personal Protective Equipment such as helmets, goggles, safety belts etc. shall be used wherever required as per the directives of the Engineer. First aid equipment shall be made available at all demolition works of any magnitude. OHS guidelines must be followed and practiced to prevent any workplace hazard or accident.

Dismantling shall be done in a systematic manner. Materials likely to be damaged by dropping shall be carefully removed and lowered (not thrown) and properly stacked. Nails, screws and bolts, shall wherever required, be removed by use of proper tools in order to remove items fixed with them. The latter should not be removed by tearing or ripping off.

All operations necessary for the removal of any existing structure that might endanger new construction shall be removed completely prior to the start of the work.

All materials obtained from dismantling or demolition shall be the property of the Government unless otherwise specified and such materials shall be kept in safe custody until they are handed over to the Engineer. All serviceable materials shall be stacked properly. Unserviceable materials shall be disposed off as directed by the Engineer. The distinction between the serviceable and unserviceable materials shall be as per the direction of the Engineer

***Demolishing cement concrete 1:3:6 & richer, including disposal of materials within 50m lead.***

***Demolishing stone rubble masonry including stacking useful materials & disposal of rubbish as per the instruction of EIC - In cement mortar***

**Measurement:** Parts of work required to be dismantled and those required to be demolished shall be measured separately. The length, breadth and thickness shall be measured correct to 10mm and the cubical contents shall be worked out correct to two places of decimal. In measuring thickness of roofs provided with water proofing treatments with bitumen felts, the thickness of water proofing treatment shall be ignored. Where reinforcement steel or structural steel is required to be separated, the work shall be measured separately in kg of salvaged steel.

**Rate:** The rate shall include the cost of all labour involved and tools used in demolishing and dismantling including scaffolding. The rate shall also include the charges for separating out and stacking the serviceable material properly and disposing of unserviceable material within a distance of 50 metres.

The rate shall also include for temporary shoring for the safety of portions not required to be pulled down, or of adjoining property, and providing temporary enclosures or partitions, where considered necessary.

***Dismantling R.C.C fence posts or struts including all earth work and dismantling of the concrete footings/bases in R.C.C & stacking within 50m lead***

**Measurement:** The posts, struts and ballies shall be measured in numbers, while the barbed wire will be measured in kilograms.

**Rate:** The rate shall include the cost of all labour involved and tools used in dismantling including scaffolding. The rate shall also include the charges for separating out and stacking the serviceable material properly and disposing of unserviceable material within a distance of 50 metres.

The rate shall also include for temporary shoring for the safety of portions not required to be pulled down, or of adjoining property, and providing temporary enclosures or partitions, where considered necessary.

## **2. EARTH WORK**

### **General**

This work shall consist of excavation, removal and satisfactory disposal of all materials necessary for the construction in accordance with requirements of these specifications and the lines, grades and cross-sections shown in the drawings or as indicated by the Engineer. It shall include the hauling and stacking of or hauling of suitable cut materials as required, to sites of embankment and sub-grade construction, and also the disposal of unsuitable cut materials in specified manner, trimming and finishing to specified dimensions or as directed by the Engineer. The excavation shall be done manually or by mechanical means as directed by Engineer in charge considering feasibility, urgency of work, availability of labour/mechanical equipment and other factors involved.

Classification of materials for purpose of manual excavation shall be as follows:

**Ordinary Soil** – Generally any soil which can be excavated by the ordinary application of pick and shovel, rake or any other ordinary digging equipment; such as vegetable or organic soil, turf gravel, sand, silt loam, clay, peat etc.

**Hard Soil** – Generally any soil which requires close application of picks or jumpers or scarifiers to loosen; such as stiff clay, gravel, cobble stone, water bound macadam and soling of roads.

**Ordinary Rock:** Generally, any rock which can be excavated by splitting with crow bars or picks and does not require blasting, wedging or similar means of excavation such as lime stone, sand stone, hard laterite, hard conglomerate and un-reinforced cement concrete below ground level. If required light blasting may be resorted to for loosening the materials but this will not in any way entitle the material to be classified as “Hard Rock”.

**Hard Rock:** Generally, any rock or boulder for the excavation of which blasting is required such as quartzite, granite, basalt, reinforced cement concrete (reinforcement to be cut through but not separated from concrete) below ground level and the like.

**Hard Rock (blasting prohibited):** Hard rock requiring blasting as described above but where the blasting is prohibited for any reason and excavation has to be carried out by chiseling, wedging or any other agreed method.

**Marshy Soil:** This shall include soils like soft clays and peat excavated below the original ground level of marshes and swamps and soils excavated from other areas requiring continuous pumping or bailing out of water.

For machine excavation, materials shall be classified as follows:

**All Kinds of Soil:** Generally, any strata, such as sand, gravel, loam, clay, mud, black cotton soil, moorum, shingle, river or nallah bed boulders, soling of roads, paths etc. and hard core macadam surface of any description (water bound, grouted tarmac etc.), lime concrete, mud concrete and their mixtures which for excavation yields to the application of picks, shovels, jumpers, scarifiers, ripper and other manual digging implements.

**All kinds of rocks** which include the above-mentioned categories of rocks.

**Authority for classification:** Engineer shall decide the classification of excavation, and his decision shall be final and binding on the Contractor. Merely the use of explosives in excavation will not be considered as a reason for higher classification unless blasting is clearly necessary in the opinion of the Engineer.

**Setting out:** After the site has been cleared (as per the specifications in Chapter 2), the limits of excavation shall be set out true to lines, curves, slopes, grades and sections as shown on the drawing or as directed by the Engineer. The Contractor shall provide all labour, survey instruments and materials such as strings, pegs, nails, bamboos, stones, lime, mortar, concrete, etc., required in connection with the setting out of works and the establishment of bench marks. The Contractor shall be responsible for the maintenance of the benchmarks and other marks and stakes as long as they are required for the work in the opinion of the Engineer.

The ground levels shall be taken at 5m to 15m intervals in uniformly sloping ground and at closer intervals where local mounds, pits or undulations are met with. The ground levels shall be recorded in field books and plotted on plans. These plans shall be drawn to a suitable scale with North direction line and the position of benchmark invariably shown on it. The contractor and the Engineer shall sign the plan before

the earthwork is started. The contractor shall, at his own expense, supply the labour required for taking levels.

**Stripping and storing topsoil:** When so directed by the Engineer, the topsoil existing over the sites of excavation shall be stripped to the specified depths and stockpiled at designated location for re-use in covering embankment slopes, cut slopes, and other disturbed areas where re-vegetation is desired. Prior to stripping the topsoil, all trees, shrubs etc. shall be removed along with their roots, with the approval of the Engineer.

**Excavation:** All excavations shall be carried out in conformity with the directions laid hereinunder and in a manner approved by the Engineer. The works shall be so done that the suitable materials available from excavation are satisfactorily utilized as agreed upon beforehand.

While planning of excavation, the Contractor shall take adequate precautions against soil erosion, water pollution etc. and take appropriate drainage measures to keep the sites free of water.

The excavations shall conform to the lines, grades, side slopes and levels shown on the drawing or as directed by the Engineer. The Contractor shall not excavate outside the limits of excavation. Subject to the permitted tolerances, any excess depth/width excavated beyond the levels/dimensions specified on the drawing shall be made good at the cost of the Contractor with the suitable material of characteristics similar to that removed and compacted.

All debris and loose materials on the cut slopes shall be removed. No backfilling shall be allowed in order to obtain the required slopes excepting that when boulders or soft materials are encountered in the cut slopes, these shall be excavated to the approved depth on instructions of the Engineer and the resulting cavities filled with suitable materials and thoroughly compacted in an approved manner.

After excavation, the sides of the excavated areas shall be trimmed and contoured to minimize erosion and ponding, allowing natural drainage to take place. If trees were removed, new trees shall be planted as per the direction of the Engineer. The cost of planting the new trees shall be deemed to be incidental to the work.

**Methods, tools and equipment:** Only such methods, tools and equipment as approved by the Engineer shall be adopted for the work. If so desired by the Engineer, the Contractor shall demonstrate the efficacy of the type of equipment to be used before the commencement of the work. Methods, tools and equipment to be adopted for the work shall be such which will not affect the property to be preserved.

**Rocks excavation:** Rocks when encountered in the road excavation shall be removed up to the formation level or as otherwise indicated on the drawings. Where, however, unstable shale or other unsuitable materials are encountered at the formation level, these shall be excavated to the extent of 500 mm below the formation level or as otherwise specified. In all cases, the excavation operations shall be so carried out that at no point on cut formation the rock protrudes above the specified level. Rocks and large boulders which are likely to cause differential settlement and also local drainage problems should be removed to the extent of 500 mm below the formation level in full formation width including drains and cut through the side drains.

Slopes in rock cutting shall be uniform lines corresponding to the slope lines shown on the drawings or as directed by the Engineer. Notwithstanding the foregoing, all loose pieces of rock on excavated slope surface which moves when pierced by a crowbar shall be removed.

Where blasting is to be resorted to, the same shall be carried out as per the RGOB blasting manual and all precautions indicated therein observed.

**Marsh excavation:** The excavation of soils from marshes/swamps shall be carried out as per the programme approved by the Engineer. Excavation of marshes shall begin at one end and proceed in one direction across the entire marsh immediately ahead of back filling. The method and sequence of excavating and back filling shall be such as to ensure, to the extent practicable, the complete removal or displacement of all muck from within the lateral limits called for on the drawings or as staked by the Engineer, and to the bottom of the marsh, firm support or levels indicated.

**Blasting:** The contractor shall obtain a licence from the competent authority for obtaining and storing the explosives. The contractor shall procure the explosives, fuses, detonators etc. from the Government or as per the provision in terms and condition of the contract. The Engineer or his representative shall have the right to check the contractor's store and accounts of explosives. The contractor shall provide facilities for this.

All blasting work shall only be done under careful supervision of trained personnel and the contractor shall take all precautions as per rules for blasting operations.

The Contractor shall ensure safety measures for every worker present, through the provision of personal protective equipment. The contractor shall be responsible for any damage arising out of accident to the workmen, public or property due to storage, transportation and use of explosive during blasting operations.

***Earth work in excavation over areas, exceeding 300mm in depth, 1.5m in width as well as 10 sq.m in area on plan, including disposal of excavated earth as per the direction of EIC- Ordinary Soil***

Excavation exceeding 1.5m in width or/and 10 m<sup>2</sup> in area on plan as well as exceeding 300mm in depth in all types of soils and rocks shall be described as excavation over areas.

**Measurements:** The length and breadth shall be measured correct to 10 mm. In case the measurements are taken with staff and level, the level shall be recorded correct to 5mm and depth of cutting and heights of filling calculated correct to 5mm. The area shall be worked out to the nearest two places of decimal in square metres.

**Rates:** The rates shall cover the cost for carrying out all the required operations including cost of labour, materials, equipment hired/owned, tools and plants, and incidentals necessary to complete the work. The rates shall also include, where necessary:

- Disposing of the cleared materials with all lifts and lead up to 50m;
- Bailing out or pumping of water in excavations from rains, subsoil water etc.;
- Protection and supporting of existing services i.e. pipe, water mains, cables met within the course of excavation. Care shall be taken not to disturb electric and communication cables, removal of which if necessary, shall be arranged by the Engineer.

***Back filling of the wall using selected excavated material as per the instruction of EIC***

Earth used for filling shall be free from stone, shingle or boulder larger than 75 mm in any direction and salts, organic or other foreign matter. Normally excavated earth from the same area shall be used for filling. However, if such earth contains deleterious material, it shall not be used. All clods of earth shall be broken or removed.

The spaces around the foundations pipes and drains in trenches shall be cleared of all debris, brick bats etc. The filling shall be done in layers, not exceeding 200mm in each layer. Each layer shall be watered, rammed and consolidated before the succeeding one is laid. Earth shall be rammed with iron rammers where feasible

and with the butt-ends of crowbars where rammer cannot be used. Special care shall be taken that no damage is caused to the pipes, drains and masonry or concrete in the trenches, under floor, etc.

**Measurements:** The cubical contents of foundation concrete and masonry in foundation up to ground level shall be worked out and the same deducted from the cubical contents of earthwork in excavation for foundations to arrive at the quantity for filling sides of foundation. For filling in plinths and under floors, depth shall be the consolidated depth.

**Rates:** The rates shall cover the cost for carrying out all the required filling operations including cost of labour, materials, equipment hired/owned, tools and plants, and incidentals necessary to complete the work.

### 3. STONE WORK

#### *Providing and laying Hand packed stone filling or soling with stones*

Stones as obtained from the quarry shall be packed with their broader surface as base. The packing shall be as dense as possible and the interstice shall be filled with small stones. The height of stones shall be as per the thickness of soling required. The stones shall be arranged neatly and the joints shall be as thin as possible.

**Measurements:** The length, breadth and height shall be measured correct to 10 mm. and the volume calculated correct to 0.01 cum.

**Rate:** The rate shall include the materials and labour involved in all operation described above.

### 4. CONCRETE WORK

#### **General**

Water, Cement, fine aggregate and coarse aggregate shall conform to material specifications. Concrete can be specified by proportions or by nominating the required strength.

Concrete shall be prepared by mixing graded stone aggregate or gravel of normal size as specified with fine aggregate and cement in specified proportions with required quantity of water.

**Proportioning:** It shall be done by volume. Boxes of suitable size shall be used for measuring sand and aggregate. The internal dimensions of the boxes shall be generally 35 x 25 x 40cm deep or as otherwise approved by the Engineer. The unit of measurement for cement shall be a bag of 50 kg and this shall be taken as 0.035cum. While measuring the aggregate, shaking, ramming or heaping shall not be done. The proportioning of sand shall be on the basis of its dry volume and in case of damp sand allowance for bulking shall be made by adopting the method prescribed under IS 2386 (part III).

**Mixing:** It shall be done in mechanical mixer. Mixing by hand shall be employed only in special cases with the specific prior permission of the Engineer-in-Charge. Stone aggregate shall be washed with water to remove dirt, dust or any other foreign materials, where necessary.

**Machine Mixing:** The mixer drum shall be flushed clean with water. Measured quantity of dry coarse aggregate shall be followed with measured quantity of fine aggregate and then cement. In case damp sand is used, add half of the quantity of coarse aggregate followed by cement and sand. Finally add balance quantity of the coarse aggregate. The skip shall be raised and dry materials slipped into the drum. The dry materials shall be mixed for at least four turns of the drum, after which the correct quantity of water shall be added gradually while the drum is in motion, to ensure even distribution with the dry material. The total quantity of water for mixing shall be introduced before 25% of mixing time has elapsed and shall be regulated to achieve the specified water cement ratio. The complete contents of the mixed concrete shall

be emptied before recharging. When the mixer is closed down for the day or at any time exceeding 20 minutes, the drum shall be flushed clean.

**Mixing time:** The materials shall be mixed for a period of not less than 2 minutes and until a uniform colour and consistency is obtained. The time shall be counted from the moment all the materials have been put into the drum.

**Hand Mixing:** Hand mixing shall be done on a smooth, clean and water-tight platform of suitable size in the following manner.

- (a) Measured quantity of sand shall be spread evenly
- (b) The cement shall be dumped on the sand and distributed evenly
- (c) The sand and cement shall be mixed intimately with spade, turning the mixture over and over again, until it is of even colour throughout and free from streaks
- (d) The sand cement mixture shall be spread out and measured quantity of coarse aggregate shall be spread on its top. Alternatively the measured quantity of coarse aggregate shall be spread out and the sand cement mixture shall be spread on its top.
- (e) The above materials shall be mixed at least three times by shovelling and turning over by twist from centre to side, then back to the centre and again to the sides.
- (f) A hollow shall be made in the middle of the mixed pile.
- (g) Three quarters of the total quantity of water required shall be added while the material is turned in towards the centre with spades. The remaining water shall be added by a water-can fitted with rose head, slowly turning the whole mixture over and over again until a uniform colour and consistency is obtained throughout the pile.
- (h) The mixing platform shall be washed at the end of the day.

**Consistency:** The quantity of water to be used for each mix of 50kg cement, to give the required consistency shall not be more than 34 litres for 1:3:6 mix, 30 litres for 1:2:4 mix, 27 litres for 1:1 1/2:3 mix and 25 litres for 1:1:2 mix. In the case of vibrated concrete, the limit specified may be suitably reduced to avoid segregation. The quantity of water shall be regulated by carrying out regular slump tests.

The following slumps shall be adopted for different kinds of works:

**Table 5.6.1 SLUMPS FOR DIFFERENT KINDS OF WORK**

Works	Slump in mm	
	Vibrator used	Vibrator not used
Mass concrete in foundation footings, retaining walls and pavement	10-25	50-75
Thin sections of flooring less than 75 mm thickness	25-40	75 -100

The entire concrete used in the work shall be laid gently (not thrown) in layers not exceeding 150mm and shall be thoroughly vibrated by means of mechanical vibrators till a dense concrete is obtained. The Engineer may however relax the condition specifying use of mechanical vibrators at his discretion for certain items depending upon the thickness of the members and feasibility of vibrating the same and permit hand compaction. Hand compaction shall be done with the help of tamping rods so that

concrete is thoroughly compacted and completely worked into the corners of the formwork. The layers of concrete shall be so placed that the bottom layer does not finally set before the top layer is placed. Compaction shall be completed before the initial setting starts i.e. within 30 minutes of addition of water to the dry mixture. For items where the vibrators are not to be used, it shall be the duty of the contractor to take the permission of the Engineer before the start of work.

During cold weather, concreting shall not be done when the temperature falls below 4.5°C. The concrete placed shall be protected against frost by suitable covering. Concrete damaged by frost shall be removed and work redone. Please see specifications relating to cold weather concreting Reinforced Cement Concrete. During hot weather, precautions shall be taken to see that the temperature of wet concrete does not exceed 38°C.

When the placing of concrete is suspended, necessary removal of laitance and roughening the surface for jointing future work shall be done before the concrete sets. When the work is resumed the previous work must be thoroughly cleaned, roughened, watered and a grout of neat cement slurry of the proportion, 1 Kg of cement per 2 litres of water applied uniformly.

Curing: Green work shall be protected from rain by suitable covering. The work should also be protected from damage and rain during construction.

After the concrete has begun to harden i.e. about 1 to 2 hours after its laying, it shall be protected with moist gunny bags, sand or any other material approved by the Engineer against quick drying. After 24 hours of laying of concrete, the surface shall be cured by flooding with water of minimum 25mm depth, or by covering with wet absorbent materials. The curing shall be done for a minimum period of 14 days. In special cases, curing may have to be done for more number of days as required by the Engineer.

Over the foundation concrete, the masonry work may be started after 48 hours of its laying, but the curing of cement concrete shall be continued along with the masonry work for minimum period of 14 days.

Where cement concrete is used as sub-grade for flooring, the flooring may be commenced before the curing period of sub-grade is over but the curing of sub-grade shall be continued along with the top layer of flooring for a minimum period of 14 days.

The water used for curing shall not produce any objectionable stains or unsightly deposit on concrete surface. In special circumstances and locations curing by other means such as sealing material insulating blankets etc. may be adopted with the specific prior approval of the Engineer.

The minimum compressive strength of mix 1 :1.5 :3 and 1 :2 :4 shall be as follows:

Table 5.6.2 MINIMUM COMPRESIVE STRENGTH

Mix	Compressive strength in kg/sq.cm at 28 days	
	At 7 days	At 28 days
1:1.5:3	175	265
1:2:4	140	210

***Providing and laying in position plain cement concrete 1:2:4 (1 cement : 2 sand : 4 graded crushed rock 40 mm nominal size) excluding the cost of centering and shuttering - All work upto plinth level***

**Measurements:** The work under the following categories shall be measured separately:

- (a) From foundation to plinth level.
- (b) From plinth level to floor 5 level.
- (c) From floor 5 levels and so on.
- (d) Concrete work in the parapet shall be measured together with the corresponding work in the wall of the storey next below.

Cast-in-Situ concrete shall be classified and measured under one of the items given above.

Length and breadth shall be measured correct to a 10 mm. The thickness of slab, partitions, etc. and the like shall be measured correct to the nearest 5mm.

The consolidated cubical contents shall be calculated net nearest to 0.01cu.m. Concrete laid in excess, of the sections shown in the drawing unless directed by the Engineer shall not be measured.

Precast cement concrete solid articles shall be measured separately and shall include use of moulds, finishing the top surfaces even and smooth with wooden trowel, before setting in position in cement mortar 1:3 (1 cement: 3 coarse sand).

No deduction shall be made for:

- (a) Ends of dissimilar materials (e.g. joists, beams, posts, girders, rafters, purlins, trusses, corbels, step etc.) upto 500 sq.cm in section.
- (b) Opening up to 0.1m<sup>2</sup> or as specified.
- (c) Volume occupied by pipes, conduits, sheathing etc. not exceeding 100 sq.cm each in cross sectional area.
- (d) Volume occupied by reinforcement;

**Rate:** The rates shall cover the cost for carrying out all the required operations including cost of labour, materials, equipment hired/owned, tools and plants, and incidentals necessary to complete the work.

## **5. REINFORCED CONCRETE WORK**

The concrete shall be as specified under concrete works. Concrete shall be always mixed by mechanical mixer unless otherwise the Engineer permits hand mixing.

**Consistency:** The concrete, which will flow sluggishly into the forms and around the reinforcements without any segregation of coarse aggregate from the mortar, shall be used. The consistency shall depend on whether the concrete is vibrated or hand tamped. It shall be determined by slump test as prescribed in IS 1199. The slumps of concrete for different types of works shall be as given below, unless otherwise specified:

Table 5.8.1 SLUMPS OF CONCRETE FOR DIFFERENT TYPES OF WORK

Sl. No	Types of Work	Slump in mm	
		Vibrators used	Vibrators not used
1	Mass concrete in R.C.C foundation footings, and retaining walls	10 - 25	80
2	Beams, slabs and columns simply reinforced	25 - 40	100 – 125
3	Thin R.C.C section or section with congested steel	40 - 50	125 - 150

***Providing & laying in position reinforced cement concrete 1:1.5:3 (1 cement: 1.5 sand: 3 graded crushed rock 20 mm nominal size) work in plinth and skirting courses, fillets, columns, pillars, posts and struts upto floor five level excluding the cost of centering, shuttering and reinforcement.***

Concreting shall be commenced only after the Engineer has inspected the centering, shuttering and reinforcement as placed and passed the same.

In case of concreting of slabs and beams; wooden plank or cat-walks supported directly on the centering by means of wooden blocks or lugs shall be provided to convey the concrete to the place of deposition without disturbing the reinforcement in any way. Labour shall not be allowed to walk over the reinforcement.

In case of columns and walls, it is desirable to place concrete without construction joints. The programme of concreting in the vertical direction shall be restricted to one metre per hour. The concrete shall be deposited in its final position in a manner to preclude segregation of ingredients. In deep trenches and footings, concrete shall be placed through chutes as directed by the Engineer. In case of columns and walls the shuttering shall be so adjusted that the vertical drop of concrete is not more than 1.5 meters at a time.

**Cold weather concreting:** During cold weather, as a rule concreting shall not be done when the temperature falls below 4.5 degrees Celsius. However, in circumstances where it becomes necessary to deposit concrete at or near freezing temperatures, precautions shall be taken to ensure that at the time of placing it has a temperature of not less than 4.5-degree Celsius and that this temperature is maintained till the concrete is compacted and it is thoroughly hardened. When necessary, the ingredients shall be heated before mixing and concrete carefully protected after placing; in general heating water alone to about 60 degree Celsius may be sufficient for this purpose. Dependence shall not be placed on salt or other chemicals for the prevention of freezing. (Use of calcium chloride to accelerate the rate of hardening is not permitted as it is considered harmful). Concrete placed shall be protected against frost by suitable covering. Concrete damaged by frost shall be removed and work redone.

**Hot weather concreting:** During hot weather, precaution shall be taken to see that the temperature of wet concrete does not exceed 38 degrees Celsius. No concrete shall be laid within half an hour of the closing time of the day, unless permitted by the Engineer. It is necessary that the time between mixing and placing of concrete shall not exceed 30 minutes so that the initial setting process is not interfered with.

Concrete shall be compacted into a dense mass immediately after placing, by means of mechanical vibrators designed for continuous operation. The Engineer may however, relax this condition at his discretion for certain items, depending on the thickness of members and feasibility of vibrating the same, and permit hand compaction instead. Hand compaction shall be done with the help of tamping rods so that concrete is

thoroughly compacted and completely worked around the reinforcement, embedded fixtures, and into corners of the formwork. The layers of concrete shall be so placed that the bottom layer does not finally set before the top layer is placed. The vibrators shall maintain the whole of concrete under treatment in an adequate state of agitation, such that de-aeration and effective compaction is attained at a rate commensurate with the supply of concrete from the mixers. The vibration shall continue during the whole period occupied by placing of concrete, the vibrators being adjusted so that the centre of vibrations approximates to the centre of the mass being placed at the time of compacting.

Concrete shall be judged to be properly compacted, when the mortar fills the spaces between the coarse aggregate and begins to cream up to form an even surface. When this condition has been attained, the vibrator shall be stopped in case of vibrating tables and external vibrators. In case both internal and external vibrators are being used the internal vibrators shall first be withdrawn slowly after which the external vibrators shall be stopped so that no loose pocket is left in the body of the concrete. The specific instructions of the makers of the particular type of vibrator used shall be strictly complied with. Shaking of reinforcement for the purpose of compaction should be avoided. Compaction shall be completed before the initial setting starts, i.e. within 30 minutes of addition of water to the dry mixture.

**Construction joints:** Concreting shall be carried out continuously up to the construction joints, the position and details of which shall be as shown in Structural drawing or as indicated in this specification or as directed by the Engineer. Such joints shall be kept to the minimum and shall not be located in valleys. The joints shall be kept at places where the shear force is the minimum and these shall be straight and at right angles to the direction of main reinforcement.

In case of columns, the joints shall be horizontal and minimum of 20 cm below the bottom of the beam running into the column head. The portion of the column between the stopping off level and the top of the slab shall be concreted with the beam. When stopping the concrete on a vertical plane in slabs and beams, an approved stop-board shall be placed with necessary slots for reinforcement bars or any other obstruction to pass the bars freely without bending. The construction joints shall be keyed by providing a triangular or trapezoidal fillet nailed on the stop-board. Inclined or feather joints shall not be permitted. Any concrete flowing through the joints of stop-board shall be removed soon after the initial set. When concrete is stopped on a horizontal plane, the surface shall be roughened and cleaned after the initial set. When the work has to be resumed, the joint shall be thoroughly cleaned with wire brush and loose particles removed. A coat of neat cement slurry at the rate of 2.75kg of cement per square metre shall then be applied on the roughened surface before fresh concrete is laid.

**Expansion Joints:** Expansion Joints shall be provided as shown in the structural drawings or as directed by the Engineer including all formwork and labour necessary to form.

**Curing:** After the concrete has begun to harden i.e. about 1 to 2 hours after it's laying, it shall be protected from quick drying with moist gunny bags, sand or any other material approved by the Engineer. After 24 hours of laying of concrete, the surface shall be cured by flooding with water of minimum 25mm depth, or by covering with wet absorbent material. The curing shall be done for a minimum period of 14 days.

**Finishing:** In case of roof slabs, the top surface shall be finished even and smooth with wooden trowel, before the concrete begins to set.

Immediately on removal of forms, the Engineer shall examine the R.C.C. work before any defects are made good such as:

- a) The work that has sagged or contains honeycombing to an extent detrimental to structural safety or architectural concept shall be rejected.

- b) Surface defect of a minor nature may be accepted. On acceptance of such work by the Engineer, the same shall be rectified as follows:
1. Surface defects which require repair when forms are removed usually consist of bulges due to movement of forms, ridges at form joints, honeycombed areas, damage resulting from the stripping of forms, and bolt holes. Bulges and ridges are to be removed by careful chipping or tooling and the surface is then rubbed with a grinding stone. Honey combed and other defective areas must be chipped out, the edges being cut as straight as possible and perpendicularly to the surface, or preferably slightly undercut to provide a key at the edge of the patch.
  2. Shallow patches are first treated with a coat of thin grout composed of one part of cement and one part of sand and then filled with mortar similar to that used in the concrete. The mortar is placed in layer not more than 10mm thick and each layer is given a scratch finish to secure bond with the succeeding layer. The last layer is finished to match the surrounding concrete by floating, rubbing, or tooling on formed surfaces by pressing the form material against the patch while the mortar is still plastic.
  3. Large and deep patches require filling up with concrete held in place by forms. Such patches are reinforced and carefully dowelled to the hardened concrete.
  4. Holes left by bolts are filled with mortar carefully packed into place in small amounts. The mortar is mixed as dry as possible with just enough water so that it will be tightly compacted when forced into place.
  5. Tiered holes extending right through the concrete may be filled with mortar with a pressure gun similar to the gun used for greasing motorcars.
  6. Normally, patches appear darker than the surrounding concrete, possibly owing to the presence on their surface of less cement laitance. Where uniform surface colour is important, this effect shall be remedied by adding 10 to 20 percent of white Portland cement to the patching mortar, the exact quantity being determined by trial.
  7. The same amount of care to cure the materials in the patches should be taken as with the whole structure. Curing must be started, as soon as possible, after the patch is finished to prevent early drying. Damp Hessian may be used but, in some locations, it may be difficult to hold it in place. A membrane-curing compound in these cases will come in most convenient.
- c) The surface, which is to receive plaster or where it is to be joined with brick masonry wall, shall be properly roughened immediately after the shuttering is removed, taking care to remove the laitance completely without disturbing the concrete. The roughening shall be done by hacking. Before the surface is plastered it shall be cleaned and wetted so as to give good bond between concrete and plaster. The R.C.C. work shall be done carefully so that the thickness of plaster required for finishing the surface is not more than 6mm.
- d) The surface of R.C.C. slab on which the cement concrete or mosaic floor is to be laid shall be roughened with brushes while the concrete is green. This shall be done carefully without disturbing the concrete.

**Measurement:** Dimensions shall be measured nearest to 10mm, except for the thickness of slab which shall be measured to nearest 5mm. The areas shall be worked out to nearest 0.01 square metres. The cubic contents shall be worked out to nearest 0.01 cubic metres.

Work under the following category shall be measured separately.

- a) In foundation upto floor one level.
- b) From floor one level to floor two level.
- c) From floor two level to floor three level and so on
- d) R.C.C. above roof level shall be measured along with the R.C.C. work in floor just below.

No deduction shall be made for the following:

- a) Ends of dissimilar materials (e.g. joints, beams, posts, girders, rafters, purlins, trusses, corbels, steps etc.) upto 500sq.cm in cross-section.
- b) Opening upto 0.1 sq.m.

Note: In calculating area of opening upto 0.1 sq.m the size of opening includes the thickness of any separate lintels or sills. No extra labour for forming such openings or voids shall be paid for.

- c) The volume occupied by reinforcement.
- d) The volume occupied by pipes, conduits, etc. not exceeding 100sq.cm each in cross-sectional area. Nothing extra shall be paid for leaving and finishing such cavities and holes.
- e) Small voids not exceeding 40 Sq.cm each in cross-sectional area. Nothing extra shall be paid for leaving and finishing such cavities and holes.

Measurements shall be taken before any rendering is done in the concrete members. The measurement will not include rendering. The measurement of R.C.C. work between various units shall be regulated as below:

- a) Slabs shall be taken as running continuously through except when slab is monolithic with the beam. In that case it will be from the face of the beam.
- b) Beams shall be measured from face to face of columns and shall include haunches, if any, between columns and beams. The depth of the beam shall be from the bottom of slab to the bottom of beam, if beam and slab are not monolithic. In case of monolithic construction where slabs are integrally connected with beam, the depth of the beam shall be from the top of the slab to the bottom of the beam.
- c) The columns shall be measured from top of column base to underside of the first floor slab and subsequently from top of floor slab to underside of the floor slab above. In case of columns for flat slabs, flare of column shall be included with column for measurement.
- d) Chajja shall be measured inclusive of bearing. But when Chajja is combined with lintel, slab and beam, it shall be measured as clear portion. Whenever vertical fins and chajjas combined, chajjas shall be measured clear between fins. The vertical fins shall be measured through.
- e) The filling of expansion joints with bitumen filler, bitumen felt or any such material and the provision of copper or brass plate for covering, etc., shall be measured in running metres.

**Rate:** The rate includes the cost of materials and labour involved in all the operations described above except for the cost of centering and shuttering unless otherwise mentioned in the item.

**Note:** The 28 days cube test shall be the basis of determination of strength for R.C.C. work. Concrete that is less than the required strength shall not be accepted unless otherwise stated.

## 6. FORM WORK

***Providing & fixing formwork (centring and shuttering) including strutting, propping etc. and removal of formwork- Foundation and plinth etc.***

***Providing & fixing formwork (centring and shuttering) including strutting, propping etc. and removal of formwork- Columns, pillars, post, struts etc.***

**Propping and Centring:** Props used for centring shall be of steel, timber posts, ballies or any other material approved by Engineer. Use of brick masonry pillars in mud mortar shall also be permissible. In no case ballies shall be of diameter less than 100mm measured at mid length and 80mm at thin end. Maximum permissible spacing shall be 1.2m centre to centre. Ballies shall rest squarely on wooden sole plates of 40mm thickness and minimum bearing area of 0.1sq.m laid either on ground or on 40 x 40cm brick masonry

pillars in mud mortar of height not exceeding 40cm. Double wedges shall further be provided between the sole plates and the wooden props so as to facilitate tightening and easing of shuttering without jarring the concrete. In case brick masonry pillars of adequate section are used instead of props, wooden sole plates shall be provided at the top of pillars and double wedges inserted between the sole plate and the bottom of shuttering.

Formwork and concreting of upper floor shall not be done until concrete of lower floor has set for at least 28 days. In case of balconies and cantilever beams, coming one above the other, the members being cast shall be supported by props on two floors below the floor where initial supporting has been done. Ballies shall rest squarely on wooden sole plates of 40mm thickness and with minimum bearing area of 0.1sq.m.

The details of formwork stated above shall be applicable for spans of 4.50m and height upto 3.50 metres. In case any of these limits is exceeded the formwork shall be properly designed for the self-weight, weight of reinforcement, weight of fresh concrete, various live loads imposed during the construction process (such as workmen and equipment). Dumping of concrete, movement of construction equipment and action of the wind may produce lateral forces which must be resisted by the form work to prevent lateral failure for which suitable horizontal as well as diagonal bracings shall be provided. The permissible stresses in bending, buckling load of props, permissible deflection of shuttering should not be exceeded.

In case the height of centring exceeds 3.50 metres, the props may be provided in multi-stages. Before the concreting is started, the props and wedges shall be thoroughly checked to see that these are intact, and take suitable action in case these are loose. While the concreting is in progress, at least one carpenter shall be readily available at the site. The carpenter shall keep a constant watch on the props and take immediate remedial measures, as soon as any of these get loosened. Care shall be taken that props and wedges do not get loose for a minimum period specified in Table 5.8.5.

**Shuttering:** The shuttering shall have smooth and even surface and the joints shall not permit leakage of cement grout. Timber used shall be well seasoned, free from loose knots, projecting nails, splits or other defects that may mar the cement surface of concrete. It shall not be so dry as to absorb water from concrete and swell and bulge, or so green or wet as to shrink after erection. Species of timber that are not affected appreciably by its contact with water shall be used. The timber shall be accurately sawn and planed on the sides and the surface coming in contact with concrete. For exposed concrete faces, timber for shuttering shall be wrought on all faces in contact with concrete.

Wooden formwork with metal sheet lining or steel plates stiffened by steel angles shall also be permitted. Where metal forms are used, all bolts and nuts shall be countersunk and well ground to provide a smooth plane surface. The chamfers, bevelled edges and mouldings shall be made in the formwork itself. Opening for fan clamps and other fittings connected with services shall be provided in the shuttering as directed by the Engineer-in-charge. As far as practicable, clamps shall be used to hold the forms together. Where use of nails is unavoidable minimum number of nails shall be used and these shall be left projecting so that they can be easily withdrawn. Use of double head nails shall be preferred.

**Surface Treatment for Shuttering:** The surfaces of timber shuttering that would come in contact with concrete shall be well wetted and coated with soap solution, raw linseed oil, form oil of approved manufacture or any other approved material (such as polythene/polyethylene sheets), to prevent adhesion of concrete to form work. Soap solution, for the purpose shall be prepared by dissolving yellow soap in water to get the consistency of paint. Inside surfaces of forms shall be thoroughly cleaned before application of any of the materials mentioned above. Release agents shall be applied strictly in accordance with the manufacturers' instructions and shall not be allowed to come in contact with any reinforcement. Re-use of

the shuttering shall be permitted only after the inside surface has been thoroughly cleaned in the manner described above.

Contractor shall give the Engineer due notice before placing any concrete in the forms to permit him to inspect and accept the form work as to its strength alignment and general fitness, but such inspection shall not relieve the contractor of his responsibility for safety of workman, machinery, materials and for results obtained.

**Camber:** Suitable camber shall be provided in horizontal members of structures, especially in long spans to counteract the effects of deflection. The formwork shall be so assembled as to provide for such camber. The camber for beams and slabs shall be 4mm per metre (1 in 250) or as directed by the Engineer, so as to offset the subsequent deflection. For cantilevers, the camber at free end shall be 1/50th of the projected length or as directed by the Engineer.

**Special Formwork:** For special type of work-locations like tall structures etc. use of special types of formwork like moving or climbing forms shall be permitted. The details of such formworks along with the sequence of working shall be got approved from the Engineer before their erection

**Removal of Form Work:** No formwork or any part thereof shall be removed without prior approval of the Engineer. The formwork shall be so removed as not to cause any damage to concrete due to shock or vibration. In a slab and beam construction, sides of beam shall be stripped first, then the under sides of slab and lastly the underside of the beam. Formwork must be so designed that they can be stripped in the order required i.e.

- a) Shutters to vertical (non load bearing) faces e.g. column boxes, beam sides, wall forms,
- b) Shutters forming soffits to slabs, horizontal and inclined which carry only light load, e.g. slabs, roofs, floors and canopies etc.
- c) Soffit shutters carrying heavy load e.g. beam and girder bottoms. The whole of the formwork should be planned and a definite scheme of operation worked out. In no circumstances should forms be struck until the concrete reaches strength of atleast twice the stress to which the concrete may be subjected at the time of striking. Where possible the formwork should be left longer as it would assist curing. Forms should be eased carefully in order to prevent the load being suddenly transferred to concrete. The period that shall elapse after the concrete has been laid, before easing and removal of centring and shuttering is undertaken shall be as given in Table below:

Table 5.8.5 MINIMUM PERIOD FOR REMOVAL OF FORMWORK

Type of formwork	Minimum period before striking formwork
Vertical formwork to columns, walls and beams	16 – 24 h
Soffit formwork to slabs (props to be re-fixed immediately after removal of formwork)	3 days
Soffit formwork to beams (props to be re-fixed immediately after removal of formwork)	7 days
Props to slabs spanning upto 4.5 m	7 days
Props to slabs spanning over 4.5 m	14 days
Props to beams and arches spanning upto 6 m	14 days
Props to beams and arches spanning over 6 m	21 days

**Note 1:** For rapid hardening cement, 3/7 of the above periods will be sufficient in all cases, except for vertical sides of slabs, beams and columns which should be retained for at least 24 hours.

**Note 2:** In case of cantilever slabs and beams, the centring shall remain till structures for counter acting or bearing down have been erected and have attained sufficient strength.

**Note 3:** Proper precautions should be taken to allow for the decrease in the rate of hardening that occurs with all cements in cold weather.

**Note 4:** Work damaged through premature or careless removal of forms shall be reconstructed.

**Measurements:** Where it is stipulated that the formwork shall be paid for separately, measurement shall be taken of the area of shuttering in contact with the concrete surface. Dimensions of formwork shall be measured correct to 10mm. The measurements shall be taken separately under each of the items mentioned above.

Centring and shuttering where exceeding 3.5 metres height in one floor shall be measured and paid for separately.

Where it is not specifically stated in the description of the item that formwork shall be paid for separately, the rate of the R.C.C. item shall be deemed to include the cost of formwork.

No deductions from the shuttering due to the openings/ obstructions shall be made if area of such openings/obstructions does not exceed 0.1sq.m. Nothing extra shall be paid for forming such openings.

**Rate:** The rate of formwork includes the cost of labour, materials tools and plant required for all the operations described in this section including properly supporting the members until the concrete is cured, set and hardened as required. No separate payment shall be made for items such as form release agent, connections, provisions for openings and other items required for the completion of the work unless specified otherwise.

## 7. STEEL REINFORCEMENT

### ***Providing & fixing Thermo-Mechanically Treated reinforcement bar (Yield Strength 500 MPa) for R.C.C work including cutting, bending, binding and placing in position complete***

The type and grade of reinforcement to be used shall be as indicated on the drawings. Where this information is not given on the drawings, hot rolled deformed bars having yield strength of 500 Mpa shall be used. Bars shall be bent cold (no heating shall be permitted), correctly and accurately to the size and shape as shown on the detailed drawings or as directed by the Engineer. Preferably, bars of full length shall be used and within the following tolerances:

Table 5.8.2 TOLERANCES ON DIMENSIONS OF REINFORCEMENT BAR

Sl. No	Dimension	Tolerance
1	Length of straight bars	± 25 mm
2	Location of splices	± 50 mm
3	Length of lap splices	± 50 mm

Minimum clear cover shall be as indicated on the drawings. Where cover is not indicated on the drawings, it shall be in accordance with the following:

Table 5.8.3 MINIMUM CLEAR COVER FOR REINFORCEMENT

Sl. No	Location	Clear cover
1	Slabs	20 mm
2	Beam – main reinforcement	30 mm
3	Beam – stirrups	20 mm
4	Column – main reinforcement	40 mm
5	Column - ties	20 mm
6	Footings	75 mm

Overlapping of bars shall be as indicated on the drawings. The overlapping bars shall not touch each other and these shall be kept apart by 25 mm or 1.25 times the maximum size of the coarse aggregate whichever is greater, with concrete between them. But where this cannot be done, the overlapping shall be bound together at intervals not exceeding twice the dia. of such bars, with two strands of annealed steel wire of 0.90 mm to 1.6 mm thickness twisted tight. The overlaps shall be staggered for different bars and located at points, along the span, where neither shear nor bending moment is maximum. Where lap length is not explicitly shown on the drawings, the length shown in the following table shall be used:

Table 5.8.4 LAP LENGTH OF THE REBAR

Sl. No	Bar size	Lap length
1	10 mm	300 mm
2	12 mm	350 mm
3	16 mm	600 mm
4	20 mm	900 mm
5	25 mm	1100 mm

The ends of rods shall be bent in to semi-circular hooks, having clear diameter equal to four times the diameter of the bar, with a length, beyond the bend equal to four times the diameter of the bar. End hooks may, however, not be provided for cold twisted, hot rolled and CRS bars.

Note: Welding should not be used unless absolutely necessary. Reinforcement bar does not weld very well and the resulting splice can be a weak spot. Binding is better as welding can produce a reduction in strength as well.

Reinforcement bars shall be placed in position as shown in the drawings. The bars crossing one another shall be tied together at every intersection with two strands of annealed steel wire 0.90 to 1.6 mm thickness

twisted tight to make the skeleton of the steel work rigid so that the reinforcement does not get displaced during the deposition of concrete.

The bars shall be kept in position by the following methods:

- a) In case of beam and slab construction, pre-cast cover blocks in cement mortar 1:2 (1 cement: 2 coarse sand), about 4cm x 4cm section and of thickness equal to the specified cover shall be placed between the bars and shuttering, so as to secure and maintain the requisite cover of concrete over reinforcement.
- b) In case of cantilevered and double layer reinforced beams or slabs, the vertical distance between the horizontal bars shall be maintained by introducing chain spacers or support bars of steel at 1.0 metre or at shorter spacing to avoid sagging.
- c) In case of columns and walls, the vertical bars shall be kept in position by means of timber templates with slots accurately cut in them, or with block of cement mortar (1:2) suitably tied to the reinforcement.
- d) In case of other R.C.C. structure such as arches, domes etc, cover blocks, spacers and templates shall be used as directed by the Engineer.

**Measurement:** Reinforcement including authorised spacer bars and laps shall be measured in lengths of different diameters, as actually used in the work nearest to 10mm and their weight calculated on the basis of standard tables. Wastage and un-authorised overlaps shall not be paid for. Annealed steel wire required for binding or tack welding shall not be measured, its cost being included in the rate of reinforcement. Wherever welding is resorted to in lieu of over laps such welds shall be measured separately in members for different size of reinforcement.

**Rate:** The rate of reinforcement shall include the cost of labour and materials as required for all operations described above except welding in lieu of over laps, which shall be paid for separately. No separate payment will be made for concrete spacer blocks, timber templates, tie wire or any other accessories required for the performance of the work.

## 8. PLASTERING WORK

### *Providing and laying 12mm cement plaster in C.M 1:4*

**Preparation of surface:** The joints shall be raked out properly. Dust and loose mortar shall be brushed out. Efflorescence if any shall be removed by brushing and scraping. The surface shall then be thoroughly washed with water, cleaned and kept wet before plastering is commenced. In case of concrete surface, if a chemical retarder has been applied to the formwork, the surface shall be roughened by wire brushing and all the resulting dust and loose particles cleaned off and care shall be taken that none of the retarder is left on the surface. The joints of masonry shall be raked out properly so that the plaster is well keyed with the masonry.

**Mortar:** The mortar of the specified mix described in the item shall be used.

**Scaffolding:** For all exposed brickwork or tile work, double scaffolding having two sets of vertical supports shall be provided. The supports shall be sound and strong, tied together with horizontal pieces over which scaffolding planks shall be fixed. For all other masonry in buildings, single scaffolding shall be permitted. In such cases, the inner end of the horizontal scaffolding pole shall rest in a hole provided only in the header course for the purpose. Only one header for each pole shall be left out. Such holes for scaffolding shall, however, not be allowed in pillars/columns less than one metre in width, or immediately near the skewbacks of arches. The holes left in masonry works for scaffolding purposes shall be filled and made good before plastering.

**Note:** In case of special type of brickwork, scaffolding shall be got approved from Engineer.

**Application of Plaster:** Ceiling plaster shall be completed before commencement of wall plaster. Plastering shall be started from the top and worked down towards the floor. All putlog holes shall be properly filled in advance of the plastering as the scaffolding is taken down. To ensure even thickness and true surface, plaster about 15 x 15 cm, shall be first applied, horizontally and vertically, at not more than 2 metres intervals over the entire surface to serve as gauges. The surfaces of these gauged areas shall be truly in the plane of the finished plaster surface. The mortar shall then be laid on the wall, between the gauges with trowel. The mortar shall be applied in a uniform surface slightly more than the specified thickness. The surface shall be brought to a true surface, by working a wooden straight edge reaching across the gauges, with small upward and side ways movements at a time. Finally the surface shall be finished off true with trowel or wooden float accordingly as a smooth or a sandy granular texture is required. Excessive trowelling or over working the float shall be avoided. All corners, arises, angles and junctions shall be truly vertical or horizontal as the case may be and shall be carefully finished. Rounding or chamfering corners, junctions etc. where required shall be done without any extra payment. Such rounding or chamfering shall be carried out with proper templates to the sizes required. In suspending work at the end of the day, the plaster shall be left, cut clean to line both horizontally and vertically, when recommencing the plastering, the edge of the old work shall be scraped cleaned and wetted with lime putty or cement grout before plaster is applied to the adjacent areas, to enable the two to properly join together. Plastering work shall be closed at the end of the day on the body of the wall and not nearer than 15 cm to any corners or arises. It shall not be closed on the body of the features such as plasters, bands and copings, as these invariable lead to leakages. No portion of the surface shall be left out initially to be patched up later on. The plastering and finishing shall be completed within half an hour of adding water to the dry mortar.

**Finish:** The plaster shall be finished to a true and plumb surface and to the proper degree of smoothness as required. The work shall be tested frequently as the work proceeds with a true straight edge not less than 2.5 m long and with plumb bobs. All horizontal lines and surfaces shall be tested with a level and all jambs and corners with a plumb bob as the work proceeds.

**Precaution:** Any cracks which appear in the surface and all portions, which sound hollow when tapped, or are found to be soft or otherwise defective, shall be cut out in rectangular shape and redone as directed by the Engineer.

**Thickness:** The thickness of the plaster specified shall be measured exclusive of the thickness of key. The average thickness of the plaster shall not be less than the specified thickness and the minimum thickness over any portion of the surface shall not be less than specified thickness by more than 3 mm. Where the thickness required as per description of the item is 20 mm the average thickness of the plaster shall not be less than 20 mm whether the wall treated is of brick or stone. In the case of brickwork, the minimum thickness over any portion of the surface shall not be less than 15 mm while in the case of stonework the minimum thickness over the bushings shall be not less than 12 mm.

**Curing:** Curing shall be started as soon as the plaster has hardened sufficiently not to be damaged when watered. The plaster shall be kept wet for a period of at least 7 days. During this period, it shall be suitably protected from all damages at the contractor's expense by such means as the Engineer may approve. The dates on which the plastering is done shall be legibly marked on the various sections plastered so that curing for the specified period thereafter can be watched.

**Measurement:** Length and breadth shall be measured correct to 10 mm and its area shall be calculated in square metres correct to two places of decimal. Thickness of the plaster shall be exclusive of the thickness of the key i.e. grooves, or open joints in brick works. The measurements of wall plaster shall be taken

between the walls or partitions (the dimensions before plastering shall be taken) for the length, and from the top of the floor or skirting to the ceiling for the height. Depth of coves or cornices if any shall be deducted.

The following shall be measured separately from wall plaster:

- (a) Plaster bands 30 cm wide and under.
- (b) Cornices, beadings and architraves or architraves moulded wholly in plaster.
- (c) Circular work not exceeding 6 m in radius.

Plaster over masonry pilasters will be measured and paid for as plaster only. A coefficient of 1.63 shall be adopted for the measurement of one side plastering on honeycomb work.

- (a) Moulded cornices and coves:
- (b) Length shall be measured at the centre of the girth.
- (c) Moulded cornices and coves shall be given in square metres the area being arrived at by multiplying length by the girth.
- (d) Flat or weather-top cornices when exceeding 15 cm in width shall not be included in the girth but measured with the General Plaster work.
- (e) Cornices, which are curved in their length, shall be measured separately.

Exterior plastering at a height greater than 10m from average ground level shall be measured separately in each storey height. Patch plastering (in repairs) shall be measured as plastering new work, where the patch exceeds 2.5 sq.m, extra payment being made for preparing old wall, such as dismantling old plaster, raking out the joints and cleaning the surface. Where the patch does not exceed 2.5 sq.m in area, it shall be measured under the appropriate item under sub-head "Repairs to Buildings".

Deductions in measurements for openings etc. will be regulated as follows:

- (a) No deduction will be made for openings or ends of joists, beams, posts, girders, steps etc. upto 0.5 sq.m in area; no additions shall be made either, for jambs, soffits and sills of such openings. The above procedure will apply to both faces of wall.
- (b) Deduction for openings exceeding 0.5 sq.m but not exceeding 3 sq.m each shall be made for reveals, jambs, soffits, sills etc. of these openings.
  - (i) When both faces of walls are plastered with same plaster, deductions shall be made for one face only.
  - (ii) When two faces of walls are plastered with different types of plaster or if one face is plastered and other is pointed, or one face is plastered and other is un-plastered, deduction shall be made from the plaster or pointing on the side of the frame for the doors, windows etc. on which width of reveal is less than that on the other side but no deduction shall be made on the other side. Where width of reveals on both faces of wall are equal, deduction of 50% of area of opening on each face shall be made from area of plaster and/or pointing as the case may be.
  - (iii) For opening having door frame equal to or projecting beyond thickness of wall, full deduction for opening shall be made from each plastered face of wall.
  - (iv) For opening exceeding 3 sq.m in area, deduction will be made in the measurements for the full opening of the wall treatment on both faces, while at the same time, jambs, sills and soffits will be measured for payment. In measuring jambs, sills and soffits, deduction shall not be made for the area in contact with the frame of doors, windows etc.

**Rate:** The rate shall include the cost of the labour and materials involved in all the operations described above.

## 9. GABION WORK

*Providing & filling hand-packed stone in G.I mesh 4mm (8swg) including supplying, weaving, placing in position, securing & fastening of mesh complete- Double-knotted mesh, 100 mm*

The gabion wall so constructed shall satisfy the basic requirement such as stability, flexibility and durability. It shall also satisfy environmental and safety requirements.

The G.I wire shall be of mention diameter having tensile strength of 300-400 Mpa confirming to IS: 280. The size of the mesh shall be as specified in the items.

Sausages shall be fixed as directed by the Engineer. The different blocks shall be secured properly. The crates shall be placed in position before filling with boulders. It shall be filled by carefully hand packing boulders as tightly as possible and not by merely throwing stones.

**Measurements:** Measurement shall be taken in cubical content correct to 0.01 cu.m.

**Rate:** The rate shall include all materials and labour involved in the work.