

SPECIFICATION

ITEM NO. - 01

Excavation for foundation upto 1.5 m depth including sorting out and stacking of useful materials and disposing off the excavated stuff upto 50 Meter lead.(A) Loose or soft soil.(A) Loose or soft soil

305 1. . EMBANKMENT CONSTRUCTION

305.1 General:

305.1.1 Description:

These Specifications shall apply to the construction of embankments including sub grades, earthen shoulders and miscellaneous backfills with approved materials obtained from roadway and drain excavation, borrow pits or other sources. All embankments, sub grades, earthen shoulders and miscellaneous backfills shall be constructed in accordance with the requirements of these specifications and in conformity with the lines, grades, and cross-sections shown on the drawings or as directed by the Engineer.

305.2 Materials and General Requirements.

305.2.1 Physical requirements :

305.2.1.1 The materials used in embankments, sub grades, earthen shoulders and miscellaneous backfills shall be soil, murrum, gravel, a mixture of these or any other material approved by the Engineer. Such materials shall be free of logs, stumps, roots, rubbish or any other ingredient likely to deteriorate or affect the stability of the embankment sub grade.

The following types of material shall be considered unsuitable for embankment:

- (a) Materials from swamps, marshes and bogs;
- (b) Peat, log, stump and perishable material; and soil that classifies as OL, OI, OH or Pt in accordance with IS:1498;
- (c) Materials susceptible to spontaneous combustion;
- (d) Materials in a frozen condition;
- (e) Clay having liquid limit exceeding 50 and plasticity index exceeding 25; and
- (f) Materials with salts resulting in leaching in the embankment.

305.2.1.2 Expansive clay exhibiting marked swell and shrinkage, properties ("free swelling index" exceeding 50 percent when tested as per IS:2720-Part 40) shall not be used as a fill material. Where an expansive clay with acceptable "free swelling index" value is used as a fill material, sub grade and top 500mm portion of the embankment just below sub grade shall be non-expansive in nature.

305.2.1.3 Any fill material with a soluble sulphate content exceeding 1.9 grams of sulphate (expressed as SO₃) per liter when tested in accordance with BS:1377 Part-3, but using a 2:1 water-soil ratio shall not be deposited within 500 mm or other distance described in the Contract), permanent works constructed out of concrete, cement bound materials or other cementations materials.

Materials with a total sulphate content (expressed as SO₃) exceeding 0.5 per cent by mass, when tested in accordance with BS: 1377, Part 3 shall not be deposited within 500 mm or other distances described in the contract, of metallic items forming part of the Permanent Works.

305.2.1.4 The size of the coarse material in the mixture of earth shall ordinarily not exceed 75mm when being placed in the embankment and 50 mm when placed in the sub grade. However, the Engineer may at his discretion permit the use of material coarser than this also if he is satisfied

that the same will not present any difficulty as regards the placement of fill material and its compaction to the requirements of these specifications. The maximum particle size shall not be more than two-thirds of the compacted layer thickness.

305.2.1.5 Ordinarily, only the materials satisfying the density requirements given in Table 300-1 shall be employed for the construction of the embankment and the sub grade.

TABLE 300-1. DENSITY REQUIREMENTS OF EMBANKMENT AND SUBGRADE MATERIALS

S.No.	Type of work	Maximum laboratory dry unit weight when tested as per IS:2720(Part 8)
1.	Embankments upto 3 metres height, not less than 15.2 kN/cu.m. subjected to extensive flooding.	Not less
2.	Embankments exceeding 3 metres height Not less than 16.0 kN/cu.m. or embankments of any height subject to long periods of inundation.	Not less
3.	Subgrade and earthen shoulders/ Verges/backfill	Not less than 17.5 kN/cu.m.

Notes: (1) This Table is not applicable for lightweight fill materials e.g. cinder, fly ash etc.

(2) The materials to be used in sub grade shall be non-expensive and shall satisfy design CBR at the specified dry density and moisture content. In case the available materials fail to meet the requirement of CBR, use of stabilization methods in accordance with Clause 403 and 404 or by any stabilization method approved by the Engineer shall be followed.

305.2.1.6 The materials to be used in sub grade shall conform to the design CBR value at the specified dry density and moisture content of the test specimen. In case the available materials fails to meet the requirement of CBR, use of stabilization methods in accordance with Clause 403 and 404 or by any stabilization method approved by the Engineer or by the IRC Association Committee shall be followed.

305.2.1.7 The materials to be used in high embankment construction shall satisfy the specified requirements of strength parameters

305.2.2 General Requirements:

305.2.2.1 The materials for embankment shall be obtained from approved sources with preference given to materials becoming available from nearby roadway excavation or any other excavation under the same Contract. The work shall be so planned and executed that the best available materials are saved for the sub grade and the embankment portion just below the sub grade.

305.2.2.2 Borrow materials:

The arrangement for the source of supply of the materials for embankment and sub grade and compliance with the guidelines, and environmental requirements, in respect of excavation and borrow areas as stipulated, from time to time by the Ministry of Environment and Forests, Government of India and the local bodies, as applicable, shall be the sole responsibility of the Contractor.

Borrow pits along the road shall be discouraged. If permitted by the Engineer, these shall not be dug continuously. Ridges of not less than 8 m width should

be left at intervals not exceeding 300m. Small drains shall be cut through the ridges to facilitate drainage. The depth of the pits shall be so regulated that their bottom does not cut an imaginary line having a slope of 1 vertical to 4 horizontal projected from the edge of the final section of the bank, the maximum depth in any case being limited to 1.5 m. Also, no pit shall be dug within the offset width of a minimum of 10 m.

Haulage of material to embankments or other areas of fill shall proceed only when sufficient spreading and compaction plant is operating at the place of deposition.

Where the excavation reveals a combination of acceptable and unacceptable materials, the Contractor shall, unless otherwise agreed by the Engineer, carry out the excavation in such a manner that the acceptable materials are excavated separately for use in the permanent works without contamination by the unacceptable materials. The acceptable materials shall be stockpiled separately.

The Contractor shall ensure that he does not adversely affect the stability of excavation or fills by the methods of stockpiling materials, use of plants or sitting of temporary buildings or structures.

305.2.2.3 Fly-Ash

User of fly-ash shall conform to the Ministry of Environment and Forest guidelines. Where fly-ash is used the embankment construction shall conform to the physical and chemical properties and requirements of IRC:SP:38-2001, "Guidelines for Use of Flyash in Road Construction". The term fly-ash shall cover all types of coal ash such as ponds ash, bottom ash or mound ash.

Embankment constructed out of fly ash shall be properly designed to ensure stability and protection against erosion in accordance with IRC guidelines. A suitable thick cover may preferably be provided at intervening layers of pond ash for this purpose. A thick soil cover shall bind the edge of the embankment to protect it against erosion. Minimum thickness of such soil cover shall be 500mm.

305.2.2.4 Compaction Requirements

The Contractor shall obtain representative samples from each of the identified borrow areas and have these tested at the site laboratory following a testing programme approved by the Engineer. It shall be ensured that the sub grade material when compacted to the density requirements as in Table 300-2 shall yield the design CBR value of the sub grade.

TABLE 300-2. COMPACTION REQUIREMENTS FOR EMBANKMENT AND SUBGRADE.	
Type of work/material	Relative compaction as percentage of max. laboratory dry density as per IS:2720 (Part 8)

1. Sub grade and earthen shoulders Not less than 97%
2. Embankment Not less than 95%
3. Expansive Clays
 - a) Sub grade and 500mm. portion Not allowed. Just below the sub grade.
 - b) Remaining portion of embankment Not less than 90-95%

The Contractor shall at least 7 working days before commencement of

compaction submit the following to the Engineer for approval :

(i) The values of maximum dry density and optimum content obtained in accordance with IS:2720 (Part 8), appropriate for each of the fill materials he intends to use.

(ii) A graph of density plotted against moisture content from which each of the values in (i) above of maximum dry density and optimum moisture content were determined.

The maximum dry density and optimum moisture content approved by the Engineer, it shall form the basis for compaction.

305.3 Construction Operations :

305.3.1 Setting Out

After the site has been cleared to Clause 201, the work shall be set out to Clause 301.3.1. The limits of embankment/sub grade shall be marked by fixing batter pegs on both sides at regular intervals as guides before commencing the earthwork. The embankment/sub grade shall be built sufficiently wider than the design dimension so that surplus material may be trimmed, ensuring that the remaining material is to be desired density and the position specified and conforms to the specified side slopes.

305.3.2 Dewatering

If the foundation of the embankment is in an area with stagnant water, and in the opinion of the Engineer it is feasible to remove it, the same shall be removed by bailing out or pumping, as directed by the Engineer and the area of the embankment foundation shall be kept dry. Care shall be taken to discharge the drained water so as not to cause damage to the works, crops or any other property. Due to any negligence on the part of the Contractor, if any such damage is caused, it shall be the sole responsibility of the Contractor to repair./restore it to original condition or compensate the damage at his own cost.

If the embankment is to be constructed under water, Clause 305.4.6 shall apply.

305.3.3 Stripping and Storing topsoil

In localities where most of the available embankment materials are not conducive to plant growth, or when so directed by the Engineer, the topsoil from all areas of cutting and from all areas to be covered by embankment foundation shall be stripped to specified depths not exceeding 150 mm and stored in stockpiles of height not exceeding 2 m for covering embankment slopes, cut slopes and other disturbed areas where re-vegetation is desired. Topsoil shall not be unnecessarily trafficked either before stripping or when in a stockpile. Stockpiles shall not be surcharged or otherwise loaded and multiple handling shall be kept to a minimum.

305.3.4 Compacting ground supporting embankment/Subgrade:

Where necessary, the original ground shall be leveled to facilitate placement of first layer of embankment, scarified, mixed with water and then compacted by rolling in accordance with Clause 305.3.5 and 305.3.6 so as to achieve minimum dry density as given in Table 300-2.

In case where the difference between the sub grade level (top of the sub grade on which pavement rests) and ground level is less than 0.5 m and the ground does not have 97 per cent relative compaction with respect to the dry density as given in Table 300-2, the ground shall be loosened up to a level 0.5m below the sub grade level, watered and compacted in layers in accordance with Clauses 305.3.5 and 305.3.6 to achieve dry density not less

than 97 percent relative compaction as given in Table 300-2.

Where so directed by the Engineer, any unsuitable material occurring in the embankment foundation (500mm portion just below the sub-grade) shall be removed and replaced by approved materials laid in layers to the required degree of compaction.

Any foundation treatment specified for embankments especially high embankments, resting on suspect foundations as revealed by borehole logs shall be carried out in a manner and to the depth as desired by the Engineer. Where the ground on which an embankment is to be built has any of the material types (a) to (f) in Clause 305.2.1, at least 500 mm of such material must be removed and replaced by acceptable fill material before embankment construction commences.

305.3.5 Spreading material in layers and bringing to appropriate moisture content

305.3.5.1 The embankment and sub grade material shall be spread in layers of uniform thickness in the entire width with a motor grader. The compacted thickness of each layer shall not be more than 250mm

when vibratory roller / vibratory soil compactor is used and not more than 200 mm when 80-100 kN static roller is used. The motor grader blade shall have hydraulic control suitable for initial adjustment and maintain the same so as to achieve the specific slope and grade. Successive layers shall not be placed until the layer under construction has been thoroughly compacted to the specified requirements as in Table 300-2 and got approved by the Engineer. Each compacted layer shall be finished parallel to the final cross-section of the embankment.

305.3.5.2 Moisture content of the material shall be checked at the site of placement prior to commencement of compaction; if found to be out of agreed limits, the same shall be made good. Where water is required to be added in such constructions, water shall be sprinkled from a water tanker fitted with sprinkler capable of applying water uniformly with a controllable rate of flow to variable widths of surface but without any flooding. The water shall be added uniformly and thoroughly mixed in soil by balding, dicing or barrowing until a uniform moisture content is obtained throughout the depth of the layer.

If the material delivered to the roadbed is too wet, it shall be dried, by aeration and exposure to the sun, till the moisture content is acceptable for compaction. Should circumstances arise, where owing to wet weather, the moisture content can not be reduced to the required amount by the above procedure, compaction work shall be suspended.

Moisture content of each layer of soil shall be checked in accordance with IS:2720 (Part 2), and unless otherwise mentioned, shall be so adjusted, making due allowance for evaporation losses, that at the time of compaction it is in the range of 1 per cent above to 2 per cent below the optimum moisture content determined in accordance with IS:2720 (Part 8) as the case may be. Expansive clays shall, however, be compacted at moisture content corresponding to the specified dry density, but on the wet side of the optimum moisture content obtained from the laboratory compaction curve.

After adding the required amount of water, the soil shall be processed by means of graders, harrows, rotary mixers or as otherwise approved by the Engineer until the layer is uniformly wet.

Clods or hard lumps of earth shall be broken to have a maximum size of 75 mm when being placed in the embankment and a maximum size of 50 mm when being placed in the sub grade.

305.3.5.3 Embankment and other areas of fill shall, unless otherwise required in the Contract or permitted by the Engineer, be constructed evenly over their full width and their fullest possible extent and the Contractor shall control and direct construction plant and other vehicular traffic uniformly over them. Damage by construction plant and other vehicular traffic shall be made good by the Contractor with material having the same characteristics and strength as the material had before it was damaged.

Embankments and other areas of unsupported fills shall not be constructed with steeper side slopes, or to greater widths than those shown in the Contract, except to permit adequate compaction at the edges before trimming back, or to obtain the final profile following any settlement of the fill and the underlying material. Whenever fill is to be deposited against the face of a natural slope, or sloping earthworks face including embankments, cutting, another fills and excavations steeper than 1 vertical on 4 horizontal, such faces shall be benched as per Clause 305.4.1 immediately before placing the subsequent fill.

All permanent faces of side slopes of embankments and other areas of fill formed shall, subsequent to any trimming operations, be reworked and sealed to the satisfaction of the Engineer by tracking a tracked vehicle, considered suitable by the Engineer, on the slope or any other method approved by the Engineer.

305.3.6 Compaction

Only the compaction equipment approved by the Engineer shall be employed to compact the different material types encountered during construction. Static three wheeled roller, self propelled single drum vibratory roller, tandem vibratory roller, pneumatic type roller, pad foot roller etc. of suitable size and capacity as approved by the Engineer shall be used for the different types and grades of materials required to be compacted either individually or in suitable combinations.

The compaction shall be done with the help of self propelled single drum vibratory roller or pad foot vibratory roller of 80 to 100 kN static weight or heavy pneumatic type roller of adequate capacity capable of achieving the required compaction. The contractor shall demonstrate the efficacy of the equipment he intends to use by carrying out compaction trails. The procedure to be adopted for these site trials shall be submitted to the Engineer for approval.

Earthmoving plant shall not be accepted as compaction equipment nor shall the use of a lighter category of plant to provide any preliminary compaction to assist the use of heavier plant be taken into account.

Each layer of the material shall be thoroughly compacted to the densities specified in Table 300-2. Subsequent layers shall be placed only after the finished layer has been tested according to Clause 903.2.2 and accepted by the Engineer. The Engineer may permit measurement of field dry density by a nuclear moisture/density guage used in accordance with agreed procedure and the guage is calibrated to provide results identical to that obtained from tests in accordance with IS: 2720 (Part 28). A record of the same shall be maintained by the Contractor.

When density measurements reveal any soft areas in the embankments / subgrade / earthen shoulders, further compaction shall be carried out as directed by the Engineer. If inspite of that the specified compaction is not achieved, the material in the soft areas shall be removed and replaced by approved material, compacted using appropriate mechanical means such as light weight vibratory roller, double drum walk behind roller, vibratory plate compactor, trench compactor or vibratory tamper to the density requirements

and satisfaction of the Engineer.

305.3.7 Drainage

The surface of the embankment/subgrade at all times during construction shall be maintained at such a cross fall (not flatter than that required for effective drainage of an earthen surface) as will shed water and prevent ponding.

305.3.8 Repairing of damages caused by rain/spillage of water:

The soil in the affected portion shall be removed in such areas as directed by the Engineer before next layer is laid and refilled in layers and compacted using appropriate mechanical means such as small vibratory roller, plate compactor or power rammer to achieve the required density in accordance with Clause 305.3.6. If the cut is not sufficiently wide for use of required mechanical means for compaction, the same shall be widened suitably to permit their use for proper compaction. Tests shall be carried out as directed by the Engineer to ascertain the density requirements of the repaired area. The work of repairing the damages including widening of the cut, if any, shall be carried out by the Contractor at his own cost, including the arranging of machinery/equipment for the purpose.

305.3.9 Finishing operations:

Finishing operations shall include the work of shaping and dressing the shoulders/verge/ roadbed and side slopes to conform to the alignment, levels, cross sections and dimensions shown on the drawings or as directed by the Engineer subject to the surface tolerance described in Clause 902. Both the upper and lower ends of the side slopes shall be rounded off to improve appearance and to merge the embankment with the adjacent terrain.

The topsoil, removed and conserved earlier (Clause 301.3.2 and 305.3.3) shall be spread over the fill slopes as per directions of the Engineer to facilitate the growth of vegetation. Slopes shall be roughened and moisture slightly prior to the application of the topsoil in order to provide satisfactory bond. The depth of the top soil shall be sufficient to sustain plant growth, the usual thickness being from 75 mm to 150 mm.

Where directed, the slopes shall be turfed with sods in accordance with Clause 307. If seeding and mulching of slopes is prescribed, this shall be done to the requirement of Clause 308.

When earthwork operations have been substantially completed, the road area shall be cleared of all debris, and ugly scars in the construction area responsible for objectionable appearance eliminated.

305.4 Construction of Embankment and subgrade under special conditions.

305.4.1 Earthwork for widening existing road embankment:

When an existing embankment and/or subgrade is to be widened and its slopes are steeper than 1 vertical on 4 horizontal, continuous horizontal benches, each at least 300 mm wide, shall be cut into the old slope for ensuring adequate bond with the fresh embankment/subgrade material to be added. The material obtained from cutting of benches could be utilized in the widening of the embankment/subgrade. However when the existing slope against which the fresh material is to be placed is flatter than 1 vertical on 4 horizontal, the slope surface may only be ploughed or scarified instead of resorting to benching.

Where the width of the widened portions is insufficient to permit the use of

conventional rollers, compaction shall be carried out with the help of small vibratory rollers/plate compactors/power rammers or any other appropriate equipment approved by the Engineer. End dumping of material from trucks for widening operations shall be avoided except in difficult circumstances when the extra width is too narrow to permit the movement of any other types of hauling equipment.

305.4.2 Earthwork for embankment and subgrade to be placed against sloping ground Where an embankment /subgrade is to be placed against sloping ground, the latter shall be appropriately benched or ploughed/scarified as required in Clause 305.4.1 before placing the embankment/subgrade material. Extra earthwork involved in benching or due to ploughing/scarifying etc. shall be considered incidental to the work.

For wet conditions, benches with slightly inward fall and subsoil drains at the lowest point shall be provided as per the drawings, before the fill is placed against sloping ground.

Where the contract requires construction of transverse subsurface drain at the cut-fill interface, work on the same shall be carried out to Clause 309 in proper sequence with the embankment and subgrade work as approved by the Engineer.

305.4.3 Earthwork over existing road surface:-

Where the embankment is to be placed over an existing road surface, the work shall be carried out as indicated below:-

(i) If the existing road surface is of granular or bituminous type and lies within 1 m of the new formation levels, it shall be scarified to a depth of 50mm or as directed so as to provide ample bond between the old and new material ensuring that at least 500 mm portion below the top of new subgrade level is compacted to the desired density.

(ii) If the existing road surface is of bituminous type or cement concrete type and lies within 1 m of the new formation level, the bituminous or cement concrete layer shall be removed completely.

(iii) If the level difference between the existing road surface and the new formation level is more than 1

m. the existing surface shall be roughened after ensuring that the minimum thickness of 500mm of subgrade is available.

305.4.4 Embankment and subgrade around structures:-

To avoid interference with the construction of abutments, wing walls or return walls of culvert/bridge structures, the Contractor shall, at points to be determined by the Engineer suspend work on embankment forming approaches to such structures, until such time as the construction of the latter is sufficiently advanced to permit the completion of approaches without the risk of damage to the structure.

Unless directed otherwise, the filling around culverts, bridges and other structures upto a distance of twice the height of the road from the back of the abutment shall be carried out independent of the work on the main embankment. The fill material shall not be placed against any abutment or wing wall, unless permission has been given by the Engineer but in any case not until the concrete or masonry has been in position for 14 days. The embankment and subgrade shall be brought up simultaneously in equal layers on each side of the structure to avoid displacement and unequal pressure. The sequence of work in this regard shall be got approved from the Engineer.

The material used for backfill shall not be an organic soil or highly plastic clay having plasticity index and liquid limit more than 20 and 40 respectively when

tested according to IS: 2720 (Part 5) .Filling behind abutments and wing walls for all structures shall conform to the general guidelines given in IRC: 78. The fill material shall be deposited in horizontal layers in loose thickness and compacted thoroughly to the requirements of Table 300-2.

Where the provision of any filter medium is specified behind the abutment, the same shall be laid in layers simultaneously with the laying of fill material. The material used for filter shall conform to the requirements for filter medium spelt out in Clause 2504 unless otherwise specified in the Contract. Where it may be impracticable to use conventional rollers, the compaction shall be carried out by appropriate mechanical means such as small vibratory roller, plate compactor or power rammer. Care shall be taken to see that the compaction equipment does not hit or come too close to any structural member so as to cause any damage to them or excessive pressure against the structure.

305.4.5 Construction of embankment over ground incapable of supporting construction equipment.

Where embankment is to be constructed across ground which will not support the weight of repeated heavy loads of construction equipment, the first layer of the fill may be constructed by placing successive loads of material in a uniformly distributed layer of a minimum thickness required to support the construction equipment as permitted by the Engineer. The Contractor, if so desired by him, may also use suitable geosynthetic material to increase the bearing capacity of the foundation. This exception to normal procedure will not be permitted where, in the opinion of the Engineer, the embankments could be constructed in the approved manner over such ground by the use of lighter or modified equipment after proper ditching and drainage have been provided. Where this exception is permitted, the selection of the material and the construction procedure to obtain an acceptable layer shall be the responsibility of the Contractor. The cost of providing suitable traffic conditions for construction equipment over any area of the Contract, will be the responsibility of the Contractor and no extra payment will be made to him. The remainder of the embankment shall be constructed as specified in Clause 305.3.

305.4.6 Embankment construction under water and Water logged areas

305.4.6.1 Embankment construction under water

Where filling or backfilling is to be placed under water, only acceptable granular material or rock shall be used unless otherwise approved by the Engineer. Acceptable granular material shall be of GW, SW, GP, SP as per IS:1498 and consist of graded, hard durable particles with maximum particle size not exceeding 75mm. The material should be non-plastic having uniformity coefficient of not less than 10. The material placed in open water shall be deposited by end tipping without compaction.

305.4.6.2 Embankment construction in waterlogged and Marshy Areas : The work shall be done as per IRC:34.

305.4.7 Earthwork for high embankment :-

The material for high embankment construction shall conform to Clause

302.2.1.7. In the case of high embankments (more than 6 m), the Contractor shall normally use fly ash in conformity with Clause 305.2.1.1 or the material from the approved borrow area.

Where provided, stage construction of embankment and controlled rates of filling shall be carried out in accordance with the Contract including

installation of instruments and its monitoring.

Where required, the contractor shall surcharge embankments or other areas of fill with approved material for the periods specified in the Contract. If settlement of surcharged fill results in any surcharging fill results the Contractor shall bring the resultant level upto formation level with acceptable materials for use in fill.

305.4.8 Settlement period

Where settlement period is specified in the Contract, the embankment shall remain in place for the required settlement period before excavating for abutment, wing wall, retaining wall, footings, etc. or driving foundation piles. The duration of the required settlement period at each location shall be as provided for in the contract or as directed by the Engineer.

305.5 Plying of Traffic

Construction and other vehicular traffic shall not use the prepared surface of the embankment and/or subgrade without the prior permission of the Engineer. Any damage arising out of such use shall, however be made good by the Contractor at his own expense as directed by the Engineer.

305.6 Surface Finish and Quality Control of Work

The surface finish of construction of subgrade shall conform to the requirements of Clause 902. Control on the quality of materials and works shall be exercised in accordance with Clause 903.

305.7 Subgrade Strength

It shall be ensured prior to actual execution that the borrow area material to be used in the subgrade satisfies the requirements of design CBR. Subgrade shall be compacted and finished to the design strength consistent with other physical requirements. The actual laboratory CBR values of constructed subgrade shall be determined on remoulded samples, compacted to the field density at the field moisture content and tested for soaked / unsoaked condition as specified in the contract.

305.8 Measurements for Payment

305.8.1 Earth embankment/subgrade construction shall be measured separately by taking cross sections at intervals given in Sub-section 113.3 after completion of clearing and grubbing and after completion of embankment / sub-grade. The volume of earthwork in cubic metres by the method of average end areas.

305.8.2 The measurement of fill material from borrow areas shall be the difference between the net quantities of compacted fill and the net quantities of suitable material brought from roadway and drainage excavation. For this purpose, it shall be assumed that one cum. of suitable material brought to site from road and drainage excavation forms one cu.m. of compacted fill and all bulking or shrinkage shall be ignored.

305.8.3 The embankment constructed with fly ash will be measured in cum, separately for the fly ash portions and for the soil cover and intervening layers of soil, unless otherwise specified in the contract.

305.8.4 Construction of embankment under water shall be measured in cu.m.

305.8.5 Construction of high embankment with specified material and in specified manner shall be measured in cu.m.

305.8.6 Stripping including storing and reapplication of topsoil shall be measured in

cu.m.

305.8.7 Work involving loosening and recompacting of ground supporting embankment / subgrade shall be measured in cu.m.

305.8.8 Removal of unsuitable material at embankment/subgrade foundation and replacement with suitable material shall be measured in Cu.m.

305.8.9 Scarifying existing granular/bituminous road surface shall be measured in Square metres.

305.8.10 Dismantling and removal of existing cement concrete pavement shall be measured vide Clause 202.6.

305.8.11 Filter medium and backfill material behind abutments, wing walls and other retaining structures shall be measured as finished work in position in cu.m.

305.9 RATES:

The Contract unit rates for the items of embankment and subgrade construction shall be payment in full for carrying out the required operations including full compensation for :

- (i) Cost of arrangement of land as a source of supply of material of required quantity for construction unless provided other wise in the contract.
- (ii) Setting out;
- (iii) Compacting ground supporting embankment/subgrade except where removal and replacement of unsuitable material or loosening and recompacting is involved;
- (iv) Scarifying or cutting continuous horizontal benches 300mm wide on side slopes of existing embankment and subgrade as applicable;
- (v) Cost of watering or drying of material in borrow areas and/or embankment and subgrade during construction as required;
- (vi) Spreading in layers, bringing to appropriate moisture content and compacting to specification requirements;
- (vii) Shaping and dressing top and slopes of the embankment and subgrade including rounding of corners;
- (viii) Restricted working at sites of structures;
- (ix) Working on narrow width of embankment and subgrade,
- (x) Excavation in all soils from borrow pits/designated borrow areas including clearing and grubbing and transporting the material to embankment and subgrade site with all lifts and leads unless otherwise provided for in the contract.
- (xi) All labour, material, tools, equipment and incidentals necessary to complete the work to the Specifications;
- (xii) Dewatering, and
- (xiii) Keeping the embankment/completed formation free of water as per Clause 311.
- (xiv) Transporting unsuitable excavated material for disposal with all leads and lifts.

305.9.2 Clause 301.9.5 shall apply as regards Contract unit rates for items of stripping and storing top soil and of reapplication of topsoil.

305.9.3. Clause 301.9.2 shall apply as regards Contract unit rate for the item of loosening and recompacting the embankment / subgrade foundation.

305.9.4. Clauses 309.1.1 and 305.8 shall apply as regards Contract rates for items of removal of unsuitable material and replacement with suitable material respectively.

305.9.5. The Contract unit rate for scarifying existing granular/bi-tuminous road surface shall be payment in full for carrying out the required operations including full compensation for all labour, materials, tools, equipment and incidentals, necessary to complete the work. This will also comprise of

handling, giving credit towards salvage value and disposal of the dismantled materials with all leads and lifts or as otherwise specified.

305.9.6. Clause 202.7 shall apply as regards Contract unit rate for dismantling and removal of existing cement concrete pavement.

305.9.7. The Contract unit rate for providing and laying filter material behind abutments shall be payment in full for carrying out the required operations including all materials, labour, tools, equipment and incidentals to complete the work to Specifications.

305.9.8. The Contract unit rate for providing and compacting backfill material behind abutments and retaining walls shall be payment in full for carrying out the required operations including all materials, labour, tools, equipment and incidentals to complete the work to Specifications.

305.9.9. Clause 305.4.6 shall apply as regards Contract unit rate for construction of embankment under water.

305.9.10. Clause 305.4.7 shall apply as regards Contract unit rate for construction of high embankment. It shall include cost of instrumentation, its monitoring and settlement period, where specified in the Contract or directed by the Engineer.

In case the Contract unit rate specified is not inclusive of all leads, the unit rate for transporting material beyond the initial lead, as specified in the contract for construction of embankment and subgrade shall be inclusive of full compensation for all labour, equipment, tools and incidentals necessary on account of the additional haul or transportation involved beyond the specified initial lead.

Measurement shall be taken and paid in Cu.m.

Item No.02 Providing and laying cement concrete 1:4:8 (1 cement: 4 Coarse sand :8 crushed stone aggregate 40 mm. nominal size) and curing complete including the cost of form work in (A) Foundation and Plinth

1.0. Materials

1.1. Water shall conform to M-1. Cement shall conform to M-4. Sand shall conform to M-8. Graded stone aggregate 40 mm. nominal size shall conform to M-12.

2.0. Workmanship

2.1. General

2.1.1. Before stating concrete the bed of foundation trenches shall be cleared of all loose materials, leveled, watered and rammed as directed

2.2. Proportion of Mix:

2.2.1. The proportion of cement, sand and stone aggregate shall be one part of cement. 4 parts of coarse sand and 8 parts of **graded** stone aggregates and shall be measured by volume.

2.3. Mixing:

2.3.1. The concrete shall be mixed in a mechanical mixer at the site of work. Hand mixing may however be allowed for smaller quantity of work if approved by the Engineer-in-charge. When hand mixing is permitted by the Engineer-in-charge in case of break-down of machineries and in the interest of the work, it shall be carried out on a water tight platform and care shall be taken to ensure that mixing is continued until the mass is uniform in colour and consistency, However in such case 10% more cement than otherwise period 1 1/2 to 2 minutes. The quantity of water shall be just sufficient to produce a dense concrete of required workability for the purpose.

2.4. Transporting & Placing the Concrete:

2.4.1. The concrete shall be handed from the place, of mixing to the final position in not more than 15 minutes by the method as directed and shall be placed into its final-position, compacted and finished within 30 minutes of mixing with water i.e. before the setting commences.

2.4.2. The concrete shall be laid in layers of 15 cms. to 20 cms.

2.5.1. The concrete shall be rammed with heavy iron rammers and rapidly to get the required compaction and to allow all the interstices to be filled with mortar.

2.6. Curing:

2.6.1. After the final set, the concrete shall be kept continuously wet if required by pounding for a period of not less than 7 days from the date of placement.

3.0. Mode of measurement and payment

3.1. The concrete shall be measured for its length, breadth and depth, limiting dimensions to those specified on plans or as directed

3.2. The rate shall be for a unit of **one cubic meter**.

Item No.03 Brick work using common burnt clay building bricks having crushing strength not less than 35 kg./Sq.Cm. in foundation and plinth in Cement Mortar 1:6 (1- Cement : 6 -fine sand)

1.0. Materials

Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. Bricks shall conform to M-15. Cement mortar shall conform to M-11.

2.0. Workmanship

2.1. Proportion:

2.1.1. The proportion of the cement mortar shall be 1:6 (1 cement : 6 fine sand) by volume.

2.2. Wetting of bricks:

2.2.1. The bricks required for masonry shall be thoroughly wetted with clean water for about two hours before use or as directed. The cessation of bubbles, when the bricks are wetted with water is as indication of through wetting of bricks.

2.3. Laying:

2.3.1. Bricks shall be laid in English bond unless directed otherwise. Half or cut bricks shall not be used except when necessary to complete to bond; closures in such case shall be cut to required size and used near the ends of walls.

2.3.2. A layer of mortar shall be spread on full width for suitable length of the lower course. Each brick shall first be properly bedded and set home by gently tapping with handle of trowel or wooden mallet. Its inside face shall be flushed with mortar before the next brick is laid and pressed against it. On completion of course, the vertical joints shall be fully filled from the top with mortar.

2.3.3. The walls shall be taken up truly in plumb. All courses shall be laid truly horizontal and all vertical joint shall be truly vertical. Vertical joints in alternate course shall generally be directly one over the other. The thickness of brick course shall be kept uniform.

2.3.4. The brick shall be laid with frog up wards. A set of tools comprising of wooden straight edges, man son's spirit level, square half meter rub, and pins, string and plumb shall be kept on the site of work for frequent checking during the progress of work.

2.3.5. Both the faces of walls of thickness greater than 23 cms. shall be kept in proper place. All the

connected brick work shall be kept not more than one meter over the rest of the work. Where this is not possible, the work shall be raked back according to bond (and not left toothed) at an angle not steeper than 45 degrees.

- 2.3.6.** All fixtures, pipes, outlets of water, hold fasts of doors and windows etc. which are required to be built in wall shall be embedded in cement mortar.

2.4. Joints:

- 2.4.1.** Bricks shall be so laid that all joints are quite flush with mortar. Thickness of joints shall not exceed 12 mm. The face joints shall be raked out as directed by raking tools daily during the progress of work, when the mortar is still green so as to provide key for plaster or pointing to be done.

- 2.4.2.** The face of brick shall be cleaned the very day on which the work is laid and all mortar dropping removed.

2.5. Curing:

- 2.5.1.** Green work shall be protected from rain suitably. Masonry work shall be kept moist on all the faces for a period of seven days. The top of masonry work shall be kept well wetted at the close of the day.

2.6. Preparation of foundation bed:

- 2.6.1.** If the foundation is to be laid directly on the excavated bed, the same shall be leveled, cleared of all loose materials, cleaned and wetted before starting masonry. If masonry is to be laid on concrete footing, the top of concrete shall be cleaned and moistened. The contractor shall obtain the engineer's approval for the foundation bed before foundation masonry is started. When pucca flooring is to be provided flush with the top to plinth, the inside plinth offset shall be kept lower than the outside plinth top by the thickness of the flooring.

3.0. Mode of measurements & payment

- 3.1.** The measurements of this item shall be taken for the brick masonry fully completed in foundation up to plinth. The limiting dimensions not exceeding those shown on the drawings or as directed shall be final. Battered tapered and curved portions shall be measured net.

- 3.2.** No deduction shall be made from quantity of brick work nor any extra payment made for embedding in masonry of marking holes in respect of following item.

(1) Ends of joints, beams, posts, girders, rafters, purlins, trusses, corbels, steps, etc. where cross sectional area does not exceed 500 sq.cm.

(2) Opening not exceeding 1000 sq.cm.

(3) Wall plate, sand bed, plates bearing of slab, chhajjas and like whose thickness does not exceed 10 cms. and the bearing does not extend the full thickness of wall.

(4) Drainage holes and recesses for cement concrete blocks to embed hold fasts for doors, windows etc.

(5) Iron fixtures, pipes up to 300 mm. dia. hold fasts of doors, and windows built into masonry and pipes etc. for concealed wiring.

(6) Forming charges of section not exceeding 350 sq.cm. in masonry.

- 3.3.** Apparatuses for fire places shall not be deducted nor shall extra labour required to make splaying of jumps, throating and making trenches over the aperture be paid for separately.

- 3.4.** The rate shall be for a unit of one cubic meter.

Item No.04 Filling available excavated earth (excluding rock) in trenches. plinth, sides of foundations etc. in layers not exceeding 20 cm. in depth consolidating each disposed layer by ramming and watering.

1.0. Workmanship

1.1. The earth to be used for filling shall be free from salts, organic or other foreign matter. All clods of earth shall

be broken.

1.2. As soon as the work in foundation has been completed and measured the site of foundation shall be cleared

of all debris, brick bats: mortar dropping etc., and filled with earth in layers not exceeding 20 cms. Each layer shall be adequately watered, rammed and consolidated before the succeeding layer is laid The earth shall be rammed with iron rammers where feasible and with the but ends of crow-bars, where rammer cannot be used.

1.3. The plinth shall be similarly filled with earth in layers not exceeding 20 cms. adequately watered and consolidated by ramming with iron or wooden rammers. When filling reaches finished level the surface shall be flooded with water for at least 24 hours and allowed to dry and then rammed and consolidated.

1.4. The finished level of filling shall be kept to shape intended to be given to floor.

1.5. In case off large heavy duty flooring like factory flooring, the consolidation may be done by power rollers, where so specified. The extent of consolidation required, shall also be as specified.

1.6. The excavated stuff of the selected type shall be allowed to be used in filling the trenches and plinth. Under

no circumstances black cotton soil be used for filling the plinth.

2.0. Mode of Measurements & Payment

2.1. The payment shall be made for filling in plinth and trenches. No deduction shall be made for shrinkage or

voids, if consolidated as instructed above.

2.2. The rate shall be for a unit of one cubic meter.

Item No.05 Filling in foundation and plinth with murrum or selected soil in layers of 20cm. thickness including watering, ramming and consolidating etc. complete.

1 Scope

Filling the excavated or void spaces in foundation trenches (sides/backfill) and within the plinth area (inside walls, up to plinth beam bottom or finished floor level) with approved filling material, placed, watered, rammed/compactified in controlled layers to achieve proper density and avoid future settlement.

2 Material

- **Murrum** (preferred in many regions): Well-graded, reddish/yellowish murrum soil (lateritic/gravelly type), free from organic matter, roots, vegetation, black cotton soil, clay lumps, salts, debris, or deleterious materials. Typical acceptable properties (from various project specs): Liquid limit ≤ 40 , Plasticity index ≤ 20 , minimum dry density after compaction $\sim 1.7\text{--}1.8 \text{ g/cm}^3$ or as per field Proctor test.

- **Selected soil / Selected earth:** Granular soil, sandy loam, or excavated earth free from black cotton soil, organic content, roots, stones >75-100 mm, garbage, or harmful salts. Avoid expansive clays.
- Material source shall be approved by the Engineer-in-Charge.
- No black cotton soil, marshy/peaty soil, or topsoil with vegetation shall be used.

3 Preparation of Area

- Clear the area of all loose soil, debris, vegetation, roots, stumps, water, slush, or organic matter.
- Level the base surface (bottom of excavation or after foundation concrete).
- Remove any soft pockets and replace with approved material if needed.
- Ensure no standing water; dewater if required.

4 Layering and Placement

- Fill in **horizontal layers not exceeding 20 cm loose thickness** (before compaction).
- Some stricter specifications allow 15-20 cm or max 15 cm for better control.
- Spread uniformly; break clods/lumps.
- Do not dump material in thick heaps—spread evenly to avoid poor compaction in lower parts.

5 Watering / Moisture Content

- Add water to bring the material to **optimum moisture content (OMC)** for best compaction (typically checked by feel or Proctor test).
- Sprinkle water uniformly (do not flood excessively to avoid softening base or washing fines).
- In dry areas, water may be added during spreading; in wet seasons, natural moisture may suffice.

6 Compaction / Ramming / Consolidation

- Each layer shall be thoroughly compacted to achieve **dense, uniform mass** with no voids.
- Methods (as per site conditions and approval):
 - Manual: Heavy rammers (7-10 kg iron rammers), crowbars, or wooden/steel tampers (common in small/medium residential works).
 - Mechanical (preferred for larger areas): Plate compactors, vibratory rollers (8-10 tonne), or smooth drum rollers (4-6 passes typical).
- Compact until no further settlement occurs under the rammer/roller, surface appears firm, and achieves min. 90-95% of Standard Proctor density (field density test may be required in important works).
- Successive layers shall only be placed after the previous layer is fully compacted and approved.

7 Sequence and Precautions

- Start filling immediately after foundation concrete gains strength (to utilize curing water for moisture).
- Fill symmetrically on both sides of walls/columns to avoid unequal pressure.
- Protect foundations from damage during ramming.
- In plinth area, fill up to bottom of plinth beam/floor level (or as per drawing).
- Top surface shall be trimmed/levelled to required slope/grade.

8 Testing / Quality Control

- Visual: Firm surface, no settlement under foot/roller, no pumping.
- Field density test (sand replacement or core cutter) if specified (common in govt./large projects).
- No layer shall be covered until approved by Engineer-in-Charge.

9 Measurement & Payment

- Measured in cubic metres (m³) of finished compacted volume.
- Deduct volume of concrete/structures within the filled area.
- Rate includes all leads, material (if brought from outside), watering, compaction tools, labour, etc.

Item No.05 Filling in plinth with sand under floors incl. watering ramming consolidating and dressing etc.comp

1 Scope Filling the excavated or void spaces in foundation trenches (sides/backfill) and within the plinth area (inside walls, up to plinth beam bottom or finished floor level) with approved filling material, placed, watered, rammed/compactified in controlled layers to achieve proper density and avoid future settlement.

2 Material

- **Murum** (preferred in many regions): Well-graded, reddish/yellowish murum soil (lateritic/gravelly type), free from organic matter, roots, vegetation, black cotton soil, clay lumps, salts, debris, or deleterious materials. Typical acceptable properties (from various project specs): Liquid limit ≤ 40 , Plasticity index ≤ 20 , minimum dry density after compaction $\sim 1.7\text{--}1.8 \text{ g/cm}^3$ or as per field Proctor test.
- **Selected soil / Selected earth:** Granular soil, sandy loam, or excavated earth free from black cotton soil, organic content, roots, stones $>75\text{--}100 \text{ mm}$, garbage, or harmful salts. Avoid expansive clays.
- Material source shall be approved by the Engineer-in-Charge.
- No black cotton soil, marshy/peaty soil, or topsoil with vegetation shall be used.

3 Preparation of Area

- Clear the area of all loose soil, debris, vegetation, roots, stumps, water, slush, or organic matter.
- Level the base surface (bottom of excavation or after foundation concrete).
- Remove any soft pockets and replace with approved material if needed.
- Ensure no standing water; dewater if required.

4 Layering and Placement

- Fill in **horizontal layers not exceeding 20 cm loose thickness** (before compaction).
- Some stricter specifications allow 15-20 cm or max 15 cm for better control.
- Spread uniformly; break clods/lumps.
- Do not dump material in thick heaps—spread evenly to avoid poor compaction in lower parts.

5 Watering / Moisture Content

- Add water to bring the material to **optimum moisture content (OMC)** for best compaction (typically checked by feel or Proctor test).
- Sprinkle water uniformly (do not flood excessively to avoid softening base or washing fines).
- In dry areas, water may be added during spreading; in wet seasons, natural moisture may suffice.

6 Compaction / Ramming / Consolidation

- Each layer shall be thoroughly compacted to achieve **dense, uniform mass** with no voids.
- Methods (as per site conditions and approval):
 - Manual: Heavy rammers (7-10 kg iron rammers), crowbars, or wooden/steel tampers (common in small/medium residential works).
 - Mechanical (preferred for larger areas): Plate compactors, vibratory rollers (8-10 tonne), or smooth drum rollers (4-6 passes typical).
- Compact until no further settlement occurs under the rammer/roller, surface appears firm, and achieves min. 90-95% of Standard Proctor density (field density test may be required in important works).
- Successive layers shall only be placed after the previous layer is fully compacted and approved.

7 Sequence and Precautions

- Start filling immediately after foundation concrete gains strength (to utilize curing water for moisture).
- Fill symmetrically on both sides of walls/columns to avoid unequal pressure.
- Protect foundations from damage during ramming.
- In plinth area, fill up to bottom of plinth beam/floor level (or as per drawing).
- Top surface shall be trimmed/levelled to required slope/grade.

8 Testing / Quality Control

- Visual: Firm surface, no settlement under foot/roller, no pumping.
- Field density test (sand replacement or core cutter) if specified (common in govt./large projects).
- No layer shall be covered until approved by Engineer-in-Charge.

9 Measurement & Payment

- Measured in cubic metres (m³) of finished compacted volume.
- Deduct volume of concrete/structures within the filled area.
- Rate includes all leads, material (if brought from outside), watering, compaction tools, labour, etc.

ITEM NO.07

Brick work using common burnt clay building bricks having crushing strength not less than 35 kg./Sq.Cm. in foundation and plinth in Cement Mortar 1:6 (1- Cement : 6 -fine sand)(B) Conventional

MATERIAL AS ABOVE DISCRIPTION & FOLLOW ITEM NO. 03

ITEM NO.08

Providing and fixing 35 mm thick shutters for Doors, windows and clerestory windows including Indian teak wood frames 10 cm x 7 cm. size including anodized alluminium fixtures and fastenings including primer coat of approved quality and two coats of oil painting etc, complete. (ii) Fully Panelled

1 Scope Providing and fixing fully panelled shutters for doors (single/double leaf), windows, and clerestory windows/ventilators, including fabricating teak wood frames, fitting anodized aluminium fixtures/fastenings, applying primer + two coats oil paint, and complete installation in prepared openings.

2 Materials

- **Timber:** First-class **Indian teak wood** (*Tectona grandis*), well-seasoned (moisture content 12-15% max as per IS 1141), free from defects like knots >25 mm, cracks, sapwood, warp, twist, decay, insect attack, or fungal growth. Density min. 650 kg/m³.
 - Approved species: Indian teak (preferred); no second-grade or plantation teak unless specified.
- **Panels:** Solid teak wood panels (not plywood/blockboard unless hybrid specified). Thickness of panels typically 12-18 mm (often 15 mm nominal).
- **Frames:** Indian teak wood, size **100 mm × 70 mm** (10 cm × 7 cm), rebated for shutter, with mortise & tenon joints or dowel joints glued + screwed.
- **Fixtures & Fastenings:** Anodized aluminium (mat/satin finish, anodic coating min. 15-20 microns per IS 1868), including:
 - Butt hinges (heavy-duty, 100-125 mm long for doors, 75-100 mm for windows; 3-4 per leaf).
 - Tower bolts (aluminium, 200-300 mm long), handles (aluminium handles/pulls), aldrops, door stoppers, etc.
 - Screws: Brass or anodized steel screws.
- **Primer & Paint:** Approved quality wood primer (e.g., pink primer or synthetic), followed by two coats of superior quality oil paint (enamel/synthetic gloss) in approved shade/color.
- All materials ISI-marked where applicable; samples approved by Engineer-in-Charge.

3 Fabrication of Shutters (Fully Panelled)

- **Thickness:** 35 mm nominal (tolerance ± 1 mm).
- **Construction:** Framed and panelled type (stiles, top/bottom rails, lock rail/mullion/intermediate rails + raised/sunken panels).
 - Stiles & rails: Min. width 100-125 mm (stiles), 150-200 mm (top/bottom rails), 100-150 mm (lock rail).
 - Panels: Rectangular/square, solid teak, tongued & grooved into grooves in stiles/rails (groove depth 12-15 mm). Panels raised (beaded/moulded edges) or flat with chamfered edges.
 - Joints: Mortise & tenon (tenon length min. 75-100 mm), glued with synthetic resin adhesive (IS 851) + pinned/screwed.
 - No through tenons visible; all exposed edges chamfered/rounded.
- **Glazing (if any hybrid):** Not applicable for fully panelled (all panels timber; glazed portions separate item).
- Shutters planed, sanded smooth; free from warp/twist (max. 3 mm in length/width).

4 Frames

- **Size:** 100 mm \times 70 mm section, rebated (rebate depth 15-18 mm for shutter).
- **Corners:** Mitred or haunched mortise & tenon joints, glued + screwed.
- **Holdfasts:** Mild steel flat holdfasts (40 \times 5 mm, 200-250 mm long, 3-4 per side) embedded in CC blocks (1:3:6) in walls.
- Exposed faces planed & moulded (chamfer/bead as per design).

5 Fixing / Installation

- Frames fixed plumb/level in prepared openings before plastering (or after if specified).
- Gaps between frame & masonry packed with seasoned teak/glued wooden pieces + cement mortar (1:4).
- Shutters hung on hinges, adjusted for smooth swing (clearance 3-5 mm top/sides, 6-10 mm bottom).
- Fixtures screwed firmly; no loose parts.
- For double-leaf doors: Rebated meeting stiles (one leaf rebated over other).
- Clerestory windows/ventilators: Fixed or openable as per drawing.

6 Finishing

- Exposed surfaces: Cleaned, knots treated with shellac knotting, filled with putty/wood filler.
- Apply one coat approved wood primer.
- Two coats superior oil paint (gloss/semi-gloss) in approved shade; each coat properly dried/sanded.
- Unexposed faces (frame backs, contact with masonry): One coat wood preservative (e.g., solignum/tar) or primer.

7 Quality Control / Testing

- Timber moisture tested (oven-dry method or meter).
- Shutters checked for squareness, warp (max. 3 mm), panel fit (no gaps > 1 mm).
- Hinges/fixtures tested for smooth operation, no creaking.
- Progressive approval by Engineer-in-Charge (factory-made or site-fabricated).

8 Measurement & Payment

- Shutters: Measured in square metres (m^2) of exposed face (outside line of frame for doors/windows; deduct openings $< 0.01 m^2$).
- Frames: Often included in shutter item or separate (m^3 or per running metre).
- Rate includes all materials, labour, tools, fixtures, painting, leads, wastage, etc. (often % extra for double-leaf or special designs).

ITEM NO.09

Providing and fixing window having extruded aluminum Colour anodized section frame main outer size 95mm x 24mm x 1.17mm @ wt.of 0.738 Kg/mt , horizontal Three track member size 92mm x 31.75mm x 1.30mm,@ Wt.1.07 Kg/mt , vertical member of size 92mm x 31.75mm x 1.50mm @ Wt. 1.06 Kg/mt with sliding shutters of horizontal member size 40 mmx18mmx1.29mm @ wt.of 0.456 Kg/mt, vertical member of size 40mm x 18mm x 1.29 mm @ wt.of 0.456Kg/mt/ with 5 mm thick transparent bronze colour tinted float glass with powder coated aluminum fittings and fixtures and transparent silicon sealant glass fixing to frame as per details etc

1.0 MATERIAL

1.1 Aluminum standard section

1.1.1 Window having extruded aluminium colour powder coated

Aluminum alloy used in the manufacture of window section shall confirm to I.S. designation HEA-WP of I.S. 733-1975 and also designation WVG-WP of I.S. 1285-1975 section shall be as specified in the drawing and design.

The works included standard window having extruded aluminium colour powder coated frame main outer size 95mm x 24mm x 1.17mm (@wt. 0.738 Kg/mt.), horizontal Three track member size 92mm x 31.75 mm x 1.30mm (@wt. 1.07 Kg/mt.), vertical member of size 92mm x 31.75mm x 1.50mm (@wt. 1.06 Kg/mt.) with sliding shutters of horizontal member size 40mm x 18mm x 1.29mm (@wt. 0.456 Kg/mt.), vertical member of size 40 x 18 mm x 1.29mm (@wt. 0.456 Kg/mt.) as per details as directed by Engineer in charge.

All sections shall be free from any scratches or holes or any damages on surface. All section shall have finished luster surface on all sides

1.1 Glass : The transparent bronze colour tinted float glass shall be of approved make having thickness of **5mm**. The glass shall be clear and free from scratches and cracks. The glass shall be provided on wall panel and fixed with transparent silicon gasket

1.2 Glazing clips: Glazing clips (structural glass) shall be of size as directed by the Engineer in charge around the glass allover shall be free from any scratches or holes or any damage of on surface all section shall have finished luster surface on all sides.

1.3 Rubber Gasket

Rubber gasket shall be of approved make shall be free from any scratches or holes or any damages on surface, and shall have finished luster surface on all sides.

1.4 Fixtures

Hinges shall be of approved make shall be free from any scratches or holes or any damages on surface and shall have finished luster surface on all sides.

1.5 Handles

Handles shall be of approved make shall be free from any scratches or holes or any damages on surface, and shall have finished luster surface on all sides.

1.6 Bolts

All Bolts shall be of approved make shall be free from any scratches or holes or any damages on surface and shall have finished luster surface on all sides.

1.7 Stoppers

Stoppers shall be of approved make shall be free from any scratches or holes or any damages on surface, and shall have finished luster surface on all sides.

Product is from reputed company having ISO 9001-2000 certificate and with three years performance guarantee.

2.0 WORKMANSHIP

The work of window having extruded aluminium colour anodized section frame shall be done with extreme finishing the partial board shall be fixed in the bottom panel and glass shall be fitted on top panel as directed by Engineer in charge, using glazing clips and rubber gaskets as required. All the fixtures and fastenings shall be fitted at right place and as directed by Engineer in charge floor spring shall be fitted properly so as to align the window properly and shall be given trial of opening and closing properly.

3.0 Mode of Measurement & Payment

3.1. The unit rate of window having extruded aluminium colour anodized section frame shall include the cost of all materials, cost of anodizing, cost of all necessary fixtures and fastenings, labour charges for fixing frames, shutters and fixing the window in wall at the place shown in drawing and as instructed by Engineer in charge, all tools and plant required for assembling and fixing in position, finishing as per direction of the Engineer-in-charge, and all other incidental expenses for preparing frame and shutter of specified size to complete the structure or its components as shown on the drawings and according to these specifications. They shall also include the cost of making, fixing and making walls good by plaster patch colour etc as required.

3.2. The Window shall be measured for its improvising and fixing window having extruded aluminium colour anodized section frame having heavy handle, heavy lock, bracket, stoppers, **5mm** thick transparent glass panel of approved make with anodized aluminium fixtures and transparent silicon glass fixings to from as detail including PVC T in frame silicon based linings handles, locks two nos. PVC gasket screws aluminum joints special runner etc. complete.

3.3 The rate shall be for a unit of **one square meter**.

ITEM NO.10

**Providing and laying controlled cement concrete M.200 and curing complete excluding the cost of formwork and reinforcement for reinforced concrete work in (A)
Foundations, footings, Base of columns and Mass concrete**

in case of ordinary concrete, mix is not required to be designed by preliminary tests and proportions of cement, fine aggregates and coarse aggregates are specified by volume as given in table below for different grades of concrete designated as ordinary M. 100, M. 150, M.200 and M.250.

1. In the designation of a concrete mix, letter "M" refers to the mix and the number the specified 28 days works cube compressive strength of that mix on 150 mm cubes expressed in kg. / cm².

2. The ordinary concrete mix shall generally be specified by volume. For cement which normally comes in bags and is used by weight, volume shall be worked out taking 50 kg of cement as 0.035 cubic metres in volume. While measuring aggregate by volume, shaking, ramming or hammering shall not be done. Proportioning of sand shall be as per its dry volume. In case it is dump, allowance for "bulking" shall be made as per I.S.: 2386 (Part - III).

3. Ingredients required for ordinary concrete containing one 50 Kg bag of cement of different proportions of mix shall be as given in Table below.

TABLE

Grade concrete	of	Mix by Volume	Total quantity of dry aggregate by volume	Proportion of fine	Quantity of water per 50
			per 50 Kg. / of cement to be taken as per sum of individual volume of fine and coarse aggregates, maximum	aggregate to coarse aggregate.	Kg. of cement maximum.
1 Ordinary		2 Liters	3	4	5 Liters

M-100	1:3:6	300	Generally 1 : 34
M-150	1:2:4	220	2 for 32
M-200	1:1 ½ : 3	160	aggregate to 30
M-250	1 : 1 : 2	100	coarse 27
			aggregate by
			volume but
			subject to
			and upper
			limit of 1 : 1
			½ and a lower
			limit 1 : 3

NOTE - The proportions of the aggregates shall be adjusted from upper limit to lower limit progressively as the grading of the fine aggregates becomes finer & the maximum size of coarse aggregate becomes larger.

Example -For an average grading of fine aggregate (that is Zone II of I.S.: 383-1963) the proportions shall be 1:1.1/2, 1:2 and 1:3 for maximum size of aggregates 10 mm, 20 mm. and 40 mm. respectively (after carrying out sieve analysis).

Note-2 A mix leaner than M.100 (1:3:6) may be used for non- structural parts, if provided in the contract. In such case grading of aggregates shall be by volume. Other requirements for mixing, placing & curing shall be the same.

4. Following shall be the maximum nominal size of coarse aggregate for the different items of work.

Sr. No.	Item of Construction	Maximum nominal size of coarse aggregate
(i)	R.C.C. well curb, R.C.C. well staining and R.C.C. pipes	40 mm.
(ii)	R.C.C. well staining	63 mm
(iii)	Well cap or pipe cap; solid type pipes abutment and wing-walls, and their pipe caps	40 mm
(iv)	R.C.C. works in cross girders deck slab, wearing coats, kerb, light posts, blast walls, approach slab etc. and hollow type piers, abutment, wing-walls and their pier caps.	20 mm
(v)	R.C.C. bearings	20 mm
(vi)	For any other item of construction not covered by items (i) to (v)	As specified on the drawing or as desired by the Engineer-in-charge in case it is not specified on drawing.

For heavily reinforced concrete members as in the case of ribs of main beams nominal maximum size of aggregate shall usually be restricted to 5 mm less than the minimum lateral clear distance between the main bars or 5 mm less than the minimum cover to the reinforcement, whichever is the smaller.

5. Fine aggregate shall be clean, hard, coarse sand. It shall be free from dust and such other substances. The sand be got approved by the Engineer-in-charge.

6. All materials shall be stored as to prevent their deterioration or intrusion of their quality and fitness for the work. Any material which has deteriorated or has been damaged or is otherwise considered defective by the Engineer-in-charge shall not be used in the works.

7. Cement shall be stored above the ground level in perfectly dry and water tight sheds. Wherever bulk storage containers are used, their capacity should be sufficient to cater to the requirements at site and should be cleaned at least once every 3 to 4 months. The aggregate shall be stored in such a way as to prevent admixture of foreign materials. Different size of fine or coarse aggregate shall be stored in separate stock- piles sufficiently away from the each other to prevent intermixing the materials.

8. The water for mixing shall be potable water to satisfaction of the Engineer-in- charge. The quantity of water shall be just sufficient to produce a dense concrete of required workability for the job.

9. For all work concrete shall be mixed in a mechanical mixer which along with other accessories shall be kept in first class working condition and so maintained throughout the construction. Mixing shall be continued till materials are uniformly distributed and uniform colour of the entire mass is obtained and each individual particle of the coarse aggregate show complete coating of mortar containing its proportionate amount of cement. In no case shall the mixing be done for less than 2 minutes after all ingredients have been put into the mixer.

10. When hand mixing is permitted by the Engineer-in-charge for small jobs or for certain other reasons. It shall be done on a smooth watertight platform large enough to allow efficient

turning over of the ingredients of concrete before and after adding water. Mixing platform shall be so arranged that no foreign material shall get mixed with concrete nor does the mixing water flow out. Cement in required number of bags shall be placed in a uniform layer on top of the measured quantity of fine and coarse aggregate, which shall also be spread in a layer of uniform thickness on the mixing platform. Dry coarse and fine aggregate and cement shall then be mixed thoroughly by turning over to get a mixture of uniform colour. Enough water shall then be added gradually through a rose can and the mass turned over till a mix of required consistency is obtained. In hand mixing quantity of cement shall be increased by 10 per cent above that specified.

11. Mixers which have been out of use for more than 30 minutes shall be thoroughly cleaned before putting in a new batch. Unless otherwise agreed to be the Engineer-in-charge, the first batch of concrete from the mixer shall contain only two thirds of normal quantity of coarse aggregate. Mixing plant shall be thoroughly cleaned before changing from one type of cement to another.

12. The method of transporting and placing concrete shall be approved by the Engineer-in-charge. Concrete shall be so transported and placed that no contamination, segregation or loss of its constituent material takes places. All form work and reinforcement contained in it shall be cleaned and made free from standing water, dust, snow or ice immediately before placing of concrete. No concrete shall be placed in any part of the structure until the approval of the Engineer-in-charge has been obtained.

13. If concreting is not started within 24 hours of the approval being given, it shall have to be obtained again from the Engineer-in-charge. Concreting being given, it shall proceed continuously over the area between construction joints. Fresh concrete shall not be placed against concrete which has been in position for more than 30 minutes unless a proper construction joint is formed. Concrete shall be compacted in its final position within 30 minutes of its discharge from the mixer unless carried in properly design agitators, operating continuously, when this time shall be within 2 hours of the addition of cement to the mix and within 30 minutes of its discharge from the agitator. Except where otherwise agreed to be the Engineer-in- charge, concrete shall be deposited in horizontal layers to neither a compacted depth of nor more than 0.45 metre when internal vibrators are used and not exceeding 0.30 metre in all other cases.

14. Unless otherwise agreed to by the Engineer-in-charge concrete shall not be dropped into place from a height exceeding 2 metres. When trucking or chutes are used they shall be kept clean and used in such a way as to avoid segregation. When concreting has to be resumed on a surface which has hardened, it shall be roughened, swept, clean, thoroughly wetted and covered with a 13 mm thick layer of mortar composed of cement and sand in the same ratio as in the concrete mix itself. This 13 mm layer of mortar shall be freshly mixed and placed immediately before placing of new concrete. Where concrete has not fully hardened, all laitance shall be removed by scrubbing the well surface with wire or bristle brushes, care being taken to avoid dislodgement of any particles of coarse aggregate. The surface shall then be thoroughly wetted, all free water removed and then coated with neat cement grout. The first layer of concrete to be placed on this surface shall not exceed 150 mm in thickness, and shall be well rammed against old work particular attention being given to corners and close spots.

15. All concrete shall be compacted to produce a dense homogeneous mass with the assistance of vibrators, unless otherwise permitted by the Engineer-in-charge for exceptional cases, such as concreting under water, where vibrators can not be used. Sufficient vibrators in serviceable condition shall be kept at site so that spare equipment is always available in the event of break downs.

16. Immediately after compaction, concrete shall be protected against harmful effects of weather, including rain, running water, shocks, vibration, traffic, rapid temperature changes, frost and driving out process. It shall be covered with wet sacking, Hessian or other similar absorbent material approved by the Engineer-in-charge soon after the initial set, and shall be kept continuously wet for a period of not less than 14 days from the date of placement. Masonary work over the foundation concrete may be started after 48 hours of it's laying but the curing of concrete shall be continued for a minimum period of 14 days.

17. Form work shall include all temporary or permanent forms required for forming the concrete together with all temporary construction required for their support. Form work shall however be divided into following two distinct categories:

- (1) Shuttering i.e., form work required for forming the concrete.
- (2) Scaffolding i.e., form-work required for supporting shuttering.

Forms for shuttering shall be constructed only in metal suitably lined. Forms for scaffolding shall be constructed of metal or timber. Both shuttering and scaffolding shall be of substantial rigid construction and shuttering shall be true to shape and dimensions shown on the drawings: All bolts and rivets shall be counter-sunk and well ground to provide a smooth, plane surface.

18. Forms shall be mortar-tight and shall be made sufficiently rigid by the use of ties and bracings to prevent any displacement or sagging between supports. They shall be strong enough to withstand all pressure, ramming and vibration, without deflection from the prescribe lines occurring during and after placing the concrete. Screw jacks or hard wood wedges where required shall be provided to make up any settlement in the formwork either before or during the placing of concrete. Suitable camber shall be provided in horizontal members of structure, specially in long spans to counteract the effects of any fixed as to provide for such camber. Forms shall be so constructed as to be removable in sections in the desired sequence, without damaging the surface of concrete or disturbing other sections. Unless otherwise specified or directed, chambers or fillets of sizes 25 mm x 25 mm shall be provided at all angles of formwork to avoid sharp corners.

19. The inside surfaces of shuttering shall, except in the case of permanent form work or where otherwise agreed to by the Engineer-in-charge, be coated with an approved material to prevent adhesion of concrete to the form work. Release agents shall be applied strictly in accordance with the manufacturer's instructions and shall not be

allowed to come into contact with any reinforcement or pre stressing tendons and anchorages. Different release agents shall not be used in form work for concrete which will be visible in the finished works:

20. Special measures shall be taken to ensure that the form work does not hinder the shrinkage of concrete because without these cracking could occur before the form work is removed. Wherever applicable arrangements must be made to ensure that the form work does not restrain the shortening and hogging of the beams or slabs during tensioning of the tendons. The form work should take due account of the calculated amount of positive or negative camber so as to ensure the correct final shape of the structures having regard to the deformation of a false work, scaffolding or propping and the instantaneous or deferred deformation due to various causes affecting pre stressed structures. Where there are re-entrant angles in the concrete sections the form work should be removed at those sections as soon as possible after the concrete has set in order to avoid cracking due to shrinkage of concrete. Form work shall be tight enough to prevent any appreciable loss of cement during vibrations, suitable tolerances should be provided in the form work, immediately before concreting all forms shall be thoroughly cleaned. Contractor shall give the Engineer-in-charge due notice before placing any concrete in the forms to permit him to inspect and accept the false work and forms as to their strength alignment and general fitness, but such inspection shall not relieve the contractor of his responsibility for safety of men, machinery, materials and for results obtained.

21. The Engineer-in-charge shall be informed in advance by the contractor of his intention to strike any formwork. While fixing the time for removal of formwork, due consideration shall be given to local conditions, character of the structure, the weather and other conditions that influence the setting of concrete and of the materials used in the mix. Where field operations are controlled by strength tests of concrete, the removal of the load-supporting or soffits forms may commence when concrete has attained strength equal to at least twice the stress to which the concrete will be subjected at the time of striking props including the effect of any further addition of loads. When field operations are not controlled by strength tests of concrete the vertical forms of beams, columns and walls may be removed after 2 days. The props of slabs and beams may be removed after 14 and 21 days respectively. All formwork shall be removed without causing any damage to the concrete. Centering shall be gradually and uniformly lowered in such a manner as to permit the concrete to take stresses due to its own weight uniformly and gradually. Where internal metal ties are permitted, they or their removable parts shall be extracted without causing any damage to the concrete and remaining holes filled with mortar. No permanently embedded metal part shall have less than 25 mm cover to the finished concrete surface. Where it is intended to reuse the formwork, it shall be cleaned and made good to the satisfaction of the Engineer-in-charge.

22. Immediately after the removal of forms, all exposed bars or bolts passing through the Cement concrete member and used for shuttering or any other purpose shall be cut inside the cement concrete member to a depth of at least 25 mm below the surface of the concrete and the resulting holes be filled by cement mortar. All fins caused by form joints, all cavities produced by the removal of form ties and all other holes and depressions, honeycomb spots, broken edges or corners and other defects, shall be thoroughly cleaned, saturated with water and carefully pointed and rendered true with mortar of cement and fine aggregate mixed in the proportions used in the grade of concrete that is being finished and of as dry as consistency as is possible to use. Considerable pressure shall be applied in filling and pointing to ensure thorough filling in all voids. Surfaces which have been pointed shall be kept moist for a period of twenty four hours. If rock pockets/honeycombs, in the opinion of the Engineer-in-charge are of such an extent or character as to affect the strength of the structure materially or to endanger the life of the steel reinforcement, he may declare the

concrete defective and require the removal and replacement of the portions of the structure affected.

23. In the case of reinforced concrete work workability shall be such that the concrete surrounds and properly grips all reinforcement. The degree of consistency, which shall depend up on the nature of work and methods of vibration of concrete shall be determined by regular slump tests. Following slump shall be adopted for different types of works.

Sr. No.	Type of Work	Slumps	
		Where vibrators are used	Where vibrators are not used
(i)	Mass concrete in R.C.C. foundations, footings and retaining walls	10 mm to 25 mm	80 mm
(ii)	Beams, slabs and columns simply reinforced	25 mm to 40 mm	100 mm to 120 mm
(iii)	Thin R.C.C. section or section with congested steel.	40 mm to 50 mm	125 mm to 150 mm

24. Works strength tests shall be made in accordance with I.S.: 516. Each test shall be conducted on ten specimens five of which shall be tested at seven days and the remaining five at 28 days. The samples of concrete shall be taken on each day of concreting and cubes shall be made at the rate of one for every 5 cubic metre of concrete or a part thereof. However, if concreting done in a day is less than 15 cubic meter, the minimum number of cubes can be reduced to 6 with the specific permission of the Engineer-in-charge. Similar works tests shall be carried out whenever the quality and grading of materials is charged irrespective of the quantity of concrete proud. The number of specimens may be suitably increased as deemed necessary by the Engineer- in-charge when procedure of tests given above reveal a poor quality of concrete and in other special cases.

25. The average strength of the group of cubes cast for each day shall not be less than the specified works cube-strength. 20 per cent of the cubes cast for each day may have values less than the specified strength, provided the lowest value is not less than 85 per cent of the specifies strength.

26. R.C.C. work shall have exposed concrete surface. Centering design and its erection shall approved by he Engineer-in-charge. One carpenter with helper will invariably be kept present throughout the period of concreting. Movement of labour and other persons shall be totally prohibited over reinforcement laid in position. For access to different parts, suitable mobile platforms shall provide so that steel reinforcement in position is not disturbed. For ensuring proper cover, mortar blocks of suitable size shall be cast and tied to the reinforcement. Timber, Kapchi or metal pieces shall not be used for this purpose. Concreting of important structural members shall always be done in the presence and under the supervision of departmental person not below the rank of Assistant Engineer / Additional Assistant Engineer Overseer or as instructed by the Engineer-in-charge. After removal of form work checks that concrete produced is of good quality. Plastering shall not be allowed to the expressed faces of concrete.

27. In reinforced concrete the volume occupied by reinforcement shall not be deducted. The slab shall be measured as running continuously through and the beam as the portion below the slab.

28. All necessary labour, materials equipment, etc., for sampling, preparing test cubes, curing etc., shall be provided by the Contractor. Testing of the materials and concrete may be arranged by the Engineer-in-charge in an approved laboratory at the cost of the contractor.

29. The payment will be made on **cmt** basis of the finished work.

30. The unit rate of concrete shall include the cost of all materials, labour, tools and plan required for mixing, placing in position, vibrating and compacting finishing as per directions of the Engineer-in-charge, curing and all other incidental expenses for producing concrete of specified strength to complete the structure or its components as show on the drawings and according to these specifications. The rate shall also include the cost of making/fixing and removing of all centers and forms required for the work.

Compaction and finishing of cement concrete road by trimix process providing extra labour charges for the trimix vacuum dewatering service process on cement concrete road surface by using vacuum dewatering pump floater surface

vibrator including making groves and rough finish to surface as per in including leveling the complete.

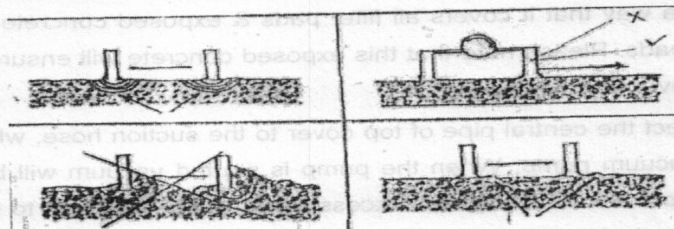
1. Working Method

Concrete Placing

Concrete can be placed & distributed by transit mixer and also sufficient man power is required. It is important to distributed the concrete evenly & as near the final level as possible.

2. Poker Vibration :

As a first step, concrete is vibrated with an immersion vibrator in order to remove entrapped air & voids & make the concrete homogeneous, please ensure that the areas close to channels & stop ands carefully vibrated. Do not distribute the concrete with the poker vibration along with the surface vibration



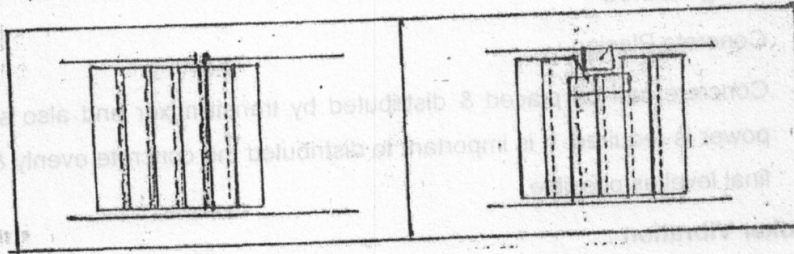
3. Surface Vibration :

Surface Vibration should always start as soon as there is enough concrete in front of surface vibrator. Two passes with the surface vibrator are required. During, the first pass, concrete must be distributed evenly in front of surface vibrator. There should be a roll of concrete of about 10-20 mm in front of leading beam along the entire length of the vibrator when the concrete has been placed and vibrated to a length of about 5 mm, the second pass is carried but. The machine should be pulled at a speed of maximum 1 mtr./min and without interruption 'avoid linings' on the surface. Keep the surface of the channel. Clean from concrete

4. Vacuum Processing :-

Place the filter pads as soon as the sufficient concrete surface is vibrated. Please note that the vacuum dewatering process must start within 30 minutes from the: time of starting concrete pouring, Filter pads are placed in such away that there is at least 100 mm fresh concrete visible around the fitter pads on all

four sides. Filter should be overlapped with each other by at least 250 mm. (all filter pads are marked with black line to ensure proper overlapping.)



The recesses or other obstacles within the area to be vacuum processed must be covered & sealed using polyethylene sheet before the filter pads are placed. If the obstacles are flush with the surface level or above, filter pad must be folded.

The rolled up top cover is placed centrally on the filter pads. It is rolled out in such a way that it covers all filter pads & exposed concrete on the sides of the filter pads. Please note that this exposed concrete will ensure perfect sealing for the cover from laying top

Connect the central pipe of top cover to the suction hose, which is connected to the vacuum pump. When the pump is started vacuum will be created between the top cover & filter pads. Excess water will be taken in to the vacuum pump's tank & discharged. Normal suction cycle is 1 -1.5 min. per 10 mm. of concrete thickness. Guidelines for selecting dewatering time @ normal condition are shown in the following table.

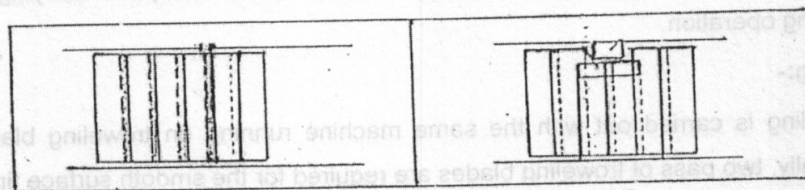
Thickness		Dewatering Time {Min}
MM	Inch	
50	2	7
100	4	15
125	6	20
150	8	30
200	10	40
250	12	45

Please note that dewatering time largely depends upon ambient conditions viz.

Temperature, humidity, etc. During the course of dewatering, the concrete surface gradually hardens & can be felt from the top of the top cover. The extent of hardness achieved by the concrete decides when to stop dewatering process.

When the vacuum processing is over, the cover is rolled up, to 100 mm so that the filter pads are visible. This will remove the water, that may have remained on the concrete surface, filter pads & in the suction hose. After about 30 seconds, the top cover is rolled completely & vacuum pump is switched off. Simultaneously, the suction hose & the top cover pipe are disconnected. Do not run the pump while the ball valve is open as likely that small aggregate are sucked into the pump due to vacuum. The entire process is repeated on the next concrete pane.

After first patch in any / given panel is dewatered, care should be taken while placing filter pad on the concrete surface next to the dewatered concrete. First filter pad should start from the edges of last filter pad of the previously dewatered concrete. The remaining filter pads than shall be placed as explained above.

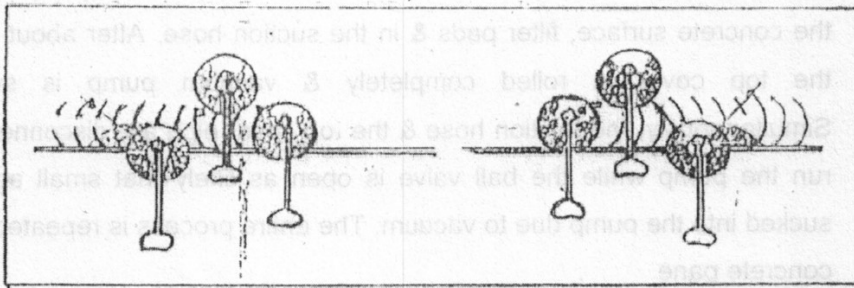


While repeating dewatering process subsequently, in order that top cover should get proper sealing against the side already vacuum processed, it should be rolled out at least 300 mm over the vacuum dewatered area. Before spreading the top cover on the dewatered area, it is essential to give one pass of skim floater (with disc) along the edges of the dewatered concrete. The concrete surface will become wet as some will be come on the top surface. This will provide the necessary sealing. Subsequently roll out the top cover completely. Check that there are no wrinkles on the top cover.

5. Floating :

The first finishing operation is floating where floating disc is used. that can not be reached by skim floater floated by hand. Care should be taken while floating near channels & edges. The skim floater is run over the channel up to disc center in order to avoid unevenness at the joint. All four sides of dewatered panel must be floated first central area is to be floated later. Any corrections, if required are to be carried out at this stage with the concrete at the time of raking only. Never use any cement paste, mixtures of cement & sand or fresh concrete for patchwork. Such materials will be pill off, will leave patches after the concrete

floor is brought to use.



Normally two passes with disc with the skim floater operating at higher speed are sufficient for the skid free surfaces. This pass of skim floater should be given perpendicular to the previous pass. please note that the floating operation brings up certain amount of water to the surface. This moisture helps in carrying out finishing operation.

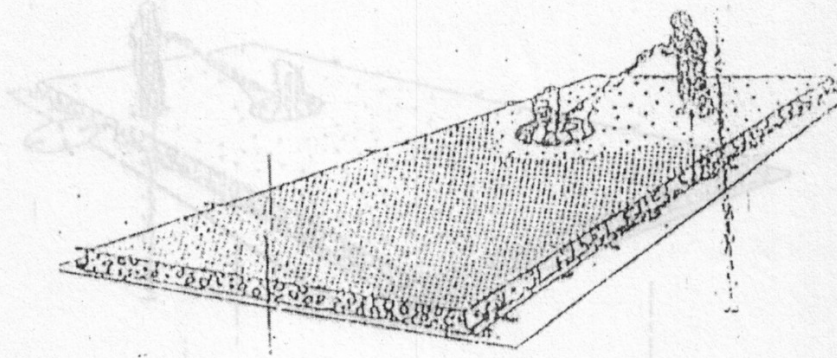
6 Troweling:-

Troweling is carried out with the same machine running on troweling blades. Normally, two pass of troweling blades are required for the smooth surface finish. However, the number of passes can be decided depending upon the surface finish required. The first troweling operation can start after the about 30 minutes after the final floating operation & surface is sufficiently dry. This pass is to be made using low speed & minimum blade angle. Please also use the lower speed when troweling near the channels, from the edges, obstacles etc. Blade angle & the speed can be increased for subsequent passed to achieved smoother surface finish.

7. Curing

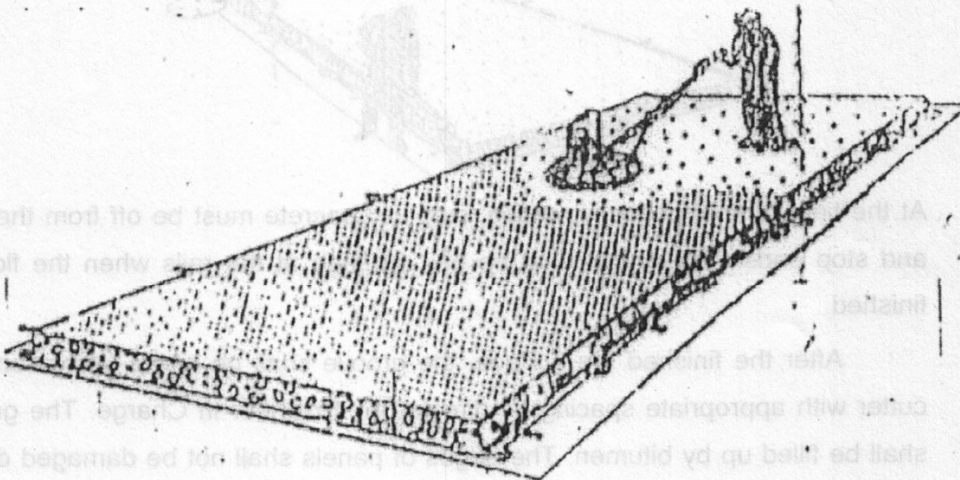
Concrete has to be protected from rapid drying which may result in cracking. Curing can be done by ponding, covering with plastic sheet or gunny bags. In any method, the surface should be always kept wet with water. Curing call also be done by application of curing compound. Curing must be done for at least 7 days.

Intermixing of topping First Pass



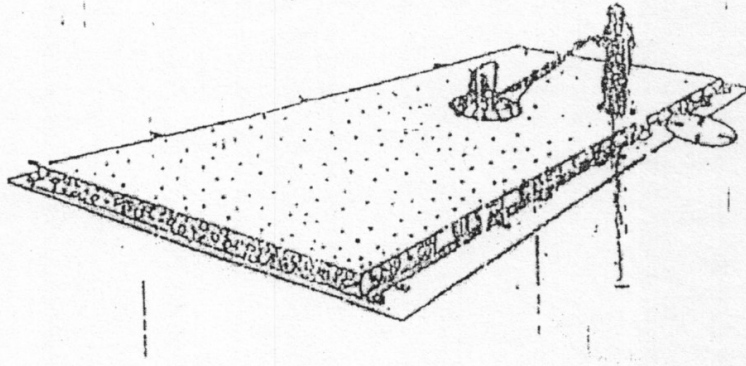
You can start the work when topping has darkened because the moisture under the concrete. The topping material is worked with care into concrete surface with a skim floated equipped with disc.

Intermixing of Topping Second Pass



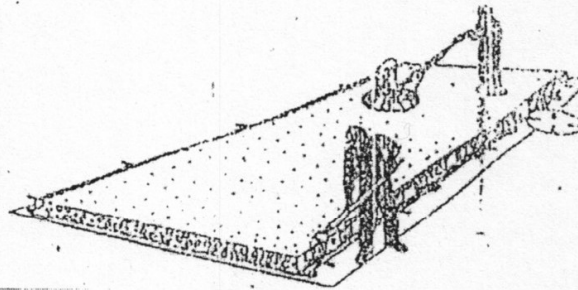
Cheek the surface flatness with straight edge and work the topping material into concrete s the first time.

Power Troweling First Pass



The first power troweling is carried out as a normal power troweling.

Power Troweling Final Pass



At the time of final power -troweling, surplus concrete must be off from the rails and stop ends., There must not be any damage at the rails when the floor is finished.

After the finished the surface, the groove shall be made using concrete cutter with appropriate spacing as directed by Engineer in Charge. The groove shall be filled up by bitumen. The edges of panels shall not be damaged during the process of making grooves.

ITEM NO.11

Providing and laying controlled cement concrete M.200 and curing complete excluding the cost of formwork and reinforcement for reinforced concrete work in (A) Plinth Beam & Coping

MATERIAL AS ABOVE DISCRIPTION & FOLLOW ITEM NO. 10

ITEM NO.12

Providing and laying controlled cement concrete M.200 and curing complete excluding the cost of formwork and reinforcement for reinforced concrete work in (A) lintel

MATERIAL AS ABOVE DISCRIPTION & FOLLOW ITEM NO. 10

ITEM NO.13

Providing and laying controlled cement concrete M.200 and curing complete excluding the cost of formwork and reinforcement for reinforced concrete work in (A) Chajja

MATERIAL AS ABOVE DISCRIPTION & FOLLOW ITEM NO. 10

ITEM NO.14

Providing and laying controlled cement concrete M.200 and curing complete excluding the cost of formwork and reinforcement for reinforced concrete work in (A) Column

MATERIAL AS ABOVE DISCRIPTION & FOLLOW ITEM NO. 10

ITEM NO.15

Providing and laying controlled cement concrete M.200 and curing complete excluding the cost of formwork and reinforcement for reinforced concrete work in (A) Beam

MATERIAL AS ABOVE DISCRIPTION & FOLLOW ITEM NO. 10

ITEM NO.16

Providing and laying controlled cement concrete M.200 and curing complete excluding the cost of formwork and reinforcement for reinforced concrete work in (A) Slab

MATERIAL AS ABOVE DISCRIPTION & FOLLOW ITEM NO. 10

ITEM NO.17

Providing TMT Bar FE500D reinforcement for R.C.C.work including bending, binding and placing in position complete upto floor two level

1.0 GENERAL

This work shall consist of furnishing and placing coated, or uncoated or high strength deformed reinforcement, bars (intentioned) of the shape and dimensions shown on the drawings and conforming to these specifications or as approved by the Engineer in charge.

2.0 MATERIAL

2.1. T.M.T. Bars

- 2.2.** Reinforcements may be either T.M.T. tensile steel, confirms to IS 1786-2008 bars. They may be uncoated or coated with epoxy or with approved protective coatings.
- 2.3.** T.M.T. bars reinforcement for R.C.C. work shall conform IS 432 (Part II) 1982 (Reaffirmed 1995) and shall be of tested quality. It shall also comply with relevant part of IS 456-2000.
- 2.4.** All reinforcement shall be clean and free from dirt, paint, grease or oil, all scale or loose or thick rust at the time of placing.
- 2.5.** All steel shall be procured from original producers no re-rolled steel shall be incorporated in the work.
- 2.6.** Only new steel shall be delivered to the site every bar shall be inspected before placing to its position and defective brittle or burnt bar shall be discarded cracked ends of bars shall be discarded

3.0 Pitch

- 3.1.** Distance between bars shall be as specified in drawings and as directed by the Engineer in charge all bars shall be placed at an accurate distance from each

other and shall be bind tightly to maintain the desired pitch Suitable means shall be provided for holding bars securely in position.

4.0 Binding wire

- 4.1. Mild steel binding wire shall be of 1.63 mm or 1.22 mm (16 to 18 gauge) diameter and shall conform IS 280-2006.
- 4.2. The use of black wire will be permitted for binding reinforcement bars. It shall be free from dirt, paint, grease or oil, oil scale or loose or thick rust and any other undesirable coating which may prevent adhesion of cement mortar at the time of binding.
- 4.3. Only new binding wire shall be delivered to the site all binding wire shall be inspected before binding to its position and defective brittle, rusted, used wire, shall be discarded.

5.0 PROTECTION OF REINFORCEMENT

- 5.1. Uncoated reinforcing steel shall be protected from rusting or chloride contamination. Reinforcements shall be free from rust, mortar, loose mill scale, grease, oil or paints. This may be ensured either by using reinforcement fresh from the factory or thoroughly cleaning all reinforcement to remove rust using any suitable method such as sandblasting, mechanical wire brushing, etc. as directed by the Engineer. Reinforcements shall be stored on bricks, racks or platforms and above the ground in a clean and dry condition and shall be suitably marked to facilitate inspection and identification.
- 5.2. Portions of uncoated reinforcing steel and dowels projecting from concrete shall be protected within one week after initial placing of concrete with a brush coat of neat cement mixed with water to a consistency, of thick paint. This coating shall be removed by lightly tapping with a hammer or other tool not more than one week before placing of the adjacent pour of concrete. Coated reinforcing steel shall be protected against damage to the coating. If the coating on the bars is damaged during transportation or handling and cannot be repaired, the same shall be rejected.

6.0 Workmanship

- 6.1. The work shall consist of furnishing and placing reinforcement to the shape and dimensions shown as on the drawings or as directed by The Engineer in charge.
- 6.2. Reinforcing steel shall conform accurate to the dimensions given in the bar bending schedules shown on relevant drawing

7.0 BENDING OF REINFORCEMENT

- 7.1. Bar bend g schedule shall be furnished by the Contractor and got approved by the Engineer before start of work.
- 7.2. Reinforcing steel shall conform to the dimensions and shapes given in the approved bar bending Schedules.
- 7.3. Bars shall be bent cold to the specified shape and dimensions or directed by the Engineer using a proper bar bender operated by hand power to obtain the correct radius of bends and shape.

Bars shall not be bent or straightened in a manner that will damage parent material or the coating bars bent during transport or handling shall, be straightened before being used on work and shall not be heated to facilitate straightening.

8.0 PLACING OF REINFORCEMENT

8.1. The reinforcement cage should generally be fabricated in the yard at ground level, and then shifted and placed in position. The reinforcement shall be placed strictly, in accordance with the drawings and shall be assembled in position, only when structure is otherwise ready for placing of concrete. Prolonged time gap, between assembling of reinforcements and casting of concrete, which may result in rust formation on the surface, shall not be permitted.

8.2. Reinforcement bars shall be placed accurately in position as shown on the drawings. The bars, crossing one another shall be tied together at every intersection with binding wire (annealed), conforming to IS:280 to make the skeleton of the reinforcement rigid such that the reinforcement does not get displaced during placing of concrete, or any other operation. The diameter of binding wire shall not be less than 1 mm.

8.3. Bars shall be kept in position usually by the following methods:

In case of beam and slab construction, industrially produced polymer cover blocks of thickness equal to the specified cover shall be placed between the bars and formwork subject to Satisfactory evidence that the polymer composition is not harmful to concrete and reinforcement. Cover blocks made of concrete may be permitted by the Engineer, provided they have the same strength and specification as those of the member.

8.4. In case of dowels for Columns and walls the vertical reinforcement shall be kept in position by means of timber templates with slots in them accurately, or with cover blocks tied to the reinforcement timber templates shall be removed after the concreting has progressed up to a level just below their location.

8.5. Layers of reinforcements shall be separated by spacer bars at approximately One meter intervals. The minimum diameter of spacer bars shall be 12 mm or: equal to maximum size of main reinforcement or maximum size of coarse aggregate, whichever is greater. Horizontal reinforcement shall not be, allowed to sag between supports.

8.6. Necessary stays, blocks, metal chairs, spacers, metal hangers supporting wires etc, or other subsidiary, reinforcement shall be provided to fix the reinforcements firmly in its correct position.

8.7. Use of pebbles, broken stone, metal pipe, brick, mortar or wooden blocks etc as devices for positioning reinforcement shall not be permitted.

8.8. Bars coated with epoxy or any other approved protective coating shall be placed on supports that do not damage the coating. Supports shall be installed in a manner such that planes of weakness are not created in hardened concrete. The coated reinforcing steel shall be held in place by use of plastic or plastic coated binding wires especially manufactured for the purpose.

8.9. Placing and fixing of reinforcement shall be inspected and approved by the Engineer before concrete is deposited.

9.0 Lapping

9.1. All reinforcement shall be furnished in full lengths as indicated on the drawing. No splicing of bars, except where shown on the drawing; will be permitted without approval of the Engineer. The lengths of the splice shall be as indicated on drawing or as approved by the Engineer. Where practicable, overlapping bars shall not touch each other, and shall be kept apart by 25 mm or 1 1/4 times the maximum size of coarse aggregate, whichever is greater, If this is not feasible, overlapping bars shall be bound with annealed steel binding wire, not less than 1 mm diameter and twisted tight in such a manner as to maintain minimum clear cover to the reinforcement from the concrete surface. Lapped splices shall be staggered or located at points, along the span where stresses are low.

10.0. Welding

10.1 Splicing by welding of reinforcement will be permitted only if detailed on the drawing or approved by the Engineer. Weld shall develop an ultimate strength equal to or greater than that of the bars connected.

10.2. While welding may be permitted for T.M.T. reinforcing bars conforming to IS:432, welding of deformed bars conforming to IS: 1786 shall in general be prohibited. Welding may be permitted in case of bars of other than S 240 grade including special. Welding grade of S 415 grade bars conforming to IS:1786, for which necessary chemical analysis has been secured and the carbon equivalent (CE) calculated from the chemical composition using the formula:

$$CE = C + \frac{Mn}{6} + \frac{Cr + Mg + V}{5} + \frac{Ni + Cu}{15}$$

is 0.4 or less.

10.3. The method of welding shall conform to IS:2751 and IS:9417 and to any supplemental specifications to the satisfaction of the Engineer

10.4. Bars shall be bent cold to the specified shape and dimensions or as directed by Engineer in charge using the proper bender tool, operated by hand or power to attain proper radius of bends. Bars shall not be bend or straightened in a manner that will injure the material. Bars bent during transport or handling shall be straightened before being used in the work. Bars shall not be heated to facilitate bending

10.5. Unless otherwise specified a 'U' type hook at the end of each bar shall invariably be provided to main reinforcement. The radius of the bane shall not be less then twice the diameter of the round bar and the length of the straight part of the bar beyond the end of the curve shall be at least four times of the diameter of the round bar. In case of bars which are not round and in case of deformed bars, the diameter shall be taken as the diameter of circle having an equivalent effective area. The hooks shall be suitably encased to prevent any spiting of the concrete

10.6. All reinforcement bars shall be accurately placed in exact position shown on the drawings and shall be securely held in position during placing of concrete by annealed binding wire not less than 1 mm in size and by using say blocks or metal chairs spacers, metal hangers, supporting wires or other approved devices at sufficiently close intervals, Bars shall not be allowed to sag between supports not displaced during concreting or any other operations of the work All devices used for positioning shall be of not corrodible material wooden and metal supports shall not extended to the surface of the concrete, except where shown in drawings. Placing bars on layers of freshly laid concrete as the work progresses for adjusting bar spacing shall not be allowed. Pieces of broken stone or brick and wooden blocs shall not be used Layers of bars shall be separated by spacer bars pre-cast mortar blocks or other approved devices. Reinforcement after bending placed in position shall be maintained in a clean condition until completely embedded in concrete, Special care shall be exercised to prevent any displacement of reinforcement in concrete already placed. To prevent reinforcement form corrosion, concrete cover shall be provided as indicated on drawings. All bars protruding from concrete and to which other bars are to be sliced and which are likely to be exposed for a period exceeding 10 days shall be protected by a thick coat of neat cement grout

10.7. Bars crossing each other where required shall be secured by binding wire (annealed) of size not less than 1 mm in such a manner that they do not slip over at the time of fixing and concreting

As far possible bars of full length shall be used in case this is not possible, overlapping of bars shall be done as directed by the Engineer in charge When practicable overlapping bars shall not touch each other, but be kept apart by 25 mm Where no feasible overlapping bars shall be bound with annealed wires

not less than 1 mm thick twisted tight The overlaps shall be staggered for different bars and located at points along the span where neither shear nor bending moments is maximum.

10.8. Whenever indicated on drawing or desired the Engineer in charge bars shall be joined by coupling which shall have a cross section sufficient to transmit the full stresses of bars The end of the bars that are joined by coupling shall be upset for sufficient length so that the effective cross section at the base of threads is not less than the normal cross section of the bar. Threads shall be standard threads Steel for coupling shall conform to IS 226

10.9. When permitted or specified on the drawings joints of reinforcement bars shall be butt-welded so as to transmit their full stresses Welded joints shall preferably be located at points when steel will not be subject to more than 75 percent of the maximum permissible stresses and welds so staggered that at any one section not more than 20 percent of the rods are welded Only electric arc welding using a process which excludes air from the molten metal and conforms to any or other special provisions for the work shall be accepted Suitable means shall be provided for holding bars securely in position during welding It shall be ensured that no voids are left in welding and when welding is done in two or three stages previous surface shall be cleaned properly Ends of bars shall be cleaned of all loose scale rust stages paint and other foreign matter before welding Only competent welders shall be employed on the work. The M S electrodes used for welding shall conform to IS 814 Welded pieces of reinforcement shall be tested. Specimen shall be taken from the actual site and their number shall frequency to test shall be as directed by the Engineer in charge

11.0 MODE OF MEASUREMENTS & PAYMENT

11.1. For the purpose of payment the bar shall be measured correct up to 10 mm length and weight payable works out at the rate specified below

Sr. No	Diameter of steel	weight of steel per running meter	Sr. No	Diameter of steel	weight of steel per running meter
1	6 mm	0.22 Kg / Rmt	8	20 mm	2.47 Kg / Rmt
2	8 mm	0.39 Kg / Rmt	9	22 mm	2.98 Kg / Rmt
3	10 mm	0.62 Kg / Rmt	10	25 mm	3.85 Kg / Rmt
4	12 mm	0.89 Kg / Rmt	11	28 mm	4.83 Kg / Rmt
5	14 mm	1.21 Kg / Rmt	12	32 mm	6.31 Kg / Rmt
6	16 mm	1.58 Kg / Rmt	13	36 mm	7.99 Kg / Rmt
7	18 mm	2.00 Kg / Rmt	14	40mm	9.86 Kg / Rmt

11.1. Excess consumption over 5% will be charged at penal rate.

11.2. Reinforcement shall be measured in length including hooks, if any, separately for different diameters as actually used in work, excluding overlaps. From the length so measured, the weight of reinforcement shall be calculated in tonnes on the basis of IS: 1732. Wastage, overlaps, couplings, welded joints, spacer bars, chairs, stays, hangers and annealed steel wire or other methods for

binding and placing shall not be measured and cost of these items shall be deemed to be included in the rates for reinforcement..

11.3. The contract unit rate for coated/uncoated reinforcement shall cover the cost of material, fabricating, transporting, storing, bending, placing, binding and fixing in position as shown on the drawings as per these specifications and as directed by the Engineer, including all labour, equipment, supplies, incidentals, sampling, testing and supervision.

The unit Rate for coated reinforcement shall be deemed to also include cost of all material, labour, tools and plant, royalty, transportation and expertise required to carry out the work. The rate shall also cover sampling, testing and supervision required for the work.

11.4. The rate shall be for a unit of **KG**

ITEM NO18

Providing and laying polished kota stone slab 25mm thick in risers of steps,skirting Dedo and pillars laid on 10mm thick cement mortar 1:3 (1-Cement : 3 coarse sand) and jointed with gray cement slury mixed with pigment to match the shade of slab including rubbing and polishing etc. complete

1.0. Materials

1.1. Water shall conform to M-1. Lime mortar shall conform to M-10. Cement mortar shall conform to M-11. **25mm thick polished kota stone** shall conform to M-49.

2.0. Workmanship

2.1. Each slab shall be cut to the required size and shape and fine chisel dressed at all the edges. The sides trust dressed shall have a full contract if a straight edge is laid along. The sides shall be table rubbed with coarse sand before paving. All angles and edges of the slabs shall be true square and free from chippings and giving a plane surface. The thickness shall be 25 mm. (average) as specified in the item but not less than 10 mm. at any place of the slab.

2.2. Bedding for the polished kota stone slabs shall be of cement plaster 1:3 (1 cement : 3 coarse sand) or L.M. 1:1.5 of average thickness 10 mm given in the description of the item. Sub grade shall be cleaned, wetted and mopped Mortar of the specified mix and thickness shall then be spread on an area sufficient to receive one blue kota stone slab. The slab shall be washed clean before laying. It shall be laid on top, pressed, tapped gently to bring it in level with the other slabs. If shall then be lifted and laid aside. Top surface of the mortar shall then be corrected by adding fresh mortar at hollows or depressions. The mortar shall then be allowed to harden bit. Over this surface, cement slurry of honey-like consistency shall be applied. The slab shall then be gently placed in position and tapped with wooden mallet till it is properly padded in level with and close to the adjoining slab. The joint shall be as fine as possible. The slabs fixed in the floor adjoining, the walls shall enter not less than 10 mm. under the plaster, skirting or dedo. The junction between the wan and floor shall be finished neatly. The finished surface shall be true to levels and slopes as directed.

2.3. The floor shall be kept wet for a minimum period of 7 days so that bedding and joints set properly

2.4. Polishing shall be normally commenced after 14 days of laying the stone slab. First polishing shall be done with carborundum stones of 120 grade grit fitted in the heavy machine and then second polishing shall be done with carborundum stone of 220 to 350 grade grit fitted in heavy machine.

Water shall be properly used during polishing. The stone shall then be washed clean with water. When directed by the Engineer-in-charge, wax polish of approved quality shall be applied on the surface with the help of soft cloth over a clean and dry surface. Then the polishing machine fitted with bobs shall be run over it.

- 2.5. The holes required for Nahni traps, pipes and any other fittings shall be made, without any extra cost.
- 3.0. Measurement & payment
- 3.1. The risers of steps, skirting or dedo shall be measured in sq. meter. Length shall be measured along the finished faces of risers, skirting or dedo. Height shall be measured from finished level of treads of floor to top. Lining of pillars shall be measured under this item.
- 3.2. The rate shall be for a unit of one sq. meter

ITEM NO19

P & L 24" x 24" vitrified 8 mm thick tile flooring over 20 mm (average) base of cement mortar 1:6 (1 cement: 6 coarse sand) on new surface or fixing on existing flooring by adhesive material including dismantling of existing flooring and jointed with color cement slurry including finished with flush pointing & cleaning the surface etc. complete for light shade

1.0. Materials

Water shall conform to M-1. Cement mortar shall conform to M-11. **24" x 24" glazed vitrified 8 mm to 10mm thick tiles of standard quality** shall conform to relevant Indian standard. The size & colour of vitrified tiles shall be approved by Engineer in charge.

2.0. Workmanship

2.1. Bedding :

2.1.1. The sub grade shall be cleaned, wetted and mopped. The bedding shall then be laid evenly over the surface tamped and corrected to desired level and allowed to harden enough to offer a rigid cushion to tiles and to enable the mason to place wooden planks across and squat on it.

2.1.2. The **vitrified flooring tiles** shall be laid on cement mortar bedding of 20 mm. thick in C.M. 1:6 (1 cement: 6 coarse sand) on existing surface flooring by adhesive material including dismantling of existing flooring and jointed with color cement slurry. The mortar shall have sufficient plasticity for laying and there shall be no hard lumps that would interfere with the evenness of bedding. The base shall be cleared and well wetted. The mortar shall then be spread in thickness not less than **10 mm**. at any place and average 20 mm thickness. The proportion of the cement mortar shall be as specified in the item.

2.2. Fixing tiles :

2.2.1. The tiles before laying shall be soaked in water for at least two hours. Neat gray cement grout at 33 kg/Cement/Sq.mt. of honey like consistency shall be spread over the mortar bedding as directed. The edges of the tiles shall be smeared with neat cement slurry. The tiles shall be well pressed and gently tapped with a wooden mallet till they are properly bedded and in level with the adjoining tiles. There shall be no hollows in bed or joints. The joints between the tiles shall be as thin as possible in straight line or as per pattern.

2.2.2. The tiles shall not have staggered joints. The joints shall be true to centre line both ways. The Nahni trap coming in the flooring shall be so positioned that its grating shall replace only one tile as far as possible. Where full size tiles cannot be fixed they shall be cut (Swan) to the required size and the edges rubbed smooth to ensure

straight and true joints. The joints shall be filled with grey cement grout with wire brush or trowel to a depth of 5 mm. and loose material removed. White cement shall be used for pointing the joints. After fixing the tiles finally in an even plane the flooring shall be kept wet and allowed to nature undisturbed for 7 days. The pattern shall be approved by Engineer in charge.

2.3. Cleaning :

2.3.1. The surplus cement grout that may have come out of the joints shall be cleaned off before it sets. Once the floor has set, it shall be carefully washed, cleared by dilute acid and dried. Proper precautions and measures shall be taken to ensure that the tiles are not damaged in any way till the completion of the construction.

3.0. Mode of measurements & payment

3.1. The work done shall be measured in sq.mt. for visible area of work done. The length and width of the flooring shall be measured not between the faces of skirting or dedos or plastered face of wall as the case may be. The paving under dedo or skirting shall not be measured. No deduction shall be made not extra paid for any opening in the floor of area upto 0.1 sq.mt. Nothing extra shall be paid for laying the floors at different levels in the same rooms.

3.2. The rate shall be for a unit of **one sq. meter**.

ITEM NO20

Providing and laying integrated cement based water proofing treatment of required thickness over the roof including 10mm thick waterproofing cement plaster in cement mortar 1:3 and chaina mosaic fitting and finally finishing the surface with white cement slurry and slopping out terrace slabs with following specification laid to required slope not flatter than 1:80 (the thickness of water proofing treatment near rainwater outlet or the lowest point of the finished slope shall not be less than 45mm, including treating the vertical surface of the parapet wall up to 20cms. height above finished level of terracing including finishing the top with joint less water proofing plaster, curing, testing etc. complete. Rate is including ten years performance of guarantee bond to be given on stamp paper. (No extra shall be paid for increase in thickness for proper slope).

(A) Applying and grouting a slurry coat of neat cement using 2.75 kg/sqm. of cement admixed with properly water proofing compound conforming to IS -2645 and 10 mm thick water proofing cement plaster in Cement mortar 1:3 over the R.C.C. slab incl. cleaning the surface before treatment

(B) Laying cement concrete using broken brick bats 75mm size with 50% of cement mortar 1:4 (1cement:4 coarse sand) over 10mm thick water proofing cement plaster in cement mortar 1:3 (1 cement, 3 coarse sand) admixed with proprietary water proofing compound conforming to IS 2645 to required slope and treating similarly the adjoining walls up to 200mm height incl. rounding of junction of walls.

Scope

- Applicable to horizontal surfaces of RCC terraces/slabs and vertical surfaces of parapet walls up to 300 mm height above the finished terrace level (including 200 mm treatment on walls as per Step B).
- Ensures waterproofing against seepage, cracking, and ponding, with a slope of 1:80 (minimum) towards rainwater outlets.
- Total thickness: Variable to achieve slope, minimum 45 mm at low points.
- Compliance: Conforms to IS 2645 (Integral Cement Waterproofing Compounds), IS 456 (Plain and Reinforced Concrete), IS 383 (Coarse and Fine Aggregates), and relevant NBC (National Building Code) clauses for roofing.

2. Materials

All materials shall be procured from approved manufacturers and tested for compliance. Storage shall be in a dry, covered area.

Material	Specification	Quantity/Rate (Approximate for 1 m ²)	Source/Compliance
Ordinary Portland Cement (OPC 43/53 Grade)	Fresh, lump-free, conforming to IS 269.	- Slurry: 2.75 kg/m ² - Plaster (1:3 mortar): As per volume - BBC mortar (1:4): 50% of BBC volume	IS 269; Blue/Star/Green mark certified.
Coarse Sand	Clean, sharp, free from silt/clay; Zone II/III grading per IS 383. Fineness modulus 2.0–3.0.	As per mortar volume (e.g., 0.12 m ³ for 1:3 plaster per m ² at 10 mm thick).	River sand or approved crushed; silt content <3%.
Broken Brick Bats (BB)	Hand-broken or machine-crushed bricks, 75 mm nominal size, hard-burnt, absorbent class I per IS 1077. Soaked in water for 24 hours before use.	40–50 kg/m ² (for ~75 mm average BBC thickness).	Absorption <20%; free from flaking.
Waterproofing Compound	Integral cementitious type (e.g., crystalline or polymer-based), non-toxic, conforming to IS 2645. Dosage: 2–3% by weight of cement.	50–75 g/m ² (for slurry and plaster).	Manufacturer's certificate; brands like Dr. Fixit, Fosroc, or PIDILITE approved.
White Cement Slurry	OPC white cement mixed with approved pigment for finish coat.	1.5–2 kg/m ² (neat slurry).	IS 8041 (White Cement).
China Tiles	20x20x6 mm thick, polished, vitrified ceramic tiles conforming to IS 4457.	As per area (jointed with white cement slurry).	Approved quality; uniform color.
Water	Potable, free from oils/salts; pH 6.5–8.5.	As required for workability.	BIS standards.
Admixtures (Optional)	Plasticizer for mortar workability, if approved.	As per manufacturer's dosage.	IS 9103.

- **Tools/Equipment:** Trowels, floats, mixing drums, spirit levels, plumb bobs, measuring tapes, and vibrators for compaction.

3. Surface Preparation

- Clean the RCC slab surface thoroughly to remove dust, laitance, grease, loose particles, and curing compounds using wire brushes, high-pressure water jet (if available), or mechanical grinders. Ensure surface is sound and level.
- Repair honeycombs, cracks (>0.5 mm), or defects with polymer-modified cement mortar (1:3 cement:sand + 5% SBR latex). Allow 7 days curing.
- Hack the surface if smooth to provide key (roughness >3 mm).
- Wet the surface 24 hours prior to application to achieve SSD (saturated surface dry) condition.
- Mask edges and junctions with 50 mm wide adhesive tape for clean lines.

4. Execution Methodology

The treatment shall be applied in dry weather (temperature 10–35°C, no rain forecast for 48 hours). Work in bays of 10–15 m² to avoid cold joints. Minimum 2 laborers per 10 m².

(A) Application of Slurry Coat and Waterproofing Cement Plaster

- **Slurry Coat:**
 - Mix neat cement (2.75 kg/m²) with waterproofing compound (2–3% by cement weight) and minimum water to achieve brushing consistency (no lumps).
 - Apply uniformly over the cleaned, SSD RCC slab using a stiff brush or broom in one coat (~1 mm thick).
 - Work into pores and junctions for full adhesion. Do not apply if surface dries out.
 - Allow initial setting (30–60 minutes) but apply next layer before full hardening.
- **10 mm Thick Waterproofing Cement Plaster:**
 - Prepare mortar in 1:3 ratio (1 cement : 3 coarse sand) admixed with waterproofing compound (2–3% by cement weight). Water-cement ratio: 0.4–0.45 for workability.
 - Apply over the slurry coat using trowel in one layer (10 mm thick), pressing firmly to ensure bond.
 - Level and compact with wooden float. Extend to parapet walls up to 100 mm height.
 - Round off junctions between slab and walls (coving radius 50 mm) using a trowel.

- Cure by ponding water for 48 hours or covering with wet gunny bags/sprinkling 3 times daily.

(B) Laying Broken Brick Bat Coba (BBC) Layer

- **Preparation:**
 - Soak brick bats in water for 24 hours; drain excess.
 - Prepare bedding mortar: 1:4 (1 cement : 4 coarse sand) admixed with waterproofing compound (2–3% by cement weight). Use 50% mortar by volume of BBC (e.g., for 75 mm BBC, mortar volume ~37.5 mm equivalent).
- **Laying BBC:**
 - Spread a 20 mm thick bedding mortar layer over the cured plaster from Step (A).
 - Place brick bats (75 mm size) hand-packed tightly, voids <10%, to achieve required slope (1:80 minimum) towards outlets. Use cement slurry to fill initial gaps.
 - Pour additional mortar (remaining 50%) over and around bats, working it into voids with trowels or rammers for full compaction. Vibrate if mechanized.
 - Total BBC thickness: 75–100 mm average, ensuring minimum 45 mm at low points. Gradient checked with dumpy level or string line.
 - Treat adjoining parapet walls up to 200 mm height above slab: Apply similar BBC vertically, hacking wall surface for key and rounding slab-wall junctions (50 mm radius).
 - Compact entire layer to eliminate honeycombing; surface shall be even and true to line.
- **Work Sequence:** Complete in one operation to avoid overlaps. If interrupted, provide 50 mm wide groove at joints, filled with cement grout + compound.

5. Finishing

- After 3 days curing of BBC, apply a neat white cement slurry coat (1.5–2 kg/m²) over the surface using brushes, filling all pores.
- Lay china mosaic tiles (20x20 mm) in 1:3 cement mortar bedding (3 mm thick), jointed with white cement slurry. Point joints neatly.
- Slope the finished surface to ensure positive drainage; no stagnant water.
- Clean excess mortar and polish tiles if required.

6. Curing and Testing

- **Curing:**
 - Pond water on horizontal surfaces for 7 days post-finishing, or cover with wet Hessian/jute cloth, sprinkling water 3–4 times daily.
 - For vertical surfaces: Continuous sprinkling or wet curing sheets for 7 days.
 - Total curing period: 14 days before loading/traffic.
- **Testing:**
 - **Flood Test:** Pond 50 mm water over 2x2 m bays for 72 hours; no leakage observed on underside (checked via access panels).
 - **Leakage Test:** Apply 0.15 N/mm² hydrostatic pressure for 24 hours; no dampness.
 - **Adhesion Test:** Pull-off test on samples (min. 1.0 N/mm² bond strength).
 - **Slope Verification:** Measured with level; deviation <5 mm in 3 m.
 - Record tests in site log; rectify failures at contractor's cost.

7. Quality Assurance and Guarantee

- **Workmanship:** All work by skilled masons (ITI certified preferred). Supervisor to inspect daily.
- **Tolerances:**
 - Thickness: ±5 mm (measured at 5 points/m²).
 - Slope: 1:80 ±1:100.
 - Surface: Even, free from cracks >0.3 mm or undulations >3 mm in 2 m.
- **Guarantee:** Contractor to provide a 10-year performance bond on non-judicial stamp paper (value as per local norms, e.g., ₹100), indemnifying against defects like cracking, peeling, or leakage due to material/workmanship. Bond submitted within 15 days of completion; xAI or client to hold until project closeout +10 years.
- **Measurement:** Paid per m² of finished terrace area, including walls (up to 200 mm height). Deduct openings >0.5 m².
- **Safety/Environmental:** Use PPE (gloves, masks); dispose waste bricks/sand at approved sites. No hazardous chemicals.

ITEM NO 21

10 mm thick Cement plaster in single coat on brick/concrete walls for interior plastering up to floor two level & finished even & smooth in (1) cement mortar 1:3 (1 cement : 3 sand)

1.0. Materials

1.1. Water shall conform to M-1. The cement mortar of proportion 1:3 shall conform to M-13.

2.0. Workmanship

2.1. Scaffolding:

Wooden bullies, bamboos, planks, trestles and other scaffolding shall be sound. These shall be properly examined before erection and use. Stage scaffolding shall be provided for ceiling and soffits of stairs plaster which shall be independent of the walls.

2.2. Preparation of back ground :

2.2.1. The surface shall be cleaned of all dust, loose mortar droppings, traces of algae, efflorescence and other foreign matter by water or by brushing. Smooth surface shall be toughened by wire brushing if it is not hard and by hacking if it is hard. In case of concrete surface, if a chemical retarded has been applied to the form work, 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 readers if left on the surface. Trimming of projections on brick/concrete surfaces where necessary shall be carried out to get an even surface.

2.2.2. Raking of joints in case of masonry where necessary shall be allowed to dry out for sufficient period before carrying out the plaster work.

2.2.3. The work shall not be soaked but only damped evenly before applying the plaster. If the surface becomes dry, such area shall be moistened again.

2.2.4. For external plaster, the pestring operation shall be started from top floor and carried downwards. For internal plaster, the plastering operations may be started wherever the building frame and cladding work are ready and the temporary supports of the ceiling resting on the wall of the floor have been removed. Ceiling plaster shall be completed before starting plaster to walls.

2:3. Application of plaster :

2.3.1. The plaster about 15x15 cms. shall be first applied horizontally and vertically at not more than 2 meters intervals over the entire surface to serve as gauge. The surfaces of these gauges shall be truly in plane of the finished plastered surface. The mortar shall then be applied in uniform surface slightly more than the specified thickness, then brought to a true surface by working a wooden straight edge reaching across the gauges with small upward and sideways movements at a time. Finally, the surface shall be finished off true with a trowel or wooden float according as a smooth or a smooth or a sandy granular texture is required Excessive troweling or overworking 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. Hounding or chamfering, corners, arises junctions etc. shall be carried out with proper templates to be size required.

2.3.2. Cement plaster shall be used within half an hour after addition of water and mortar or plaster which is partially set shall be rejected and removed forthwith from the site.

2.3.3. In suspending the work at the end of the day, the plaster shall be left out clean to the line both horizontally and vertically, when recommencing the plaster, the edges of the old work shall be scraped clean and wetted with cement putty 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 nearer than 15 cm. to any corners or arises. It shall not be closed on the body of features such as plaster bands and cornices not at the corners or arises. Horizontal joints in plaster work shall

not also occur on parapet tops and copings as these invariably lead to leakage. No portion of the surface shall be left out initially to be packed up later on.

- 2.3.4.** Each coat shall be kept damp continuously till the next coat is applied or for a minimum period of 7 days. Moistening shall commence as soon as plaster is hardened sufficiently. Soaking of walls shall be avoided and only as much water as can be readily absorbed shall be used, excessive evaporation on the sunny or windward side of building in hot air or dry weather shall be prevented by hanging matting or gunny bags on the outside of the plaster and keeping them wet.
- 2.3.5.** The plastering work shall be in single coat on fair side of brick / concrete walls for interior plastering up to floor two level, finished even and smooth in **C.M. 1:3**.
- 2.3.6** The coat of cement and fine sand mortar of proportion 1:1 (1.5 mm thick about) shall be applied to the plastered surface with a trowel to provide uniform texture while the base coat is still plastic.
- 2.3.7.** In any continuous face of wall the finishing treatment should be carried out continuously and day to day breaks made to coincide with architectural breaks in order to avoid unsightly Junctions
The smooth concrete shall be suitably sawed to provide necessary bond before plastering.
- 2.3.8. Curing :** All the plaster work shall be kept damp continuously for a period 7 days.

3.0. Mode of measurements & payment

- 3.1.** The rate shall include the cost of all materials, labour and scaffolding etc. involved in the operations described under workmanship.
- 3.2.** All plastering shall be measured in square meters unless otherwise specified. Length breadth or height shall be measured correct to a centimeter.
- 3.3.** Thickness of the plaster shall be exclusive of the thickness of the key i.e. grooves or open joints in brick work, stone work etc. or space between laths. Thickness of plaster shall be average thickness with minimum **10 mm** at any point on this surface.
- 3.4.** This item includes plastering up to floor two level.
- 3.5.** The measurement of wall plastering shall be taken between the walls or partition (dimensions before plastering being taken) for length and from the top of floor or skirting to ceiling for height. Depth of cover of cornices if any shall be deducted.
- 3.6.** Soffits of stairs shall be measured as plastering on ceilings, following soffits shall be measured separately.
- 3.7.** For jambs, soffits, sills etc. for openings not exceeding 0.5 sq. met each in area for ends of joints beams, posts, girders, steps etc. not exceeding 0.5 sq.mt each in area and for openings exceeding 0.5. sq.mt and not exceeding 3.00 sq.mt. in each area deductions and additions shall be made in the following manners.
 - (a) No deductions shall be made for ends of joints, beams, posts etc. and openings not exceeding 0.5 sq.mt each and no addition shall be made for reveals, jambs, soffits, sills etc. of these openings, for finish to plaster around ends of joints, beams posts etc.
 - (b) Deduction for openings exceeding 0.5 sq.mt but not exceeding 3 sq.mt. each shall be made as follows and no addition shall be made for reveals, jambs, soffits, sills etc. of these openings, (i) When both faces of all wall are plastered with same plaster, deduction shall be made for one face only, (ii) When two faces of wall are plastered with different types of plasters or if one face is plastered and the other pointed, deductions shall be made from the plaster or pointing on the side of frame for door,

window etc. on which width of reveals is less than that on the other side but no deductions shall be made on the other side. Where width of reveals on both faces of all are equal, deductions of 50% of area of opening on each face shall be made from areas of plaster and / or pointing as the case may be.

- 3.8. For openings having door frames equal to or projecting beyond the thickness of wall, full deduction for opening shall be made from each plastered face of the wall.
- 3.9. In case of openings of area above 3 sq.mt. each, deduction shall be made for openings but jambs, soffits and sills shall be measured.
- 3.10. The payment shall be made extra for this work over and above the plaster work
- 3.11. The rate shall be for a unit of 1 Kg of water proofing materials used in 1 bag of weighing 50 Kg. cement used extra over the rate of plastering work.
- 3.12. The rate shall be for a unit of **One sq. meter.**

ITEM NO 22

Providing 15mm thick cement plaster in single coat on Rough (Similar) side of single or half brick walls for interior plastering upto floor two level and finished even and smooth in (i) Cement mortar 1:3 (1-cement:3-sand)

1.0. Materials

- 1.1. Water shall conform to M-1. The cement mortar of proportion **1:3** shall conform to M-13.

2.0. Workmanship

2.1. Scaffolding:

Wooden bullies, bamboos, planks, trestles and other scaffolding shall be sound. These shall be properly examined before erection and use. Stage scaffolding shall be provided for ceiling plaster which shall be independent of the walls.

2.2. Preparation of back ground :

- 2.2.1. The surface shall be cleaned of all dust, loose mortar droppings, traces of algae, efflorescence and other foreign matter by water or by brushing. Smooth surface shall be toughened by wire brushing if it is not hard and by hacking if it is hard. In case of concrete surface, if a chemical retarded has been applied to the form work, 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 residues are left on the surface. Trimming of projections on brick/concrete surfaces where necessary shall be carried out to get an even surface.
- 2.2.2. Raking of joints in case of masonry where necessary shall be allowed to dry out for sufficient period before carrying out the plaster work.
- 2.2.3. The work shall not be soaked but only damped evenly before applying the plaster. If the surface becomes dry, such area shall be moistened again.
- 2.2.4. For external plaster, the plastering operation shall be started from top floor and carried downwards. For internal plaster, the plastering operations may be started wherever the building frame and cladding work are ready and the temporary supports of the ceiling resting on the wall of the floor have been removed. Ceiling plaster shall be completed before starting plaster to walls.

2.3. Application of plaster :

- 2.3.1. The plaster about 15x15 cms. shall be first applied horizontally and vertically at not more than 2

meters intervals over the entire surface to serve as gauge. The surfaces of these gauges shall be truly in plane of the finished plastered surface. The mortar shall then be applied in uniform surface slightly more than the specified thickness, then brought to a true surface by working a wooden straight edge reaching across the gauges with small upward and sideways movements at a time. Finally, the surface shall be finished off true with a trowel or wooden float according as a smooth or a smooth or a sandy granular texture is required Excessive troweling or overworking 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. Hounding or chamfering, corners, arises junctions etc. shall be carried out with proper templates to be size required.

- 2.3.2.** Cement plaster shall be used within half an hour after addition of water and mortar or plaster which is partially set shall be rejected and removed forthwith from the site.
- 2.3.3.** In suspending the work at the end of the day, the plaster shall be left out clean to the line both horizontally and vertically, when recommencing the plaster, the edges of the old work shall be scraped clean and wetted with cement putty 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 nearer than **15 cm.** to any corners or arises. It shall not be closed on the body of features such as plaster bands and cornices not at the corners or arises. Horizontal joints in plaster work shall not also occur on parapet tops and copings as these invariably lead to leakage. No portion of the surface shall be left out initially to be packed up later on.
- 2.3.4.** Each coat shall be kept damp continuously till the next coat is applied or for a minimum period of 7 days. Moistening shall commence as soon as plaster is hardened sufficiently. Soaking of walls shall be avoided and only as much water as can be readily absorbed shall be used, excessive evaporation on the sunny or windward side of building in hot air or dry weather shall be prevented by hanging matting or gunny bags oh the outside of the plaster and keeping them wet.
- 2.3.5.** The plastering work shall be in single coat on brick / concrete walls for interior plastering up to floor two level, finished even and smooth **in C.M. 1:3.**
- 2.3.6** The coat of cement and fine sand mortar of proportion 1:1 (15 mm thick about) shall be applied to the plastered surface with a trowel to provide uniform texture while the base coat is still plastic.
- 2.3.7.** In any continuous face of wall the finishing treatment should be carried out continuously and day lo day breaks made to coincide with architectural breaks in order to avoid unsightly Junctions
- 2.3.8. Curing :** All the plaster work shall be kept damp continuously for a period 7 days.
- 2.3.9.** Providing necessary grooves between structural members as directed by Engineer in charge.

3.0. Mode of measurements & payment

- 3.1.** The rate shall include the cost of all materials, labour and scaffolding etc. involved in the operations described under workmanship.
- 3.2.** All plastering shall be measured in square meters unless otherwise specified. Length breadth or height shall be measured correct to a centimeter.
- 3.3.** Thickness of the plaster shall be exclusive of he thickness of the key i.e. grooves or open joints in brick work, stone work etc. or space between laths. Thickness of plaster shall be average thickness with minimum **15 mm** at any point on this surface.
- 3.4.** This item includes plastering for all floors.

- 3.5.** The measurement of wall plastering shall be taken between the walls or partition (dimensions before plastering being taken) for length and from the top of floor or skirting to ceiling for height. Depth of cover of cornices if any shall be deducted.
- 3.6.** Soffits of stairs shall be measured as plastering on ceilings, following soffits shall be measured separately.
- 3.7.** For jambs, soffits, sills etc. for openings not exceeding 0.5 sq. met each in area for ends of joints beams, posts, girders, steps etc. not exceeding 0.5 sq.mt each in area and for openings exceeding 0.5. sq.mt and not exceeding 3.00 sq.mt. in each area deductions and additions shall be made in the following manners.
- (a) No deductions shall be made for ends of joints, beams, posts etc. and openings not exceeding 0.5 sq. mt each and no addition shall be made for reveals, jambs, soffits, sills etc. of these openings, for finish to plaster around ends of joints, beams posts etc.
- (b) Deduction for openings exceeding 0.5 sq. mt but not exceeding 3 sq.mt. each shall be made as follows and no addition shall be made for reveals, jambs, soffits, sills etc. of these openings, (i) When both faces of all wall are plastered with same plaster, deduction shall be made for one face only, (ii) When two faces of wall are plastered with different types of plasters or if one face is plastered and the other pointed, deductions shall be made from the plaster or pointing on the side of frame for door, window etc. on which width of reveals is less than that on the other side but no deductions shall be made on the other side. Where width of reveals on both faces of all are equal, deductions of 50% of area of opening on each face shall be made from areas of plaster and / or pointing as the case may be.
- 3.8.** For openings having door frames equal to or projecting beyond the thickness of wall, full deduction for opening shall be made from each plastered face of the wall.
- 3.9.** In case of openings of area above 3 sq.mt. each, deduction shall be made for openings but jambs, soffits and sills shall be measured.
- 3.10** The payment shall be made for a unit of 1.0 sq.mt of work done over and above the finishing of work of base coat.
- 4.0.** The rate shall be for a unit of **One sq. meter.**

ITEM NO 23

Distempering (Two coats) with oil bound distemper of approved brand and manufacture and of required shade on wall surfaces to give an even shade, over and including a priming coat with distemper primer of approved brand and manufacture after thoroughly brushing the surface free from mortar dropping and other foreign matter and also including preparing the surface even and sand papered smooth. Matter

1.0. Materials

- 1.1.** Oil bound washable distemper and primer shall be of approved brand and manufacture. The distemper shall be of required colour and shade and the same shall conform to I.S. : 428-1969. The shade

shall be approved by Engineer in charge. Birla or Asian acrylic lappy (putty) and primer shall be of approved brand and manufacture.

2.0. Workmanship

The distempering shall be carried out on wall surfaces to give an even shade.

2.1. Scaffolding

Where scaffolding is required, it shall be erected in such a way that as far as possible no pail of scaffolding shall rest against the surface to be distempered. A properly secured and well tied suspended platform (Joola) may be used for distempering. Where ladders are used, pieces of old gunny bags shall be tied at top and bottom to prevent scratches to the walls and floors. For distempering to ceiling, proper stage scaffolding shall be erected where necessary.

2.2. Preparation of surface :

2.2.1. The undecorated surface to be distempered shall be thoroughly brushed from dust, dirt, grease, mortar dropping and other foreign matter and sand papered smooth. New plaster surface shall be allowed to dry for at least 2 months before applications of distemper.

2.2.2. All unnecessary nails shall be removed. Pitting in plaster shall be made good with plaster again with a fine grade sand paper and made smooth. A coat of distemper shall be applied over the patches. The surface shall be allowed to dry thoroughly before the regular coat of distemper is allowed. The surface affected by moulds, moss, fungi, algae lichens, efflorescence etc. shall be treated in accordance with I.S; 2395 (Part 01) 1966. Before applying distempering, any unevenness shall be made good by applying putty made of plaster of paris mixed with water on entire surface including filling up the undulation and then sand papering the same after it is dry.

2.2.3 The lappy (putty) shall be carried out on wall surfaces to give an even shade.

2.3. Priming coat :

2.3.1. A priming coat of distemper primer of approved manufacture and shade shall be applied over the papered surface in case of new work on undecorated surface. If the distemper priming is done after the wall surface dries completely, the distemper primer shall be applied.

2.3.2. Application of primer shall be done as under: The primer shall be applied with a brush on the clean dry and smooth surface. Horizontal strokes shall be given first and vertical strokes shall be applied immediately afterwards. This entire operation will constitute one coat. The surface shall be finished as uniformly as possible leaving no brush marks. It shall be allowed to dry for at least 48 hours before oil bound distemper or paint is applied.

2.3.3. Oil bound distemper is not recommended to be applied within six months of the completion of wall plaster.

2.4. Preparation of oil bound distemper :

2.4.1. The distemper shall be diluted with water or any other prescribed thinner in a manner recommended by the manufacturer only. Sufficient quantity of distemper required for a day's work shall be prepared.

2.5. Application of Distemper coat:

2.5.1. For undecorated surfaces, after the primer coat is dried for at least 48 hours, the surface shall be lightly sand papered to make it smooth for receiving the distemper, taking care not to rub out priming coat. All loose particles shall be dusted off after rubbing. Minimum two coats of distemper shall be applied with brushes in horizontal strokes followed immediately by vertical strokes which together shall constitute one

coat. The subsequent coats shall be applied after a time interval of at least 24 hours between consecutive coats to permit proper drying of the proceeding coat. The finished surface shall be even and inform without patches, brush marks, distemper drops etc.

2.5.2. Sufficient quantity of distemper shall be mixed to finish one room at a time. The application of a coat in each room shall be finished in one operation and no work shall be striated in any room which cannot be completed on the same day.

2.5.3. 15 cm. double bristled distemper brush shall be used. After day's work brushes shall be thoroughly washed in hot water with soap solution and hung down to dry. Old brushes which are dirty and caked with distemper shall not be used on the work.

2.6. Protective measurements : The surfaces of doors, windows, floors, articles of furniture etc. and such other parts of the buildings as are not to be distempered shall be protected form being splashed upon. Such surfaces shall be cleaned of distemper splashes if any.

3.0. Mode of measurements and payment

3.1. Priming coat of distemper primer, scraping of surface spoiled by struck roots, removal of oil and grease spots, treatment for infraction of effloresces., mould moss, fungi, algae and lichen and patch repairs to plaster shall be included in this item for which nothing extra shall be paid.

3.2. All the work shall be measured net in the decimal system as in place subject to the following limits unless otherwise stated hereinafter:

(a) Dimensions shall be measured to the nearest 0.01 m.

(b) Area in individual items shall be worked out to the nearest 0.01 sq. m. All work shall be made for ends of joints, beams, posts etc. and openings, not exceeding 0.5 sq.mt. each and no addition shall be made for reveals, jambs, soffits, sills etc. of these openings not for finish around ends of joints, beams, posts etc.

3.3. Deductions of opening exceeding 0.5 sq.m. but not exceeding 3 sq. m. each shall be made as follows and net addition shall be made for reveals, jambs, soffits etc. of these openings :

(a) When both the faces of wall are provided with same finish, deductions shall be made for one face only.

(b) When each face of wall is provided with different finish, deduction shall be made for that side of frame for doors, windows etc. on which width of reveals is less than that of the other side but no deduction shall be made on the other side. Where the width of reveals on the both the fates of wall are equal, deduction of 50% of area of opening on each face shall be made from area of finish.

(c) When only one face of wall is treated and the other face is not treated, full deductions shall be made if the width of the reveal on treated side is less than that on untreated side but if the width of the reveal is equal or more than that on untreated side neither deductions nor additions to be made for reveals, jambs, soffits, sills etc.

3.4. In case of opening of area exceeding 3 sq. m. each deduction shall be made for openings but jambs, sills and soffits shall be measured.

3.5. No deductions shall be made for attachments such as casings, conduits, pipes, electric wiring and the like.

3.6. Item includes removing nails, making good holes, patches with materials similar in composition of distemper.

- 3.7.** The extra rate shall be paid for carrying our distempering work on ceiling/sloping roofs over and above.
- 3.8.** The rate includes cost of ail materials, labours, scaffolding, protective measures etc. involved in all the operations described above. This shall also include conveyance, delivery, handing, unloading, storing work etc.
- 3.9.** The rate shall be for a unit of one sq. meter.

ITEM NO 24

Wall painting (two coats) with plastic emulsion paint of approved brand and manufacture on undecorated wall surface to give an even shade including thoroughly brushing the surface free from mortar droppings and other foreign matter and sand papered smooth

. Scope

- Applicable to interior undecorated plastered walls, concrete surfaces, or similar new masonry/plastered substrates.
- Provides a durable, washable, matt/satin/semi-gloss finish (as per approved shade and type) with good hiding power, alkali resistance, and washability.
- Two coats minimum on primed surface; extra coat if shade change or poor coverage observed.
- Excludes exterior use (unless Type 2 exterior grade specified), wood, metal, or previously painted surfaces.

2. Materials

All materials shall be from approved brands (e.g., Asian Paints, Berger, Dulux, Nerolac, Indigo, or equivalent) and conform to latest IS codes. Submit samples and manufacturer's test certificates for approval before commencement.

Material	Specification	Key Requirements	Approx. Consumption (per coat)	Compliance
Plastic Emulsion Paint	Interior grade (Type 1 per IS 15489), water-based acrylic emulsion, low VOC (<50 g/L for matt class preferred). Matt, eggshell/satin, semi-gloss, or gloss finish as approved.	Smooth uniform finish, good washability, alkali resistance, fastness to light, no appreciable colour change. Lead content <90 ppm (or as per latest restriction).	100–140 sq.ft/litre per coat (depending on surface and dilution).	IS 15489 (latest), low VOC compliant. Approved shade from manufacturer's shade card.
Wall Primer (Interior Acrylic/Water Thinnable)	Acrylic-based primer sealer, alkali-resisting.	Seals porosity, improves adhesion, reduces topcoat absorption.	120–150 sq.ft/litre (one coat).	Manufacturer recommended for emulsion paint.
Wall Putty (if required for smoothness)	Acrylic-based or white cement-based putty.	For filling minor imperfections, pinholes, and	1–2 kg/m ² (1–2 coats).	Approved brand, compatible with emulsion.

Material	Specification	Key Requirements	Approx. Consumption (per coat)	Compliance
Water	Clean, potable.	achieving ultra-smooth surface. For thinning (as per manufacturer's ratio, typically 20–50% for primer/first coat).	As required.	pH 6.5–8.5.
Tools	Good quality synthetic/nylon brushes (100–150 mm width), mohair/roller (9–12 mm nap), trays, drop cloths, masking tape, sandpaper (120–320 grit).	Clean, lint-free.	-	-

- **Dilution:** Follow manufacturer's instructions (e.g., 20–50% water for first coat, less for second).
- **Storage:** Store in cool, dry place; use within shelf life.

3. Surface Preparation

Proper preparation is critical for adhesion, coverage, and durability.

1. **Cleaning:** Thoroughly brush/scrub the surface to remove mortar droppings, dust, loose particles, efflorescence, grease, oil, algae, or foreign matter using stiff wire/nylon brushes and clean water. Remove all laitance from concrete/plaster.
2. **Repair Defects:** Fill cracks, holes, honeycombing with compatible filler/putty or cement mortar (1:4). Cure repairs for minimum 7 days.
3. **Sanding:** Sandpaper the entire surface smooth using 120–180 grit emery paper to remove roughness and provide mechanical key. Remove dust with dry cloth or vacuum.
4. **Efflorescence/Alkali Treatment:** If efflorescence present, treat with 5–10% zinc sulphate solution or approved neutralizer; allow to dry.
5. **Moisture Check:** Ensure surface is completely dry (moisture content <8–12%). New plaster must cure minimum 28 days before painting.
6. **Masking:** Protect adjacent surfaces (floors, doors, windows, fittings) with drop cloths, masking tape, and polythene sheets.

4. Priming

- Apply one coat of approved interior acrylic primer (water-thinnable) on the prepared, dry surface using brush/roller.
- Dilution: As per manufacturer (typically 50–80% water).
- Coverage: Ensure full coverage without puddling.
- Drying: Allow 4–6 hours (or as specified) before putty (if used) or topcoat.
- Sand lightly (320 grit) after primer dries if needed for smoothness; wipe clean.

5. Application of Plastic Emulsion Paint (Two Coats)

- Work in dry weather/conditions (temperature 10–40°C, relative humidity <85%, no rain/dust).
- Stir paint thoroughly before and during use; strain if necessary.

- Apply using brush (for edges/corners) and roller (for large areas) for uniform application without brush marks, runs, sags, holidays, or streaks.

First Coat:

- Dilute paint as recommended (e.g., 20–50% water for better penetration on porous new surfaces).
- Apply evenly in crossing strokes (vertical then horizontal) for full coverage.
- Coverage check: No underlying primer/putty visible.
- Drying: Allow minimum 4 hours (surface dry per IS 15489: typically 45–90 min surface dry, 4–8 hours hard dry depending on class).

Second Coat:

- Apply without dilution or minimal (as per manufacturer) for opacity and even shade.
- Ensure uniform thickness, no lap marks.
- Extra coat if shade variation or poor hiding observed (at no extra cost if within scope).
- Final finish: Smooth, uniform, even shade, free from defects.
- **Total DFT (Dry Film Thickness):** Approximately 60–80 microns (two coats).
- **Theoretical Coverage:** 90–120 sq.ft/litre for two coats (actual varies with surface porosity, application method).

6. Curing and Protection

- Protect freshly painted surfaces from rain, dust, direct sun for 24–48 hours.
- Avoid washing/scrubbing for minimum 7–14 days (full hardness).
- Clean tools immediately with water.

7. Quality Assurance and Testing

- Visual inspection: Uniform colour, no brush/roller marks, runs, sags, peeling, chalking, or pin-holes.
- Adhesion: Cross-hatch test — no lifting.
- Washability: As per IS 15489 (passes cleanability test).
- Coverage verification: Measure actual area painted vs. paint used.
- Shade match: Approved sample panel on site.
- Rectify defects at contractor's cost.

8. Measurement and Payment

- Measured in square metres of actual painted surface (deduct openings >0.5 m²).
- Includes preparation, priming, putty (if specified), two coats, scaffolding, cleaning.
- Rate inclusive of all materials, labour, tools, and wastage.
- Extra coat (if required due to shade change) paid separately if instructed.

ITEM NO 25

Providing and fixing M.S. grills of required pattern to wooden frames of windows etc. with M.S. flats at required spacings and frame around, square or round bars with round headed bolts and nuts or by screws (A) Plain Grill.

1. Scope

- Applicable to interior/exterior plain M.S. grills for windows, ventilators, or partitions, fixed to wooden frames.
- Grill pattern: Plain (rectangular/square grid without decorative elements), with horizontal/vertical bars at uniform spacings (typically 100–150 mm c/c, adjustable per design).
- Sizes: As per approved drawings; standard window sizes (e.g., 900x1200 mm) or custom.
- Excludes ornamental grills, stainless steel, or grills for non-wooden frames.
- Finish: Primed with anti-corrosive paint; no rusting permitted.

2. Materials

All materials shall be new, from approved manufacturers, and tested for compliance. Submit mill test certificates and samples for approval.

Material	Specification	Size/Dimensions	Key Requirements	Compliance/Source
M.S. Flats (for Frame)	Hot-rolled mild steel flats, free from defects like cracks, laminations, or scale.	25x6 mm or 32x6 mm thick (as per grill size; e.g., 25x6 mm for frames up to 1.5 m span).	Yield strength min. 240 MPa; elongation >20%; carbon content <0.25%.	IS 2062 Grade A; Tata/BHP/Sail certified.
M.S. Bars (Square or Round)	Hot-rolled mild steel square bars or round bars, straight, uniform cross-section.	Square: 12x12 mm or 16x16 mm; Round: 10–12 mm dia. (spaced 100–150 mm c/c).	Free from bends, twists; tensile strength 410–540 MPa.	IS 432 Part 1; clean surface, no pitting.
Round-Headed Bolts and Nuts	M.S. black bolts with hexagonal nuts, round-headed for flush fixing.	M8/M10 dia. x 50–75 mm long (2–4 nos. per corner/joint).	Galvanized if exposed; threads clean, full engagement.	IS 1367 (Bolts/Nuts); ISI marked.
Screws (Alternative)	M.S. wood screws with slotted/P hillips head, countersunk.	No. 8–10 x 1.5–2 inch long (for direct screwing into wood).	Zinc-plated; corrosion-resistant.	IS 1350; approved brand.
Welding Electrodes (if joints welded)	Heavy-coated electrodes for M.S.	E 41 or E 43 type, 2.5–4 mm dia.	Flux-covered, low hydrogen.	IS 814; approved (e.g., Advani/Oerlikon).

Material	Specification	Size/Dimensions	Key Requirements	Compliance/Source
Primer Paint	Red oxide zinc chromate primer, anti-corrosive.	Ready-mixed, lead-free.	Drying time <1 hour; coverage 10–12 m ² /litre.	IS 2074; Asian Paints/Berger.

- **Wooden Frames:** Existing or as per separate spec; grills fixed without damaging frames.
- **Accessories:** Welding flux, grinding discs, measuring tapes, spirit levels.

3. Fabrication

- **Shop Fabrication:**
 - Cut M.S. flats and bars to exact lengths (± 1 mm tolerance) using hacksaw/power shear; edges deburred.
 - Form frame: M.S. flats mitered at 45° corners, welded/fixed with lugs for rigidity (welds full penetration, 25–40 mm long).
 - Bars: Fixed to frame at approved spacings (e.g., vertical bars 100 mm c/c, horizontal 150 mm c/c) using welding (fillet welds 5–8 mm) or riveting/bolting.
 - Overall: Grill panel flat, warp-free (< 2 mm in 1 m); total weight balanced.
 - Clean welds: Grind smooth, free from slag/spatter; no undercuts.
 - Pattern: Plain grid (e.g., 4–6 verticals, 5–7 horizontals intersecting at right angles).
- **Tolerances:**
 - Dimensions: ± 2 mm on length/width; ± 1 mm on spacing.
 - Squareness: Diagonals equal within 3 mm.
 - Alignment: Bars perpendicular to frame ($< 1^\circ$ deviation).
- **Painting/Priming:**
 - Degrease and wire-brush to St 2 grade (IS 9954) for rust removal.
 - Apply one shop coat of red oxide primer (25–30 microns DFT); dry 24 hours before transport.
 - Protect primed surfaces with wrapping during handling.

4. Fixing/Erection

- **Site Preparation:**
 - Inspect wooden frames for alignment, soundness, and level; repair if needed.
 - Mark fixing points on frame rebates/grooves (typically 20–25 mm deep).
- **Fixing Methods:**
 - **Preferred (Bolts/Nuts):** Drill holes (M8/M10 dia.) in wooden frame and grill frame at corners (2 nos. each) and mid-points if span > 1 m. Insert round-headed bolts from inside, secure with nuts/washers from outside. Tighten to 20–30 Nm torque.
 - **Alternative (Screws):** For lighter grills, use wood screws driven through grill frame into frame (pre-drill pilot holes to prevent splitting). Countersink heads flush.
 - Embed grill flush with frame rebate; ensure no gaps (> 2 mm) for insect entry.
 - Vertical/Horizontal Alignment: Use plumb bob/spirit level; secure temporarily with clamps during fixing.
 - Joints: If multi-panel, overlap 50 mm and weld/bolt; no cold joints.
- **Workmanship:**
 - Fix in dry weather; no fixing if wood moisture $> 15\%$.
 - Minimum 2 skilled workers per grill; complete one opening before moving.
 - Touch-up primer on site scratches/welds; apply two coats of synthetic enamel oil paint over primer (if specified in finish schedule).

5. Testing and Quality Assurance

- **Visual Inspection:** Grill free from rust, distortion, loose joints; welds uniform, no cracks.
- **Load Test:** For spans > 1 m, apply 100 kg uniform load; deflection $< L/240$ (L =span); no permanent set.
- **Fixing Test:** Pull-out test on bolts/screws (min. 500 kg shear strength per connection).
- **Dimensional Check:** Verify against approved drawing; 100% inspection.
- **Records:** Submit fabrication drawings, material certificates, and as-built sketches.
- **Defects:** Rectify at contractor's cost (e.g., re-welding, re-priming).

6. Measurement and Payment

- Measured in square metres (m²) of grill area (width x height, excluding frame overlaps).
- Deduct openings/gaps > 50 mm; add for curves if any.
- Rate inclusive of materials, fabrication, transport, fixing, priming, labour, tools, wastage (5%), and

- scaffolding.
- No extra for minor adjustments in pattern/spacing or touch-up painting.
- Payment: 70% on fabrication/priming, balance on fixing and approval.

ITEM NO 26

Steel work, riveted in built up sections framed work including cutting, hoisting, fixing in position and applying a priming coat of red lead paint. (A) In beams and joists, channels angles Tees, flats, with connecting plates or angle cleats as in main and cross beams. Hip and jack rafters, purlins conneted to common rafters and the like

1. Scope

- Fabrication of built-up sections by riveting rolled sections (channels, angles, tees, flats) with plates or cleats to form beams, joists, rafters, purlins, etc.
- Includes cutting to length/size, drilling/punching holes, riveting, hoisting/erection, alignment, fixing, and priming.
- Applicable to roof framing (hip/jack rafters, purlins), floor/roof beams, cross beams, and similar framed elements.
- Excludes welded/bolted-only connections, high-strength friction grip bolts, or cold-formed sections.

2. Materials

All materials new, tested, and from approved mills (e.g., Tata Steel, SAIL, Jindal). Submit mill test certificates (chemical/physical properties) and samples.

Material	Specification	Key Requirements	Compliance
Structural Steel Sections (Beams/Joists, Channels, Angles, Tees, Flats)	Hot-rolled mild steel	Grade E250/E350 (Fe 410/Fe 510); free from laminations, cracks, excessive scale; straight, uniform section.	IS 2062 (latest); sections per IS 808 (Dimensions).
Plates (Connecting/Gusset/Flange/Web Plates)	Mild steel plates	Thickness 6–40 mm; shear/tensile strength per grade; edges sheared/sawn square.	IS 2062; flatness tolerance per IS 3502.
Rivets	Hot-rolled steel rivet bars	Dia. 12–40 mm; power-driven shop/field driven; length sufficient for standard head + grip; heated uniformly.	IS 1148 (up to 40 mm dia.); snap head standard.
Primer Paint	Red lead paint (anti-corrosive)	Ready-mixed; red lead content per IS 102; coverage 10–12 m ² /litre; lead-free alternatives if restricted.	IS 102/2074; two coats if specified.
Washers (if used)	Tapered/milled steel washers	For beveled surfaces; thickness per grip.	IS 2016.

- Rivets:** Power-driven (pneumatic/electric); hand-driven only with approval. Heating to cherry-red (900–950°C); no overheating/burning.

3. Fabrication

- **Shop Fabrication** (preferred for riveting accuracy):
 - Take field measurements + shop drawings approved by engineer.
 - Cut sections square (± 2 mm); edges dressed smooth; no flame cutting unless approved.
 - Drill holes (preferred over punching for >10 mm thick or high-stress members); hole dia. = rivet dia. + 1.5–2 mm clearance.
 - Align members true; temporary bolts/clamps during assembly.
 - Built-up sections: Lace/batten or continuously connect (e.g., angles on flanges of channels/tees for compound beams); tie plates min. $2/3$ distance between lines.
 - Connecting plates/angle cleats: Gusset plates for rafter/purlin connections; cleats for beam-to-beam or rafter-to-purlin.
 - Rivet spacing: Per IS 800 Clause 10 (min. pitch $2.5 \times \text{dia.}$, edge distance $1.5\text{--}1.7 \times \text{dia.}$, stagger if needed).
 - Camber: As per design (e.g., upward for beams to counter deflection).
- **Riveting:**
 - Heat rivets uniformly; insert hot; head formed immediately with pneumatic snap tools.
 - Heads: Snap/flat/conical per design; full, concentric, no cracks/eccentricity.
 - Remove loose/cracked/defective rivets; replace immediately.
 - Full contact between faying surfaces; no gaps >0.5 mm.
- **Tolerances:**
 - Length: ± 3 mm.
 - Squareness: Diagonals equal within 3 mm/m.
 - Alignment: Straight within $L/1000$; camber ± 5 mm.
 - Hole alignment: Within 1.5 mm.

4. Surface Preparation and Priming

- Clean all surfaces: Remove rust, scale, oil/grease by wire brushing/power tool to St 2 grade (IS 9954/Sa $2\frac{1}{2}$ if severe).
- Apply one coat red lead primer immediately after cleaning (25–40 microns DFT); brush/roller/spray.
- Touch-up shop damage on site; protect during transport/handling.

5. Hoisting, Fixing, and Erection

- **Hoisting:** Use cranes/lifting beams; no damage to sections/paint.
- **Fixing in Position:**
 - Erect per approved erection sequence/drawings; plumb/level with guy ropes/bracing.
 - Align members; use drift pins for temporary alignment.
 - Final riveting/bolting (supplementary if needed); tighten to full contact.
 - For purlins/rafters: Connect to common rafters via cleats; hip/jack rafters framed to main rafters.
 - Temporary bracing until permanent stability achieved.
 - Grout base plates if on concrete (non-shrink grout).
- **Safety:** Comply with safety norms; no erection in high wind/rain.

6. Quality Assurance and Testing

- **Inspection:**
 - Visual: No loose rivets, cracks, distortion; heads uniform.
 - Hammer test: Tap rivets; clear ring indicates tightness.
 - Dimensional/alignment checks at shop and site.
- **Non-destructive Testing** (if specified): Radiographic/magnetic particle for critical joints.
- **Defects:** Rectify/replace at contractor's cost.

7. Measurement and Payment

- Measured in kilograms (kg) of finished/erected steel (sections + plates + rivets; no deduction for holes/cuts < specified).
- Includes cutting, riveting, hoisting, fixing, priming, wastage (5–7%), scaffolding, tools.
- Rate exclusive of erection bolts (if temporary); paid per kg as per DSR/CPWD item for riveted built-up sections in beams/joists/rafters/purlins.

ITEM NO 27

16G Make Tata Double twisted barbed wire, gauge 16, barb spacing 4". four horizontal lines and two diagonals of galvanised steel barbed wire weighting 9.38 K.G. per 100 metre strained and fixed to posts with G.I. staples, including fixing the posts in coping of compound wall

1. Scope

- Perimeter security fencing on compound walls (typically 1.2–2.0 m high wall + fencing projection).
- Arrangement: 4 horizontal strands + 2 diagonal strands (forming X-pattern between consecutive posts).
- Posts spaced 3.0–4.0 m centre-to-centre (c/c) as per approved layout.
- Includes uncoiling, straining, fixing to posts, tensioning, and post embedding/fixing in coping.
- Suitable for residential, agricultural, industrial, or institutional boundary walls in Anand, Gujarat region (moderate to high corrosion exposure).

2. Materials

Materials shall be fresh, ISI-marked where applicable, from approved suppliers (Tata Wiron preferred). Submit manufacturer's test certificates, zinc coating reports, and physical samples for approval before procurement.

Material	Specification	Key Requirements	Approx. Consumption (per 100 m fence length)	Compliance/Source
Barbed Wire	Tata Wiron double twisted (Type A or B per IS 278), 4-point barbs, double strand line wire.	Gauge 16 (~1.6 mm dia. after galvanizing); barb spacing 4" (100 mm ±5 mm); barb length 13–18 mm; 4 sharp points at 90°; uniform twist; weight 9.38 kg/100 m (±5% tolerance).	6 strands × 100 m = 600 m wire (~56.28 kg total).	IS 278:2009; Tata Wiron certified; hot-dip galvanized (min. 40–90 g/m² zinc coating, medium/heavy class per IS 4826).
Posts	RCC square/rectangular posts or M.S. angle/pipe posts.	Size e.g., 75×75 mm RCC or 50×50×6 mm angle; embedded 450–600 mm in coping; projection above wall 600–900 mm (adjustable per design).	1 post every 3–4 m (25–34 posts per 100 m).	IS 456 (RCC); IS 2062 (steel); vertical plumb.
G.I. Staples / Wire Ties	Galvanized steel barbed/ring-shank staples or binding wire.	12–14 gauge, 25–40 mm leg length; corrosion-resistant.	4–6 staples per strand per post (24–36 per post).	IS 280; hot-dip galvanized.

Material	Specification	Key Requirements	Approx. Consumption (per 100 m fence length) ~600–1200 per 100 m).	Compliance/Source
Accessories	Straining tools, turnbuckles/tensioners, G.I. binding wire (for splices).	Heavy-duty manual/pneumatic strainers; adjustable tensioners at ends/corners.	As required for taut installation.	Approved quality.

- **Galvanizing:** Uniform hot-dip process; no flaking, excessive lumps, or bare spots; zinc adheres firmly.
- **Packing:** Wire supplied in coils of 100–200 m; properly labeled (brand, gauge, spacing, weight, batch no.).

3. Surface Preparation and Post Fixing

- **Compound Wall Coping:** Ensure coping (RCC beam/parapet) is complete, cured (min. 14 days), level, free from defects, and minimum 100–150 mm thick.
- **Post Fixing:**
 - Drill/embed holes in coping (if precast) or cast posts monolithically in 1:2:4 concrete/PCC.
 - Embed posts 450–600 mm deep; grout/fill securely; provide 50 mm cover.
 - Posts plumb (deviation <5 mm/m), aligned in straight line; cure concrete/grout for 7 days minimum.
 - Top of coping finished smooth; no protrusions affecting wire fixing.

4. Execution Methodology

Work in dry weather; use skilled fencing gangs (minimum 2–3 persons per bay).

- **Uncoiling:** Use reel stands to uncoil wire without kinks, twists, or damage to barbs.
- **Straining and Fixing Sequence:**
 1. Fix top horizontal strand first (typically 300–400 mm above wall coping top) at one end post using staples + temporary clamp.
 2. Strain tightly across bay using manual/pneumatic strainer or turnbuckle (tension ~200–300 kg; no visible sag >25 mm mid-span).
 3. Secure at each intermediate post with 2 G.I. staples per strand (one on each side of post for locking).
 4. Fix remaining 3 horizontal strands at uniform vertical spacing (e.g., 200–250 mm apart).
 5. Install diagonals: One from top of starting post to bottom of next post, second crossing oppositely (X-pattern at bay centre); strain similarly.
 6. Ensure barbs point outward/upward for maximum deterrence.
 7. At corners/ends: Use double posts or angle bracing; anchor with turnbuckles for permanent tension.
- **Splices/Joints:** Overlap min. 300 mm; twist tightly or bind with 2 turns of 14G G.I. wire; no weak links.
- **Alignment & Tension:** Fence plane vertical; all strands straight; uniform tension across strands; re-check and re-strain after 7–14 days if settlement occurs.

5. Finishing and Protection

- Clean wire of dust, oil, or loose zinc flakes post-installation.
- No painting required (galvanized finish provides corrosion protection).

- Protect fresh installation from mechanical damage during site works.

6. Quality Assurance and Testing

- **Visual Checks:** Uniform barb spacing (100 mm \pm 5 mm), tight double twists, sharp intact barbs, full galvanizing (no rust), taut strands (no excessive sag), secure staples (no loosening when pulled).
- **Weight Verification:** Sample coil weighed; confirm 9.38 kg/100 m (\pm 5%).
- **Tension Test:** Apply light lateral pressure mid-bay; deflection <50 mm; wire returns to position.
- **Zinc Coating:** Visual + adhesion test (no flaking when bent 180° around mandrel); if disputed, lab test per IS 4826.
- **Defects Rectification:** Contractor to repair/replace loose, sagged, or damaged sections at own cost.

7. Measurement and Payment

- Measured in **running metres** (m) of completed fence length along the wall (single face/plan length).
- Includes supply of barbed wire, staples, straining tools, fixing to posts, embedding/fixing posts in coping, labour, scaffolding, transport, wastage (5–7%), and all incidentals.
- Deduct gate/opening widths >1.0 m.
- Rate per metre; diagonals and tensioning included (no extras).
- Payment stages: 50% on material delivery + fixing posts; balance on completion and approval.

Deputy Executive Engineer
Pan R & B Sub Division
Harij

Executive Engineer
Pan R & B Sub. Division
Patan