

Item Specifications for Civil Works

(For detailed specification, refer R & B Department booklet for General Technical Specification for building works.)

ITEM NO-01

Earth work in excavation by mechanical means / manual means in foundation trenches, drains, manholes, soak wells etc. including necessary shoring & strutting, dewatering, getting out the excavated soil up to 1 km. lead, sorting and stacking of useful material, For all civil, electrical and plumbing works. All kinds of soil.

(A) Up to 1.50 Mt. Depth

(B) 1.5 to 3.0 Mt. Depth

1.0 General

1.1 CPWD specifications clause no. 2.0, 2.1, 2.2, 2.3 shall be followed.

2.0 Site Clearance

2.1 CPWD specifications clause no. 2.4 shall be followed except nothing extra will be paid for removing, diverting existing structures and services and providing fencing for the any archeological monuments within or adjacent to the area.

3.0 Setting out and making profiles

3.1 CPWD specifications clause no. 2.5 shall be followed.

4.0 Excavation

4.1 CPWD specifications clause no. 2.7, 2.9 shall be followed up to any width (not restricted to 1.5m) and any area (not restricted to 10 sqm) on plan.

4.2 The Contractor shall do the necessary shoring and strutting or shall provide necessary slopes to a safe angle or steps as required or directed at his own cost. No extra payment shall be made for such precautionary measures taken by contractor.

4.3 The Contractor shall at his own expense and without extra charge make provision of supporting all utility services, lighting the trenches, separating and stacking serviceable materials neatly, shoring, timbering, strutting, bailing out water either sub-soil or rainwater, including pumping at any stage of the work. Trenches shall be kept free of water while masonry or concrete works are in progress and till the Architect and Engineer-in-charge considers it necessary, i.e. till the concrete is sufficiently set.

5.0 Back filling:

CPWD specifications clause no 2.10 shall be follows for back filling of trenches.

6.0 Disposal of the excavated stuff

6.1 The excavated stuff of the selected type shall be used in filling the trenches and plinth or leveling the ground in layers, including ramming and watering etc. complete as directed by the engineer-in-charge.

6.2 The Contractor has to dispose the surplus excavated earth within the plot at non objectionable place.

6.3 The lead is the shortest practical route and not necessarily the route actually taken. The decision of Engineer-In charge shall be final.

7.0 Mode of Measurement and Payment

7.1 CPWD specifications clause no. 2.11, 2.12 shall be followed.

7.2 The rate shall be for an unit of one m³. The rate shall also include necessary shoring & strutting, dewatering, getting out the excavated soil, sorting and stacking of useful material, dressing of the sides, ramming of bottom, and disposal of surplus excavated earth at non objectionable place within the site.

ITEM NO-02

Supply and Filling in foundation and plinth with murrum or selected soil in layers of 30 cm. thickness including watering, ramming and consolidating etc. Complete.

1.0 Materials

1.2 Murrum

1.1.1 Murrum shall conform to M-13.

2.0 Workmanship

2.1 As soon as the work in foundation has been completed and measured, the sides of foundation shall be cleared of all debris, brick bats, mortar dropping etc. and filled with earth in layers not exceeding 30 cm. Each layer shall be adequately watered, rammed well and consolidated before the succeeding layer is laid. The earth shall be well watered and rammed with mechanical vibrator (static / pneumatic) of required capacity as per site condition. Where mechanical vibrator cannot be used ramming shall be done with iron rammer / blunt end of crowbars.

2.2 The plinth shall be similarly filled with earth in layers not exceeding 15 cm. adequately watered and consolidated by ramming with iron rammers/ mechanical rollers. 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.

2.3 The finished level of filling shall be kept to shape and gradient, intended to receive any floor finish.

- 2.4 In case of large heavy duty flooring like factory flooring, the consolidation may be done by power rollers (light or heavy), mechanical machinery, where so specified or as directed. The extent of consolidation required shall also be as specified or as directed upto OMC.
- 2.5 The excavated stuff of the selected type only shall be allowed to be used for filling the trenches and plinths. Under no circumstances, black cotton soil shall be used for filling the plinths.
- 2.6 The compaction shall be carried out to achieve Proctor density of 95%. The procedure for OMC and proctor density shall be carried out as per relevant IS codes. The samples for test shall be as per the relevant IS codes.
- 3.0 Mode of Measurements and Payment**
- 3.1 CPWD specification clause no. 2.23.3, 2.23.4 shall be followed.
- 3.2 The payment shall be made for filling in plinth and sides of foundations. No deductions shall be made for shrinkage or voids, if considered as instructed above.
- 3.3 The rate includes cost of collecting and carting murrum or selected earth of approved quality with all lead, lift and labor required for filling in foundations and plinth and all the operations as described above.
- 3.4 The rate shall be for an unit of one m³.
- 3.5 Only consolidated measurements of the fill shall be measured and paid for under this item.
- 3.6 Receipt of royalty for earth paid to government authority shall be submitted.

ITEM NO-03

Disposing/ transporting of the surplus excavated earth or debris etc. including loading at site, transporting by mechanical or manual means & disposal, unloading, spreading and dressing and compacting etc. complete as directed beyond the initial lead of 50 mt with all lift, upto 5 km

1.0 General:

- 1.1 The distance for lead shall be as per the item description.
- 1.2 All the excavated material shall be the property of the client. Where the excavated material is directed to be used in the construction of the works for general grading, plinth filling or embankments, the operations shall be arranged in such a manner that the capacity for cutting, haulage and compaction are nearly the same.
- 1.3 All hard materials such as hard murrum, rubble etc. not intended for filling in foundations, plinth or embankments shall be stacked neatly for future use as directed by the Engineer. The contractor on his own risk shall dispose off unsuitable or surplus materials not intended for use in part of the works or for reuse outside the work site.
- 1.4 The rates quoted shall also include for dumping of excavated materials in regular heaps, bunds, riprap with regular slopes within the lead specified and levelling. As a rule, all softer material shall be laid along the centre of the heaps, the harder and more weather resisting materials forming the casing on the sides and the top. Excavated soft rock or hard rock shall be stacked separately.

3.0 Workmanship:

- 1.1 The surplus excavated earth shall be disposed off as and when directed by the Architect or Engineer-in-charge. In case the excavated earth is to be stacked inside the plot, the location of the stack shall be directed by the architect or engineer in charge. If earth is to be disposed outside the plot, non-objectionable site shall be selected by the contractor.
- 1.2 The disposal of the stuff includes loading the earth in vehicle, conveyance to the specified site, unloading, spreading and compacting with required capacity of roller the same beyond the initial lead.
- 1.3 The Contractor should contact the Engineer-In-Charge before disposing the material.

3.0 Mode of measurements and payment:

- 3.1 The rate includes for spreading, dressing etc. complete at the specified site and shall be for a unit of one m³.
- The Final quantity of the transported earth shall be worked out after overall reconciliation of excavation, filling and disposing of the earth for whole site.

ITEM NO-04

Spreading excavated earth materials and levelling to camber and gradient as directed by engineer in charge in controlled lift thickness of 300mm.

1.0 Spreading material in layers and bringing to appropriate moisture content

- 1.1 The excavated and sub grade material shall be spread in layers of uniform thickness not exceeding 300 mm compacted thickness over the entire width of embankment by mechanical means, finished by a motor grader and compacted as per MORT&H Clause 305.3.6. 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 of MORT&H and got approved by the Engineer. Each compacted layer shall be finished parallel to the final cross-section of the embankment.
- 1.2 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, cuttings, other 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.

1.3 Mode of Measurements and Payment:

Earth embankment/ sub grade construction shall be measured separately by taking cross sections at intervals in the original position before the work starts and after its completion and computing the volumes of earthwork in cubic meters by the method of average end areas.

The rate includes labour required for spreading, leveling, watering with all lift, but compaction and rolling shall be paid in relevant item.

The earth filling shall be measured after taking actual levels at the site where the earth is spread and compacted.

The rate shall be for a unit of one m³.

ITEM NO-05

Rolling and consolidation of soling in controlled lift thickness of 300mm including filling in depression which occurs during the process with power roller 8Tonne to 12 Tonne.

1.0 Compaction: Only the compaction equipment approved by the Engineer shall be employed to compact the different material types encountered during construction. Smooth wheeled, vibratory, pneumatic tyred, sheep foot or pad foot rollers, 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 vibratory roller of 8 to 12 Tonne static weight with plain or pad foot drum or heavy pneumatic tyred roller of adequate capacity capable of achieving required compaction.

The Contractor shall demonstrate the efficacy of the equipment he intends to use by carrying out compaction trials. The procedure to be adopted for these site trials shall first 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 MORT&H Table 300-2. Subsequent layers shall be placed only after the finished layer has been tested according to MORT&H Clause 903.2.2 and accepted by the Engineer. The Engineer may permit measurement of field dry density by a nuclear moisture/ density gauge used in accordance with agreed procedure and the gauge 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 embankment / subgrade/ earthen shoulders, further compaction shall be carried out as directed by the Engineer. If in spite of that the specified compaction is not achieved, the material in the soft areas shall be removed and replaced by approved material, compacted to the density requirements and satisfaction of the Engineer.

2.0 Mode of Measurements and Payment:

The earth filling shall be measured after taking actual levels at the site where the earth is spread and compacted. Payment shall be made for only rolling and compacting work.

The rate shall be for a unit of one m³.

The Mode of measurement and rate shall be given as per Cmt. basis.

Item No.-06

Filling in plinth with sand under floors including watering ramming, consolidating and dressing complete as directed by engineer in charge.

1.0. Materials:

1.1. Sand shall conform to m. 6.

2.0. Workmanship:

2.1. The relevant specifications of item no. 4.12 shall be followed except that sand shall be filled in undo, floors, including watering, ramming, consolidating and dressing etc. complete.

3.0. Mode of measurement and payment:

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

ITEM No-07

Providing and filling the expansion joint for 25 mm width and 12 mm depth with polysulphide sealant with application of primer including scraping/removing the expansion filler materials from joints, cleaning, repairing of the edges with epoxy mortar of approved colour and make, fixing of abro tapes on the edges to prevent the adjoining surface etc. complete as directed by engineer in charge.

This item includes providing and filling the expansion joint for 25 mm width and 12 mm depth with polysulphide sealant with application of primer including scraping/removing the expansion filler materials from joints, cleaning, repairing of the edges with epoxy mortar of approved colour and make, fixing of abro tapes on the edges to prevent the adjoining surface etc. complete as directed by engineer in charge.

The Mode of measurement and rate shall be given as per Running meter basis.

ITEM No-08

Providing and laying in position Plain Cement Concrete (PCC) of M15 Grade including finishing, curing, formwork (if required) etc. complete as directed by the engineer-in-charge. For All works up to Plinth level, Roads, Pavements, Plinth Protection, stone flooring, tree pit etc as per drawing.

1:2:4 (1 Cement: 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)

1:3:6 (1 Cement: 3 coarse sand : 6 graded stone aggregate 20 mm nominal size)

1:3:6 (1 Cement: 3 coarse sand : 6 graded stone aggregate 40 mm nominal size)

1:4:8 (1 Cement: 4 coarse sand : 8 graded stone aggregate 40 mm nominal size)

M10

M15

1.0 Material

1.1 Water

1.1.1 Water shall conform to M-1.

a) Cement

b) Cement shall conform to M-3.

c) Coarse Sand

1.3.1 Sand shall conform to M-6.

1.4 Coarse Aggregate

1.4.1 Coarse Aggregate shall conform to M-12.

2 Workmanship

2.1.1 CPWD specifications clause no. 4.2.1 to 4.2.14 shall be followed.

2.2 General

Good quality of cement, sand, gravel shall be supplied for the work of plain cement concrete 1:2:4 / 1:3:6 / 1:4:8. The sand and the gravel shall be actually measured and mixed with cement in the mixture machine to make uniform consistent concrete and this concrete shall only be used.

Whenever concrete is required to be mixed manually the same shall be mixed on the concrete / steel platform using 10% more cement, which shall not be paid extra. When the concrete is to be manually mixed, it shall be thoroughly mixed twice before the water is added and twice after the water is added and when the concrete is of uniform color then only it can be used. The concrete left unused for more than 20 minutes will not be allowed to be use. The form work for the cement concrete work shall be strong and of very good quality. Oil shall be applied on it before the concreting. The item shall include the rate of providing form work, centering nails, labour for removing form work, etc., and no separate charge shall be paid for it. The concrete work shall be kept wet by watering at least 3 times a day and cured for 15 days. The entire work shall be carried out using good quality material and form work and employing skilled masons. The rate shall be per cubic meter of concrete.

Before commencing the concreting, the depth and width of the excavated foundation shall be checked as per the drawing. The bed of foundation trenches shall be cleared off of all loose materials, leveled, watered and rammed, as directed by engineer-in-charge.

The rate shall be for a unit of one m³.

ITEM NO-09

Providing and fixing TMT-Fe-500 ISI make reinforcement bar for R.C.C. work including bending binding and placing in position complete up to any level.

1. Material

1.1 Reinforcement

1.1 Reinforcement shall conform to M-17.

1.2 Binding Wire

1.2 Binding Wire shall conform to M-18.

2. Workmanship

2.1 CPWD Technical specifications clause no. 5.3.1 and 5.3.2 is to be followed.

2.2 The type of reinforcement shall be as per the item description. The contractor shall submit the test certificate from steel manufacturer as and when required. The test results shall be verified, if required in any reputed laboratory.

2.3 Bar bending schedule shall be made by the contractor before starting the work. The payment shall be done based on quantity worked out in bar bending schedule. The bar bending schedule shall be prepared as per SP 34.

2.4 All the reinforcement bars shall be accurately placed in exact position shown on the drawings and shall be securely held in position with 18 gauge MS binding wire as approved by Engineer-in charge. The rebars shall be placed with stay blocks or metal chair spacers, metal hangers, supporting wires or other approved devices at sufficiently close intervals. Bars shall not be allowed to sag between supports nor displaced during concreting or any other operations of the work. All devices used for positioning shall be of non-corrodible material. Wooden and metal supports shall not extend to the surface of concrete, except where shown on drawing. Placing bars on layers of freshly laid concrete as the work progresses for adjusting bar spacing shall not allowed. Pieces of broken stone or brick and wooden blocks shall not be used. Layers of bars shall be separated by spacer bars at 1m c/c, Precast cover blocks in cement mortar 1:2 (1 cement : 2 coarse sand) about 4 X 4 cm square section or 4 cm dia round section or PVC cover blocks shall be used to maintain the cover of the concrete members as directed by Engineer In charge or Architect. Reinforcement after being 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 from corrosion, concrete cover shall be provided as indicated on drawing. All the bars projecting from concrete and to which other bars are to be spliced and which are likely to be exposed for a period exceeding 10 days shall be protected by a thick coat of neat cement grout.

2.5 Bars crossing each other where required shall be secured by 18 gauge GI binding wires (annealed) of size not less than 1 mm., in such manner than they do not slip over each other at the time of fixing and concreting.

1.1 As far as possible, bars of full length shall be used. In case this is not possible, overlapping of bars shall be done as directed. Where directed and practicable overlapping bars shall not touch each other, but be kept apart by 25 mm. or 1.25 times the maximum size of the coarse aggregate, whichever is greater by concrete between them. Where not 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 movement is maximum in beam and slab.

1.2 Whenever indicated on the drawings or desired by the Architect and Engineer-in-charge, bars shall be joined by couplings which shall have a cross section sufficient to transmit the full stresses of bars. The ends of the bars that are joined by coupling shall be upset for sufficient length so that the effective cross sectional the base of threads is not less than normal cross section of the bar. Threads shall be standard threads. Steel coupling shall conform to IS : 226.

1.3 When permitted or specified on the drawings, joints of reinforcement bars shall be welded with appropriate welding rod as per the instructions given by Structural Engineer. The type of welding, size of fillet etc shall be as approved by Structural Engineer. Welded joints shall preferably be located at points when steel will not be subject to more than 75 % of the maximum permissible stresses and welds so staggered that any one section not more than 20 % of the rods are welded. Only electric arc welding using a process which excludes air from the molten metal and conforms to any or all 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 2 or 3 stages, previous surface shall be cleaned properly. Ends of the bars shall be cleaned of all loose scale, rust, grease 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 and frequency of test shall be as directed. Welding shall be done by electric arc process as per IS : 816 and IS : 823.

1.4 At the time of concreting, a bar fitter shall remain at site to keep the reinforcement in position.

- 2.10 Rolling margin shall be checked for each lot of steel received at site. This rolling margin shall be considered for reconciliation of steel at the end of the project or after the end of each month as per the decision of engineer -in charge.
- 3.0 Mode of Measurement and Payment**
- 3.1 Reinforcement shall be measured in length including overlaps, separately for different diameters as actually used in the work. Where welding or coupling is resorted to in place of lap joints, such joints shall be measured for payment as equivalent length of overlap as per design requirement. From the length so measured, the weight of reinforcement shall be calculated in tones by using standard IS co-efficient. Length shall include hooks at the ends. The wastage of steel and binding wires shall not be measured and paid extra. The rolling margin of steel shall not be paid extra.
- 3.2 The rate for reinforcement shall include the cost of labour and material required for all operations described above like cleaning of reinforcement bars, straightening, cutting, hooking, bending, binding, welding placing in position etc. as per the drawing or directed by the Architect or engineer-in-charge. Rate shall also include the cost of GI binding wires of 16 to 18 gauge, devices like chairs, pins, spacer bars, cover blocks of PVC or cement mortar etc. for keeping reinforcement in position. The rate shall for an unit of MT.

ITEM NO-10

Construction of unreinforced, dowel jointed, M25 grade plain cement concrete flooring (broom finish) for promenade flooring, cycle track, footpath, side walk, central verge etc. as per Specifications and in conformity with the lines, grades and cross sections shown on the drawings. The work shall include furnishing of all plant and equipment, materials and labour and performing all operations in connection with the work, as approved by the Engineer. The unit rate also includes full costs of contraction, expansion, construction and longitudinal joints. It shall also includes joint filler, keys, caulking rod, debonding strip, sealant primer, joint sealant, dowel bar and tie rod. And it shall also includes cutting and making of groove in cement concrete floor as per the drawing. For construction of concrete flooring TRIMIX vacuum dewatering system shall be used.

11 (B)Without Dowels bar and tie rod

This item includes Construction of unreinforced, dowel jointed, M25 grade plain cement concrete flooring (broom finish) for promenade flooring, cycle track, footpath, side walk, central verge etc. as per Specifications and in conformity with the lines, grades and cross sections shown on the drawings. The work shall include furnishing of all plant and equipment, materials and labour and performing all operations in connection with the work, as approved by the Engineer. The unit rate also includes full costs of contraction, expansion, construction and longitudinal joints. It shall also includes joint filler, keys, caulking rod, debonding strip, sealant primer, joint sealant, dowel bar and tie rod. And it shall also includes cutting and making of groove in cement concrete floor as per the drawing. For construction of concrete flooring TRIMIX vacuum dewatering system etc complete as directed by engineer in charge.

The rate shall be for a unit of one Sq.Mt..

ITEM NO-11 & 12

Providing . & laying for control concrete in cement concrete M-25 and curing complete including cost of form work for reinforced concrete work Including the cost of centering, shuttering for all height and lift but excluding the cost of reinforcement.

Providing. & laying for exposed finish control concrete in M-25 for wall of any thickness and height and curing complete including cost of form work centering, shuttering for all height and lift but excluding the cost of reinforcement. For Retiaing wall / Boundary wall as per instruction of engineer incharge .

1.0 Material

1.1 Water

- 1.1.1 Water shall conform to M-1.

a) Cement

b) Cement shall conform to M-3.

c) Coarse Sand

1.3.1 Sand shall conform to M-6.

1.4 Coarse Aggregate

1.4.1 Coarse Aggregate shall conform to M-12.

2 Workmanship

2.1 CPWD specifications clause no. 4.2.1 to 4.2.14 shall be followed.

2.2 General

2.2.1 Before commencing the concreting, the depth and width of the excavated foundation shall be checked as per the drawing. The bed of foundation trenches shall be cleared off of all loose materials, leveled, watered and rammed, as directed by engineer-in-charge.

2.2.2 The cost of the formwork shall be included as per the item description.

2.3 Inspection

2.3.1 Contractor shall give the Architect and Engineer-in-charge due notice before reinforcement bars are placed in position, 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 the safety of men, machinery, materials and for results obtained. Immediately before concreting, all forms shall be thoroughly cleaned. Contractor shall proper access with railing for inspection of work.

a) Centering design and its erection shall be got approved from the Engineer-in-charge. Sufficient carpenter with helper shall invariably be kept present throughout the period of concreting. Movement of labour and other persons shall be totally prohibited after reinforcement is laid in position. For access to different parts, suitable mobile platforms shall be provided so that steel reinforcement in position is not disturbed. For ensuring proper cover, mortar blocks/ PVC cover of suitable size and thickness as per the drawing shall be tied to the reinforcement. Timber, kapachi or stone pieces shall not be used for this purpose. For exposed concrete members PVC blocks of grey color shall only be used.

b) All formwork 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 Architect and Engineer-in-charge has been obtained.

c) Formwork for Exposed concrete surface (If indicated)

d) All vertical members for formwork shall be of steel like acro props, H frames / cup lock system etc. Care shall be taken to set all formwork in perfect line, level (or in required camber or slope as specified) and plumb. Formwork propping shall be strong, rigid and sturdy. The formwork shall be as per pattern, design shown in drawings. Formwork shall be done accurately and precisely so as to achieve neat, clean and smooth concrete surface, in line, level and plumb. Clinks, twists, offsets, warps, riveting etc. in plates or forms shall not be allowed. Before placing concrete, forms shall be thoroughly cleaned off of all rust, dust and loose materials. Mould release agent of approved make or as per the Architect / Engineer in charge shall be applied on sheathing before placing the reinforcement steel. Also the formwork material will be of laminated plywood/best quality steel sheathing or any sort of such material, as approved by the Architect, so that all exposed concrete surfaces have uniform colour and texture. After deshuttering, all concrete surfaces shall be properly rendered with sand paper or emery stone. The sample of the exposed concrete shall be got approved by the architect or engineer in charge. For walls and columns, the sheathing plates shall be bolted with special nuts and bolts- spring coils and PVC cone spacer. No through bolts shall be allowed for basement walls and water retaining structure for which no extra amount shall be paid for.

e) For all kind of exposed concrete work only one brand (to be approved by the Architect or Engineer-in-charge) of cement shall be used.

For exposed concrete element specified in the drawing, steel shuttering made out of CR MS sheet not less than 2mm thickness (14 guage) or laminated plywood not less than 12 mm with MS angle steel supporting frame work shall be used.

For other concrete shuttering material shall be as follows:

1. Columns: Moulds from marine ply with wooden battens or steel plates
2. Straight walls / Curved wall in plan: Marine plywood with wooden battens / Acro make or equivalent make steel plates and soldiers.
3. Beam: steel plates and marine ply with battens

2.3.5 Formwork for Exposed Work

2.3.5.1 Exposed / Ordinary fair finished formwork for walls, columns, beams of basement and water retaining structures

For water retaining structure the shuttering plates on either side shall be bolted with tie rods made from spring coils on either side, welded with two nos. 8mm MS rods. PVC cone shall be placed on either side of the tie rod. The whole tie rod assembly along-with PVC cone shall be placed/fixed with special type of bolts on either side of the shuttering plates. Length of the tie rod along-with PVC cone shall be equal to the width / thickness of the element to be shuttered. Holes of cones shall be filled with rich cement mortar (1:1) and bonding agent in recommended proportion.

2.3.5.1 Exposed / Ordinary fair finished formwork For walls, columns, beams of Super structure

For walls, columns and beams, the shuttering plates on either side shall be bolted with through tie rods made from round bars minimum 12 mm with heavy quality PVC sleeves and minimum 25 mm thick PVC cones on either side of the sleeve. The whole tie rod assembly along-with PVC cone shall be placed /fixed with through bolts on either side of the shuttering plates. Holes of cones shall be filled with rich cement mortar (1:1) and bonding agent in recommended proportion.

2.4 Sampling and testing of concrete

2.4.1 The contractor shall set up a site laboratory to carry out various tests as specified. The laboratory shall include equipments like cube testing machine, slump cone, cube moulds for concrete and mortar, mechanical balance, sieve set, flakiness testing apparatus, core cutter etc.

1.1.a Samples from fresh concrete shall be taken as per IS : 1199 and cubes shall be made, cured and tested at 7 days or 28 days as per requirements in accordance with IS : 516. A random sampling procedure shall be adopted to ensure that each concrete batch shall have a reasonable chance of being tested i.e. the sampling should be spread over the entire period of concreting and cover all mixing units. The minimum frequency of sampling of concrete of each grade shall be in accordance with following :

Qty. of concrete in the work	No. of samples of concrete for testing at 28 day
1-5 m ³ .	1
6-15 m ³ .	2
16-30 m ³ .	3
31-50 m ³ .	4
51 and above	4 + one additional for each additional 50 m ³ or part thereof.

NOTE : Atleast 1 sample shall be taken from each shift. Three test specimens shall be made for each sample for testing at 28 days. Additional samples must be taken to determine strength at 7 or 3 days or at the time of striking the formwork, or to determine the duration of curing, or to check the testing error. The samples of concrete shall be taken on each day of the concreting as per above frequency. The

number of specimens may be suitably increased as deemed necessary by the Architect and Engineer-in-charge when procedure of tests given above reveals a poor quality of concrete and in other special cases.

- 2.4.3 The test results of the sample shall be average of the strength of 3 specimens. The individual variation shall not be 15% of the average strength of the sample. The compressive mean strength for the group of 4 non-overlapping consecutive test results shall be as per col. 2 table 11 of IS 456:2000 and individual test results shall be as per col. 3 of table 11 of IS 456:2000.

2.5 Stripping

- 2.5.1 The Architect and Engineer-in-charge shall be informed in advance by the Contractor of his intention to strike the 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 condition that influence the setting of concrete and of the materials used in the mix. In normal circumstances (generally where temperature are above 20°C) and where ordinary concrete is used, forms may be struck after expiry of periods specified in IS 456:2000 11.3.1 page 25 for respective item of formwork.
- 2.5.2 All formwork shall be removed without causing any shock or vibration as would damage the concrete. Before the soffit and struts are removed, the concrete surface shall be gradually exposed, where necessary in order to ascertain that the concrete has sufficiently hardened. Centering shall be gradually and uniformly lowered in such manner as to permit the concrete to take stress 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 covers to the finished concrete surface. Where it is intended to re-use the formwork, it shall be cleaned and made good to the satisfaction of the Architect and Engineer in-charge. After removal of formwork and shuttering the Engineer-in-charge shall inspect the work and satisfy by random checks that concrete produced is of good quality.
- 2.5.3 The number of props left under, their sizes and disposition shall be such as to be able to safely carry the full load of the slab, beam or arch as the case may be together with any live load likely to occur during curing or further construction.
- 2.5.4 Immediately after the removal of forms, all exposed bolts etc. 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 atleast 25 mm. below the surface of the concrete and the resulting holes be filled by cement mortar. All fine mortar lines 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 sand. Considerable pressure shall be applied in filling and pointing to ensure thorough filling in all voids. Surfaces, which are pointed, shall be kept moist for a period of 24 hours. For repairing concrete members, suitable bonding agent shall be used as directed by the consultant.
- i. If rock pockets/honeycombs in the opinion of Architect and Engineer-in-charge are of such an extent or character so as to effect 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 portion of the structure affected with no extra cost.

3

4 Mode of Measurement and Payment

- 3.1 CPWD specifications clause no. 4.2.15.1 to 4.2.15.5 and 4.2.15.7 shall be followed.
- 3.2 All structural elements like footing, slab, beam, columns, walls, lintels, chajjas, etc. shall not be classified, measured and paid separately.
- 3.3 The rate includes the cost of material, labour, tools and plant required for mixing, placing in position vibrating and compacting, finishing as directed by engineer-in-charge curing and all other incidental expenses for producing concrete of specified strength, for all floors, all shapes at any height and level, and in any position.
- 3.4 The rate shall be for an unit of one cum. The cost of formwork shall be included as per the item description.

ITEM NO-13

Repairing of Concrete road surface (PQC road) including dismantling / Scarping of Road to 3" to 4" and repairing surface with M-30 grade concrete including necessary bonding agent like SBR including necessary brooming, watering and curing completed

This Item includes repairing of Concrete road surface (PQC road) including dismantling / Scarping of Road to 3" to 4" and repairing surface with M-30 grade concrete including necessary bonding agent like SBR including necessary brooming, watering and curing completed as directed by engg. In charge.

The Mode of measurement and rate shall be given as per Square meter basis.

ITEM NO-14

Brick work using common burnt clay building bricks having crushing strength not less than 35 kg/Sq. cm. in foundations and plinth in cement mortar 1:5 (1 cement : 5 fine sand)

In foundations and Plinth

- (i) **CM 1:4 (1 Cement : 4 coarse Sand)**
 - (ii) **CM 1:5 (1 Cement : 5 coarse Sand)**
 - (iii) **CM 1:6 (1 Cement : 6 coarse Sand)**
- Super structure above plinth for all levels**
- (i) **CM 1:4 (1 Cement : 4 coarse Sand)**
 - (ii) **CM 1:5 (1 Cement : 5 coarse Sand)**
 - (iii) **CM 1:6 (1 Cement : 6 coarse Sand)**

5 Material**1.1 Water**

- 1.1.1 Water shall conform to M-1.

1.5 Cement Mortar

- 1.2.1 Cement Mortar shall conform to M-11.

1.3 Brick

- 1.3.1 Brick shall conform to M-23.

6 Workmanship**2.1 Proportion**

- 2.2.1 The proportion of the cement mortar shall be as specified in item and conform to relevant IS standards.

b) Soaking of Brick

- i. CPWD specifications clause no. 6.2.3 shall be followed.

c) Laying

- i. CPWD specifications clause no. 6.2.4 shall be followed.
- ii. **In a day brick work shall not be laid more than 1m or 10 courses in height.**
- iii. The frames of doors, windows, cupboards, etc. shall be housed into the brick work at the correct location and level, as directed while executing the masonry work. The heavy steel doors, windows frames, etc. shall be built in with brick work, but for ordinary steel doors and windows, required opening for frames, hold-fasts, etc. shall be left in the wall and frames shall be embedded later on in order to avoid damage to the frames.

d) Joints

- i. CPWD specifications clause no. 6.2.5 shall be followed except in case of non-modular bricks thickness of four course and four joints shall be 35 cm and thickness of mortar at the joint shall be 12 mm.
- ii. At the end of day's work or on holidays the top of unfinished masonry shall be kept wet. If the mortar becomes dry, white or powdery, for want of curing, work shall be pulled down and re-built at Contractor's expense.

e) Curing

- i. CPWD specifications clause no. 6.2.6 shall be followed.
- f) **Scaffolding**
 - i. CPWD specifications clause no. 6.2.7 shall be followed.
 - ii. **No through holes shall be left in brickwork to support the scaffolding. In case the holes are left in the brickwork, it shall be filled with 1:4:8 PCC.**
- g) **Preparation of foundation bed**
 - i. If the foundation is to be laid directly on the excavated bed, the bed shall be leveled, cleared off of all loose materials, cleaned and wetted before starting masonry work. If masonry is to be laid on concrete footing, the top of concrete shall be roughened, cleaned and moistened. The Contractor shall obtain approval of the Engineer-in-charge for the foundation bed, before foundation masonry is started. When pucca flooring is to be provided flush with the top of the plinth, the inside of the plinth wall shall be lowered down having an offset of the same thickness of the flooring with respect to the outside plinth wall top or as directed.
- 7 **Mode of Measurement and Payment**
 - 3.1 Brickwork shall be measured in cubic meter unless otherwise specified. Dimensions shall be measured correct to the nearest to 0.01m. Areas shall be calculated to the nearest 0.01 sqm and cubic contents shall be worked out to the nearest 0.01 cum. half brick wall thick shall be measured separately in sqm stating the thickness.
 - 3.2 The measurement shall be taken for the brick masonry fully completed in foundation, upto plinth or above plinth for all levels, heights, shapes and locations as per the item description. Battered, tapered and curved portions shall be measured net as walls.
 - 3.3 No deduction shall be made from the quantity of brick work, nor shall any extra payment be made for embedding in masonry or making holes in respect of following items
 - (1) End of joists beams, posts, girders, rafters, purlins, trusses, corbel, steps etc. where cross sectional area does not exceed 0.1 m².
 - (2) Architectural openings in walls, parapet and compound walls, not exceeding 0.1 m² area.
 - (3) Wall plates and bed plates, bearing of slabs, chhajjas and the like whose thickness does not exceed 10 cm. and the bearing does not extend to the full thickness of wall.
 - (4) Drainage holes, recesses for cement concrete blocks to embed hold fasts for doors, windows etc., forming toothings, grooves etc. and providing cramps for holding stone lining.
 - (5) Iron fixtures, pipes upto 300 mm. dia. holdfasts and doors and windows built into masonry and sanitary and water supply pipes, etc., for concealed electrical wiring and any other fixtures or inserts.
 - (6) Forming chases of section not exceeding 350 cm² in cross section or 50 cm in girth.
 - 3.2 Apertures for fire places shall not be deducted nor shall extra labor required to make splaying of jambs, throating and making arches over the aperture be paid for separately. The rate shall include for work of any shape e.g. pillars of any size and shape, curved or tapered walls, drip courses, projections, parapets, load bearing walls, sills, ottas, steps, tank walls, platforms and counter walls, ducts, channels and architectural moldings like corbelling, pattas, etc.
 - 3.3 The rate shall be for a unit of one cum.

ITEM NO-15

Brick in super structure above plinth level up to floor two level. using common burnt clay building bricks having crushing strength not less than 35 kg/Sq. cm. in cement mortar 1:4 (1 cement : 4 fine sand) i.e. Superstructure

The relevant specifications of item no. 10 shall be followed except item shall be executed for super structure above plinth for all levels.

ITEM NO-16

Half brick masonry in common burnt clay building bricks having crushing strength note less than 35 Kg/Sq. Cm. in cement mortar 1:4 (1 cement : 4 coarse sand) in Super Structure upto floor two level

- 1.0 **Materials:** Brick shall conform to M-15. Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. Cement mortar shall conform to M-11.
- 2.0 **Workmanship:**

- 2.1 Relevant specifications of bricks, wetting and laying of bricks, joints, curing etc. shall conform to item No 8 except the brick work of half bricks shall be carried out.
- 2.2 Cement mortar used in masonry work shall be in proportion of 1 part of cement and 4 part of sand by volume.
- 2.3 All bricks shall be laid stretcher wise, breaking joints with those in the upper and lower courses. The wall shall be taken truly plumb. All courses shall be laid truly horizontal and all vertical joints shall be truly vertical. The bricks shall be laid with frogs upwards. A set of masons tools shall be maintained on work as required for frequent checking.
- 3.0 **Mode of measurement and payment:**
- 3.1 The half brick masonry work in foundation and plinth shall be measured under this item, the limiting dimensions shall not exceed those shown in the plan or as directed. Any work done extra over the specified dimensions shall be ignored.
- 3.2 The relevant specifications of item No. 8 shall be followed. The length shall be measured nearest to one Cm.
The rate shall be for a unit of Sq. Mt.

ITEM NO-17

Providing & laying average 12-15 mm thick Single coat mala finish cement plaster on sides of masonry work / block wall / RCC wall, first coat 14mm thick CM 1:4 (1 cement : 4 coarse sand) by spraying , second coat up to 6 mm of CM 1:3 (1 cement : 3 fine sand) with mala finish plaster (finished with steel trowel) at all floors, all shapes and all height including hacking to RCC surface, scaffolding, curing, making grooves, forming pattas and drip mould, etc. complete as directed by engineer-in-charge.

1. Material**1.1 Water**

- 1.1.1 Water shall conform to M-1.

1.2 Cement Mortar

- 1.2.1 Cement Mortar shall conform to M-11. The mortar of the specified mix using the type of sand described in the item shall be used.

2. Workmanship

- 2.1 Relevant specifications of item no. 7.01.a shall be followed except under coat shall be 12 mm of CM 1:4 (1 cement : 4 coarse sand), finishing coat shall be 6 mm in cement mortar 1:3 (1 Cement : 3 fine sand) and shall have an average total thickness of not less than 18 mm.

2.2 12m under coat

Plaster has been brought to a true surface a wooden straight edge and the surface shall be left rough and furrowed 2 mm deep with a scratching tool diagonally both ways, to form key for the finishing coat. The surface shall be kept wet till the finishing coat is applied. Before the first coat of surface hardens roughing shall be done to receive the second coat. Second coat shall be applied only after minimum curing of 72 hours.

1.7 6 mm Finishing Coat

The finishing coat shall be applied after the under coat has sufficiently set but not dried and in any case within 48 hours.

3.0 Mode of Measurement and Payment

- 3.1 The relevant specifications of item no. 7.01.a are to be followed

ITEM NO-18

Providing and laying average 18-20 mm. thick Sand faced cement plaster on masonry work / RCC wall up to any height above ground level and for all shapes consisting of first coat (backing coat) average 13-15 mm. thick with CM 1:3 (1 cement: 3 coarse sand) rough wired finish and second coat of average 6 mm. thick uniform grained textured by using sponge, in CM 1:1 (1 cement: 1 sand), including scaffolding, hacking to RCC surface, forming grooves, drip moulds, pattas, curing etc. complete as directed by engineer-in-charge.

1.0 Material**1.1 Water**

- 1.1.1 Water shall conform to M-1.

1.2 Cement Mortar

1.2.1 Cement Mortar shall conform to M-11.

2.0 Workmanship

2.1 The work shall be carried out in two coats. The **backing coat (base coat) shall be average 13-15mm thick in CM 1:3** (1 cement: 3 coarse sand). The relevant specifications of item no. 7.03a shall be followed. Before the first coat hardens its surface shall be beaten up by edges of wooden tapers and close-wired finish shall be made on the surface. The subsequent coat shall be applied after this coat has been allowed to set for 3 to 5 days depending upon the weather conditions. The surface shall not be allowed to dry during this period. Before applying the second coat neat cement slurry shall be applied on the wall surface.

2.2 The second coat shall be completed to **average 6 mm. thickness in CM 1:1** as described above. The surface shall then be tapered to uniform grained texture by using **Wooden Gutka/ float** only, as specified. The sample of sand face shall be got approved before the work is started. The whole work shall be carried out uniformly as per the sample approved.

2.3 Curing - The curing shall be started overnight after finishing of the plasterwork. The plaster shall be kept wet for a period of 7 days. During this period, it shall be protected from all damages.

3. Mode of Measurements and Payment

3.1 CPWD specifications clause no. 13.1.9.1, 13.1.9.3, 13.9.5, 13.9.6, 13.1.9.7, 13.1.9.9 shall be followed except the plaster on molded cornices and coves in curved shape not paid separately measured and paid as per actual area in sqmt. The rate shall be for all floors, all heights, all levels and all shapes.

3.2 The rate shall be for all operations as described above.

3.3 The rate shall be for a unit of one sqm.

ITEM NO-19

Providing & doing Rendering to the existing concrete surface with required proportion of grey and white cement including needed curing as per specification and making the surface finish acceptable to the satisfaction of the Client/ Consultants. The cost includes chipping out concrete, all labour and material, making the surface finish up to desired level in conformity with existing concrete wall as well as filling the tie rod holes in the concrete with arrangement of required scaffolding at any level and curing as per the instruction by Engineer in charge.

This item includes Providing & doing Rendering to the existing concrete surface with required proportion of grey and white cement including needed curing as per specification and making the surface finish acceptable to the satisfaction of the Client/ Consultants. The cost includes chipping out concrete, all labour and material, making the surface finish up to desired level in conformity with existing concrete wall as well as filling the tie rod holes in the concrete with arrangement of required scaffolding at any level and curing as per the instruction by Engineer in charge.

The rate shall be for a unit of one sq.mt.

ITEM NO-20

Additional for Providing & fixing 15 cm wide chicken mesh jali with nails & then application of 15 mm plaster on R.C.C. & masonry joints as per dir.of engg.in charge

This item includes providing 15 cm wide chicken mesh jali with nails should be fixed at all r.c.c. & masonry Joints to avoid hair cacks in plaster between r.c.c. & masonry joints & then application of 15 mm plaster (1:4) on R.C.C. & masonry joints as per dir. of engg. In charge.

Mode of measurements & payment : The rate shall be for a unit of one Running Meter

ITEM NO-21

Providing and applying external finish of average 2 to 2.5mm thick acrylic polymer based texture and pattern with standard tool and applicator as specified by manufacturer on exterior surfaces at all heights including scaffolding to give even shades including thoroughly brushing the surfaces free from mortar dropping and other foreign matter and sand paper smoothed etc. complete as per the manufacture specifications and up to the satisfaction of Engineer in-charge/ Architect. The rate includes making of grooves, pattas

and finishing as directed by Architect/ EIC. Paint shall be measured and paid in separate tender item..

Material

1.1 Textured Wall Finish

- 1.1.1 Texture shall be of approved make.

2.0 Workmanship

- 2.1 Relevant specifications shall be followed as per item No. 11.05 except texture finish average 2 to 2.5mm thick acrylic polymer textured of approved make shall be used and the paint shall be applied with standards tools and applicators as specified by the company and under close supervision of representatives of companies. Sample shall be got approved prior to application.
- 2.2 Rate will be inclusive of including thoroughly brushing the surfaces free from mortar dropping and other foreign matter and sand papered smooth.

3.0 Mode of Measurement and Payment

- 3.1 The item shall be measured and paid in sqm. No extra will be paid for the protective coat on textured wall finish. External paint shall be paid in relevant tender item.

ITEM NO-22

Polymer mortar for replacement of spelled concrete Providing and applying primer coat by Nylon brush at the spelled out concrete location. Applying prepacked polymer mortar by trowels & float over the spelled concrete for diaphragm wall. Including scaffolding, shuttering, supplying required material including polymer etc., complete as per the specification & as directed by the Engineer.

This item includes polymer mortar for replacement of spelled concrete Providing and applying primer coat by Nylon brush at the spelled out concrete location. Applying prepacked polymer mortar by trowels & float over the spelled concrete for diaphragm wall. Including scaffolding, shuttering, supplying required material including polymer etc., complete as per the specification as directed by engineer in charge.

The Mode of measurement and rate shall be given as per Sq. meter basis

ITEM NO-23

Providing and laying for Terrazzo finish natural stone chips flooring for coping, seating, to be granolithic finish with under layer of 10 to 12 mm thick cement plaster(1:4) and top layer 10 to 12 mm thick with white, black, chocolate, grey, red, yellow or green marble chips of sizes from 7 mm to 10 mm nominal size, laid in cement marble powder mix 3:1 (3 cement : 1 marble powder by weight) in proportion of 4:7 (4 cement marble powder mix : 7 marble chips by volume) with any shade of pigment in ordinary and/or white cement of required proportion to achieve desire shade, including rubbing & polishing, coating etc. complete. Rate shall be inclusive of base coat, casting of terrazzo, rounding edges, curing, mirror polishing, finishing, etc. complete.

1.0 Material

1.1 Natural stone Chips

- 1.1.1 Natural Stone Chips shall conform to the relevant material specifications.

1.2 Cement Mortar

- 1.2.1 CPWD specifications clause no. 11.2.1 Shall be followed.

2.0 Workmanship

2.1 CPWD specifications clause no. 11.6.1, 11.6.2, 11.6.3, 11.6.4 shall be followed.

3.0 Mode of Measurement and Payment

- 3.1 CPWD specifications clause no. 11.6.5.1 shall be followed. The rate also includes the cost of borders, margins and similar bends up to 30 cm width and on staircase treads & riser, skirting coving ,flooring in narrow bands etc. complete.
- 3.2 the rate shall includes the cost base concrete (under layer) and cost of providing and fixing strips of 5 mm thk glass used for making panels.
- 3.3 Relevant specifications of item no.9.04.a shall be followed for under layer and for polishing relevant specifications of 9.10 shall be followed.

ITEM NO-24

Providing & fixing dead lock with 60/55 mm Euro profile Pin Cylinder of Kitch or equivalent with both side key /one side key -one side knob with one pair of rose for wooden /aluminium doors with necessary head screws etc. complete as per EIC. Rate shall be for all heights, all floors and all places.

This item includes providing & fixing dead lock with 60/55 mm Euro profile Pin Cylinder of Kitch or equivalent with both side key /one side key -one side knob with one pair of rose for wooden /aluminium doors with necessary head screws etc. complete as per EIC. Rate shall be for all heights, all floors and all places as directed by engineer in charge.

The Mode of measurement and rate shall be for Nos. basis.

ITEM NO-25

Providing & fixing 19 mm diameter SS 316 satin (brush) finish push-pull handles square/rectangular shape in pair of DORMA or equivalent with necessary screws etc. complete, as per drawing as approved by Architect and Engineer-in-charge. Rate shall be for all heights, all floors and all places.

- a) 200 mm long
- b) 300 mm long

This item includes providing & fixing 19 mm diameter SS 316 satin (brush) finish push-pull handles square/rectangular shape in pair of DORMA or equivalent with necessary screws etc. complete, as per drawing as approved by Architect and Engineer-in-charge. Rate shall be for all heights, all floors and all places as directed by engineer in charge.

The Mode of measurement and rate shall be for Pair basis.

ITEM No-26

Providing & fixing hydraulic rack and pinion door closer with screws to pivoted/ hinged door of approved make like Dorma or equivalent for specified door width with minimum one year guarantee. Rate shall be inclusive of fixing with using the template as per supplier's specification & maintaining in good working condition until defect liability period.

This item includes providing & fixing hydraulic rack and pinion door closer with screws to pivoted/ hinged door of approved make like Dorma or equivalent for specified door width with minimum one year guarantee. Rate shall be inclusive of fixing with using the template as per supplier's specification & maintaining in good working condition until defect liability period as directed by engineer in charge.

The Mode of measurement and rate shall be for Nos. basis.

ITEM No-27

Providing & fixing 75-100mm white PVC door Buffer with necessary screws etc. complete as approved by Engineer-in-charge.

This item includes providing & fixing 75-100mm white PVC door Buffer with necessary screws etc. complete as approved by Engineer-in-charge.

The Mode of measurement and rate shall be for Nos. basis.

ITEM No-28

Providing & fixing 150 mm satin nickel finish brass or SS 316 brush finish tower bolt of EPPW or equivalent in wooden doors/Aluminium doors, with necessary screws etc. complete as approved by Engineer-in-charge.

This item includes providing & fixing 150 mm satin nickel finish brass or SS 316 brush finish tower bolt of EPPW or equivalent in wooden doors/Aluminium doors, with necessary screws etc. complete as approved by Engineer-in-charge.

The Mode of measurement and rate shall be for Nos. basis.

ITEM No-29

Providing & fixing 200 mm satin nickel finish brass or SS 316 brush finish tower bolt of EPPW or equivalent in wooden doors/Aluminium doors, with necessary screws etc. complete as approved by Engineer-in-charge.

This item includes providing & fixing 200 mm satin nickel finish brass or SS 316 brush finish tower bolt of EPPW or equivalent in wooden doors/Aluminium doors, with necessary screws etc. complete as approved by Engineer-in-charge.

The Mode of measurement and rate shall be for Nos. basis.

ITEM No-30

Providing & fixing Door Stopper of EPPW, magnum, Kitch or equivalent with necessary screws etc. complete as approved by Engineer-in-charge in Charge.

This item includes providing & fixing Door Stopper of EPPW, magnum, Kitch or equivalent with necessary screws etc. complete as approved by Engineer-in-charge in Charge.

The Mode of measurement and rate shall be for each basis.

Item No-31

Providing and fixing roller mounted curtains of blackout type of approved make and shade as directed by the Architect/EIC. Rate to be inclusive of locking arrangement for the blinds per one blind. The rate shall be applicable for all floors and for all heights etc. complete as directed.

This item includes providing and fixing roller mounted curtains of blackout type of approved make and shade as directed by the Architect/EIC. Rate to be inclusive of locking arrangement for the blinds per one blind. The rate shall be applicable for all floors and for all heights etc. complete as directed.

The rate shall be for a unit of Square meter

Item No. 32

Providing and fixing glazing in aluminum door, window, ventilator shutters and partitions etc. Including EPDM rubber on the periphery of the glass, snap beading, glazing clips, neutral cure weather Silicone sealant of Dow corning 789 etc. complete for all height / all levels / all floor in all shapes as per the architectural drawings and directions of engineer-in-charge. Clear visible area of glass shall be measured and paid and without any wastage.

- a. 6 mm thick fully tampered glass
- b. 8 mm thick fully tampered glass
- c. 10 mm thick fully tampered glass
- d. 6 mm thick wired glass

Glass panes shall be free from flaws, specks or bubbles. All panes shall have properly squared corners and straight edges. The glass shall be clear float glass and should be approved by the Engineer in Charge. It shall be clear, float transparent and free from cracks subject to allowable defects. The float glass shall conform to the IS 14900. Glass for glazing shall conform to IS 2835 or IS 2553. The use of other types of glass, such as frosted glass, wired glass and toughen glass may also be specified by the Engineer-in- Charge. Panels of shutters shall be flat and well sanded to a smooth and level surface.

The rates shall include the cost of labour and material involved in all the operations described above.

Length and breadth of glass panes shall be measured correct to a cm. The area of the glass panes as fixed shall be calculated in square meter correct to two places of decimal.

panes as fixed shall be calculated in square meter correct to two places of decimal.

Item No. 33

Providing fixing 6mm thick frame less mirror of approve make in any shape and sizes. Mirror shall be fixed on 6mm thick cement bonded particle board (Bison panel) backing. Cement bonded particle board shall be fixed to wall with approved fastener. All edges of glass shall be sharp grinded, cute corner and polished. Glass shall be fixed with silicon sealant/ 3M tape etc complete at all floors/ all levels/ all heights as directed by engineer in charge. Installed area of mirror shall be considered for payment without wastage.

1.0 Material

1.1 The mirror shall be of Modifloat, Triveni, I.A.G. or equivalent as approved by the Consultants,

With the edges rounded off as specified. The mirror shall be float glass, electroplated with Silver. The mirror shall be free from waviness or distortion, from all angles of vision.

1.2 Its thickness shall not be less than 6mm the back of the mirror shall be free from any silvering defects. Silvering shall have a protective uniform covering of red-lead paint.

1.3 The 12mm thick marine plywood shall conform to relevant specification of civil materials and IS: 710. Teakwood shall conform to relevant specification of civil materials.

1.4 The mirror of a specified size shall be mounted on wooden frame comprising of 12mm thick Marine plywood and teak beading, as per drawing and directed by the Architect or Engineer in Charge.

2.0 Workmanship

2.1 The wooden frame shall be fixed in position by fixing wooden plugs in wall and the work shall be carried out in form of the best workmanship. For teakwood beading relevant civil work item Specification shall be followed. The teakwood beading shall be of 20mm x 32mm size.

3.0 Measurements

3.1 The rate shall be for a unit of number and include cost of all labour and materials, tools and Plant, etc., required for satisfactory completion of this item. The rate shall be for a unit of square meter.

Item No. 34

Providing & fixing hydraulic floor spring with SS cover plate & adjustable concealed casted top pivot (two piece) and bottom strap of approved make like Dorma or as per approved make for wooden/aluminum doors of specified capacity with minimum one year guarantee. Rate shall be inclusive of cutting of floor neatly, grouting the floor spring & cleaning / polishing the floor & maintaining in good working condition up till defect liability period. In case of Aluminum shutter bottom arm of floor spring & top pivot shall be firmly fixed in the aluminum members using required size of teak wood by making rabbet in the wood. a) Hold open having

weight up to 100 kg and width 1200mm - Floor Spring of Dorma BTS-75V with std. spindle and cover plate.

Hydraulic floor spring shall be of approved make, high quality and required capacity as per manufacturer's specification and as directed by engineer in charge.

(1) The closing time of the floor spring shall be easily adjustable between 3 and 20 seconds for which a suitable device to adjust the speed shall be provided.

(2) After being fitted in position the door leaf shall be opened through 90° plus 5° and released. When opened to an angle less than a right angle the door shall swing back automatically.

1.1 Workmanship

The floor spring shall be free from all mechanical defects, sharp edges and other surfaces defects.

1.2 Fixing

Suitable recess of the required size shall be cut in floor and the floor spring with all its components viz. cover plate, outer box with slide plate etc. shall be embedded in floor.

1.3 Measurement

The floor spring shall be measure in each numbers.

1.5 Rate

The rate shall be include the cost of labour and material involved in all the operations described above and making good the floor.

Item No. 35

Aluminium Work: Providing and fixing in position frames / shutter for any type of aluminium work like aluminium door, composite door-window, window (sliding, openable, sidehung, tophung, fixed etc.), casement window, aluminium partition, aluminium fixed louvers, fixed window with any type of aluminium sections of make Jindal/ Indal/ Hindalco as per approved make having minimum 50 micron pure polyester powder coating of approved shade, texture & colour of approved make for all floors/ all levels/ all heights/ all shapes/ all sizes including cutting, bending, crimping, CNC cutting, fabri cating in best work man ship manner etc as per the drawing, specification and as directed by Architect or Engineer-in-Charge. Rate shall be inclusive of providing aluminium sections (conventional and/ or Euro-profile sections), cutting, fabrication, erection and fixing to the best work man ship manner, including

1) Sheet metal screws and casted solid aluminium corner cleats fixed with external byttns with a spring for rapid and secure joint assembly for casement and sliding shutter and frame; 2) Glazing clips for receiving infill panel; 3) Best quality wool pile where ever shutter touches the frame and compatible microwave cured EPDM rubber; 4) Dash Anchor fasteners of HILTI or equivalent for fixing the frame assembly to the RCC or masonry surfaces. Minimum 1 anchor fastener shall be used for every 600 mm length of section for stability of frame. 5) 10mm GI tie rod for connecting vertical stile at top and bottom for aluminium door shutter and 4mm thick solid aluminium corner cleat of full thickness of section for connecting style and horizontal rails; 6) providing and fixing packing at every 600mm c/c of average 6 mm compact sheet of width (equal to section width less 30mm for backer rod and sealant); 7) Filling the gap between wall and frame on both sides (outside and inside) with polyethylene baker rod of avg. 10 mm thickness of approved make and colour and then sealing the remaining gap with neutral grade G/M (Glazed & Metal) weather silicon sealant of approved make and colour. 8) Termite treated seasoned teak wood as infill material to installed hardware in door shutter and frame as and when required

but excluding. 1) Necessary hardware; 2) Glazing or panelling material and shutter.

Shop drawing shall be prepared and get approved from the consultants before procurement of material by the contractor. Work shall carried out as per the approved shop drawings and approved sample. Actual weight of installed Aluminium sections which are visible shall only be measured and shall be considered for the payment. Contractor shall provide guarantee for stability, water tightness etc for 12 months after defects liability period.

- 1.1 For Aluminium section, Material Technical specification – M-79b (Aluminum section) is to be followed.
- 1.2 Powder coating of aluminium section shall be of approved make and shade and as per manufacturer's specifications. (as per item description)
- 1.3 Aluminium corner cleats, glazing clip, wool pile, EPDM rubber, Anchor fastener, compact sheet, backer rod, silicon sealant shall be of approved make and approved by consultants.

2.0 Workmanship

- 2.1 The work is to be carried out as per the best workmanship manner, as per the shop drawing prepared by contractor and approved by consultants and as per the approved sample.

2.2 Deleted

- 2.3 Approved make selected clear glass (frosted) / wired glass / toughen glass / compact sheet / SS 316 wire mesh of specified thickness as mentioned in the drawings shall be used in doors/ partition. Wired glass / frosted glass louvers shall be provided wherever shown in the drawings after grinding the edges.

- 2.4 The EPDM Gaskets shall be of size and profile as shown in drawings and as called for, to render the glazing, doors, curtain wall / glazing, windows, ventilators etc. air and water tight. Samples of gaskets shall be submitted for approval and the EPDM gasket approved by Engineer-in-Charge shall only be used. The contractor shall submit documentary proof of using the above material in the work to the entire satisfaction of Engineer in- Charge.

All gaskets used shall be 100% EPDM / silicones rubbers gaskets of approved colour for long life guarantee.

- 2.5 Necessary operating device (as per design) for operation of louvers of windows, ventilators, sky lights, including necessary rods shall be provided as per item description.
- 2.6 Necessary provision for rain water disposal shall be done in the bottom guides/frames as per the drawing.
- 2.7 Packing between wall/ column and aluminium frame shall be of compact sheet of 6 mm (equal to section width less 30mm for backer rod and sealant) thick at every 600mm c/c, filling the gap between aluminium frame and adjacent wall by average 10 mm thick polyethylene backer rod and sealing the remaining gap with neutral grade glazed and metal weather silicone sealant of approved make and shade.
- 2.8 The civil work as required for fixing of floor springs, hold fast or other works required for the erection and completion of doors/ windows etc. shall be done by the Contractor without any extra cost.
- 2.9 The Contractor shall be responsible for the windows/ doors/ curtain wall glazing/ grills etc. being set straight, in plumb level and for their satisfactory operations after the fixing is completed.
- 2.10 Wherever required and as directed strengthening of members shall be done by providing steel/ MS Concealed members without extra cost.
- 2.11 The quantities are provisional and may vary to any extent. No claim will be taken into consideration in this matter.
- 2.12 Details/ arrangements for after sales / maintenance services shall be furnished. Work shall be carried out in co-operation and in coordination with all other agencies working at site as per the drawing.

2.13 Sealant

- 2.13.1 The sealants of approved grade and colour shall only be used. The silicone for perimeter joints (between Aluminium section and RCC/Stone masonry) shall be of make approved as suggested by the Engineer in Charge.

2.13.2 Method of Application

Surface Preparation : Clean all joints and glazing pockets by removing all foreign matter and contaminants such as grease, oil, dust, water, frost, surface dirt, old sealants or glazing compounds and protective coatings.

2.13.3 Masking

Areas adjacent to joints shall be masked to ensure neat sealant lines. Masking tape shall not be allowed to touch clean surfaces to which the silicone sealant is to adhere. Tooling shall be completed in one continuous stroke immediately after sealant application and before a skin forms and masking shall be removed immediately after tooling.

2.13.4 Application

Install backer rod of appropriate size and apply silicone sealant in a continuous operation using a positive pressure adequate to properly fill and seal the joint. The silicone sealant shall be tooled with light pressure to spread the sealant against backing material and the joint surfaces before a skin forms.

A tool with convex profile shall be used to keep the sealant within the joint. Soap or water shall not be used as a tooling aid. Remove masking tape as soon as silicone joint is tooled.

2.13.5 *Tolerance*: A tolerance of ± 3 mm shall be allowed in the width of silicone joints. The depth of the joints at throat shall not be less than 6 mm.

2.14 Contractor shall provide termite treated kiln seasoned second class teak wood in frame for provision of hardware or wherever required and as directed by engineer in charge.

3.0 Mode of Measurement and Payment

3.1 All the aluminium sections including snap beading fixed in place shall be measured in running meter along the outer periphery of composite section correct to a millimeter. The weight calculated on the basis of actual average (average of five samples) weight of composite section in kilogram correct to the second place of decimal shall be taken for payment. (Weight shall be taken after anodizing). The weight of cleat shall be added for payment. Neither any deduction nor anything extra shall be paid for skew cuts. The item shall be measured length and multiply with relevant co-efficient and paid in Kg.

3.2 The rates quoted shall be inclusive of manufacture, supply and installation at site and inclusive of all the necessary fixing hardware as shown in the drawing.

3.3 The rates shall also be inclusive of providing and applying 6mm thick compact sheet/ ready made U shape PVC packing at 600mm c/c as packing, 10 mm thick backer rod and neutral cure weather silicone sealant of Dow Corning or equivalent with ordinary gun or compressed air operated gun as per the requirement and making the joints aluminium doors, windows, curtain wall glazing etc. on the external periphery of the building at the junction of two different materials as directed by engineer-in-charge.

3.4 Rate shall be inclusive of all wastages of aluminium, necessary EPDM rubber gasket between glazing clip and glass/ filler sheet, C P Brass, Sheet metal or SS screws, fasteners, sealant masking tape etc. as per the drawing. Cutting, fabrication, erection, fixing, protecting & cleaning until handing over to client to the best workmanship manner as per the Architectural drawings and approved sample.

3.5 The rates must be in accordance with detailed drawing with dimensions of aluminium sections in frames and shutters as shown in the drawing. Rate shall be valid also if any deviation is proposed.

3.6 The rate shall include the cost of all the materials, labours involved in all the operations as described in nomenclature of item and particular specification.

(b) **Providing &fixing 10" long (minimum rod size shall be 15 mm)"J" typesatinnickel finishnickel plated brush finished brass or SS brush finish Aldrop of EPPW ,Arch, Magnum or equivalent with necessary screws, pins, bolts etc. complete as approved by Engineer in Charge.**

This item includes Providing &fixing 10" long (minimum rod size shall be 15 mm)"J" typesatinnickel finishnickel plated brush finished brass or SS brush finish Aldrop of EPPW ,Arch, Magnum or equivalent with necessary screws, pins, bolts etc. complete as approved by Engineer in Charge.

Mode of measurement and Payment

The rate shall be for a unit of one number.

- © **Providing &fixing 8" long (minimum rod size shall be 12 mm) sat in nickel finish brass or SS 304 brush finish round Tadi of EPPW, Arch, Magnum make with necessary screws, pins, bolts etc. complete as approved by Engineer in Charge.**

This item includes Providing &fixing 8" long (minimum rod size shall be 12 mm) sat in nickel finish brass or SS 304 brush finish round Tadi of EPPW, Arch, Magnum make with necessary screws, pins, bolts etc. complete as approved by Engineer in Charge.

Mode of measurement and Payment

The rate shall be for a unit of one number.

- (d) **Providing and fixing chromium plated brass/ SS304 grade handles 150 mm long'D' shape rod handle with both end bracket with necessary screw setc.complete as directed by engineer in charge.**

- (e) This item includes Providing and fixing chromium plated brass/ SS304 grade handles 150 mm long'D' shape rod handle with both end bracket with necessary screw setc.complete as directed by engineer in charge.

Mode of measurement and Payment

The rate shall be for a unit of one number.

ITEM NO-36

Providing and laying Ceramics vitrified flooring tiles in flooring, treads of steps and dedo on 10 mm. thick cement plaster 1:3 (1 cement : 3 coarse sand) and jointed with white cement slurry.

This item includes providing and laying Ceramics vitrified flooring tiles in flooring, treads of steps and dedo on 10 mm. thick cement plaster 1:3 (1 cement : 3 coarse sand) and jointed with white cement slurry as directed by engg. In charge.

Mode of M/s and payment shall be on unit Sq. mt. basis.

ITEM NO-37

Providing and laying Cement concrete flooring for I.P.S. 1:2:4 (for Indian Patent Stones) (1 cement: 2 coarse sand: 4 graded stone aggregate 20 mm. nominal size) lain in layer finished with a floating coat of net cement.(50 mm th.)

Material :

Cement Concrete

Nabhi's commentary on CPWD specifications clause no. 11.2.1 shall be followed.

Workmanship

Nabhi's commentary on CPWD specifications clause no. 11.2.2, 11.2.3, 11.2.4, 11.2.5, 11.2.6, 11.2.7 shall be followed except rate is inclusive of providing and fixing glass strip or any type strip.

The cement concrete flooring of 40mm thickness is to be laid as per the site condition. The concrete shall be mixed in a mechanical mixer at the work. Hand mixed may however be allowed for smaller quantities of work and in case of failure of machines or as permitted by the Architect. It shall be carried out on a watertight platform and care shall be taken to ensure that mixing is continued until the mass is uniform in color and consistency. However, in such cases 10% more cement than otherwise required shall have to be used without any extra cost. The mechanical mixing shall be done for a period of 1.5 to 2 minutes. The quantity of water shall be just sufficient to produce a

dense concrete of required workability for the purpose. Flooring of specified thickness shall be laid in accordance with approved pattern or as directed. Finishing operation shall start shortly after the cessation of beating and shall be spread over a period of one to six hours depending upon the temperature and atmospheric conditions. The surface shall be left for some time till moisture disappears from it. Fresh quantity of cement shall be mixed with water to form thick slurry and spread over the surface while the concrete is still green. Use of dry cement or cement and sand mixture sprinkled on this surface to stiffen the concrete or absorb excessive moisture shall not be permitted. The cement slurry shall then be properly pressed twice by means of iron floats, once when the slurry is applied and the second time when cement starts setting and is to be finished smooth. The surface shall be marked with string of 300x300 mm or B.R.C. fabric jali to make the surface non-slippery as and when directed. The junction of floors with wall plaster, dado or skirting shall be rounded off where so required upto 25 mm. radius.

The form work shall be provided if necessary as directed by Architect. Concreting shall be done as per alternate bay method with necessary centering.

After the concrete has been fully compacted it shall be finished by trowelling or floating with neat cement rendering. Finishing operations shall start shortly after the compaction of concrete and the surface shall be trowelled three times at intervals so as to produce a uniform and hard surface. The satisfactory resistance of floor to wear and tear, depends largely upon the care with which trowelling is carried out. The time interval allowed between successive trowelling is very important. Immediately after placing cement rendering, only just sufficient trowelling shall be done to give a level surface. Excessive trowelling in the earlier stages shall be avoided as this tends to bring a layer in cement to the surface. Sometime, after the first trowelling, the duration depends upon the temperature and atmospheric conditions and the rate of setting of the cement used. The surface shall be retrowelled to close any pores in the surface and to bring to surface and to scrape off any excess water in concrete or any laitance. **No dry cement shall be used directly on the surface to absorb moisture or to stiffen the mix.** The final trowelling shall be done well before the concrete has become too hard but at such a time that considerable pressure is required to make any impression on the surface. The topping shall be rendered with 1:1 (1 part cement with a suitable mineral pigment (if directed): 1 part sand), instead of cement only to fill up the pin-holes etc.

Mode of measurement and Payment

The rate shall be for a unit of one Sq.Mt..

ITEM NO-38

Providing & laying average (30 to 35 mm thick) machined/hand cut green Rough kota (river wash) of approved quality, selected and sorted for uniform color & texture, in floor, otta, landing, tread, riser, ramp, sill, skirting, channel etc., in following sizes as per design (normal pattern straight or staggered joint with square or rectangular shaped stone) and drawings (with grooves of 10mm wide or without grooves). Kota stone is to be laid over cement mortar 1:4 bedding of average 20 to 30 mm thickness as per drawing with joints, pointing and finishing and filling the grooves with CM 1:2 including curing and cleaning with wire brush to remove excess cement on the sides of stone up to the satisfaction of the Architect & Engineer-in-charge. The rate shall also include necessary chamfer/ rounding the edge as per requirement

(A) Upto 600 mm X 600 mm (River Wash)

(B) Upto 900 mm x 600mm (River Wash)

(C) c) Upto 1200 mm x 300mm (River Wash)

1.0 Material

1.1 Rough Kota Stone

1.1.1 Rough Kota Stone shall conform to M-43.

2.0 Workmanship

2.1 The relevant specifications of item no. 37 A shall be followed except rough kota stone shall be used instead of polished kota stone.

3.0 Mode of Measurement and Payment

3.1 The relevant specifications of item no. 37 A shall be followed except rough kota stone shall be used instead of polished kota stone.

3.3 The rate shall be for a unit of one m²

ITEM NO-39

Polished kota Stone Providing & laying average 25mm (25to30mm) thick machined cut Green Polished Kotahstone of approved quality, selected and sorted for uniform color& texture, infloor, otta, sill, skirting, tread, riser etc., in required sizes up to 600 mm. as per design normal

pattern (straight or staggered joint with square or rectangular shaped stone) and drawings (with grooves of 10 mm wide or without grooves) .Kota stone is to be laid over cement mortar 1:6 bedding of average 40 mm thickness with joints, pointing and finishing and filling the grooves with CM1:2 as sample approved, including curing and cleaning with wire brush to remove excess cement on the sides of stone up to the satisfaction of the Architect & Engineer-in-charge setc. complete. (NOWAXING WILL BE PERMITTED). (Sample to be approved before mass production/construction/purchase)

- (a) A) Upto 600 mm X 600 mm
- (b) B) Up to 1200 mm x 300 mm

1.0 Material

1.1 Kota Stone

- 1.1.1 Kota Stone shall conform to M-44.

1.2 Cement Mortar

- 1.2.1 Cement mortar shall conform to M-11.

2.0 Workmanship

- 2.1 For dressing CPWD specifications clause no. 11.21.2 shall be followed
- 2.1 For laying and preparation of surface CPWD specifications clause no. 11.21.3 shall be followed except average thickness of CM shall be 35mm to 50 mm, cement mortar shall be 1:6 (1 cement : 6 sand) used.
- 2.2 While laying any chiseling which may be required for making the skirting or dado flush with the plaster and/or other finishes shall be done. Necessary grooves of required size in cm. between plaster and/or other finishes, dado or skirting (if required) shall be provided. Forming machine-cut/rounded edges, gutters, sills, platforms, channels, curbing, etc. if any, if required, shall be provided as per the drawing and design.
- 2.3 In places where full tiles cannot be fixed, the tiles shall be cut to the size and smoothened at edge to give straight and true joints.
- 2.4 All necessary slopes, gradients and levels shall be truly maintained as required and directed by the Architect and Engineer-in-charge.
- 2.5 The floor shall be kept wet for a minimum period of 7 days, so that bedding and joints set properly.
- 2.6 **Polishing** shall be normally commenced after 14 days of laying the slab. For special polish polishing to be done with 2 coats of 60, 120 grades of emery, balckchapadi and gutka. For semi mirror polish polishing to be done with 220, 320, 400, 600 grades of emery. Water shall be properly used during polishing. The flooring shall then be washed clean with oxalic acid. Daily moping for 15 days shall be done after polishing or up to the satisfaction of client and engineer-in-charge. All works shall be carried out as directed by the Architect and as specified in the item, no waxing will be permitted.
- 2.7 If any tile is disturbed or damaged it shall be refitted or replaced, properly jointed and polished.
- 2.8 The holes required for Nahni traps, pipes any other fittings shall be made without any extra cost.
- 3.0 Mode of Measurement and Payment**
- 3.1 Kota slab flooring shall be measured in m² for visible area of work done. Length and breadth shall be measured correct to a cm before laying skirting, dado or plaster.
- 3.2 No deductions shall be made or extra paid for any opening in the floor area upto 0.1 m². Nothing extra shall be paid for use of cut tiles or for laying the floors at different levels in the same room or courtyard. Kota slabs laid in floor borders and bands etc. shall be measured in the same item and nothing extra shall be payable on account of these or similar bands formed of half or multiples of half size standard tiles/or other uncut tiles.

- 3.4 The treads of stairs and steps paved with tiles without nosing shall also be measured under this item.
- 3.5 The rate shall include the cost of all materials (inclusive of all taxes, levies, and delivery at site), labour & sundry involved in all the operations, at all floors, at any height and level, as described above. It shall also include for breakage and wastage. Floating materials and margin of profit shall also be included. All material samples shall be approved by the Architect/Engineer-in-charge before placing orders.
- 3.6 No extra shall be paid for any small quantities like narrow widths, mitred & returned ends, rounds & cutting, fixing and making good upto & around pipes, fittings and fixtures etc.
- 3.7 The rate shall include for fixing the flooring in composite pattern as per the drawings, using different materials and sizes. The measurements of the different materials shall be taken category-wise separately and paid accordingly.
- 3.8 The basic rate, if at all provided or agreed upon includes cost of material, all taxes, levies & cost of delivery at site.
- 3.9 The risers of steps, skirting or dado shall be measured in m². Length shall be measured along the finished faces of risers, skirting or dado. Height shall be measured from finished level of treads or floor to top. Lining of pillars shall be measured under this item.
- 3.10 The rate shall be for a unit of one m²

ITEM No-40 & 41

Providing and fixing 80 mm thick abrasion resistant interlocking or Brick type paver blocks of approved make and colour as per design including average 50 mm coarse sand bedding over compacted sub-base (in required slope and of specified thickness). Rate shall be exclusive of sub-base. 1) 50 mm thick coarse sand shall be laid as cushioning layer for arranging the paver blocks. Joints of the paver blocks shall be filled with the sand 2) The paver blocks shall be laid properly on the prepared sub-base as per manufacturer's specification and as per Engineer-in-charge's instruction. a) M-40 grade - 80mm thick - shot blasted

Providing and fixing 60 mm thick abrasion resistant interlocking or Brick type paver blocks of approved make and colour as per design including average 50 mm coarse sand bedding over compacted sub-base (in required slope and of specified thickness). Sample to be approved by the Architect & Engineer-in-charge. Rate shall be exclusive of sub-base. 1) 50 mm thick coarse sand shall be laid as cushioning layer for arranging the paver blocks. Joints of the paver blocks shall be filled with the sand 2) The paver blocks shall be laid properly on the prepared sub-base as per manufacturer's specification and as per Architect and Engineer-in-charge's instruction. a) M-30 grade - 60 mm thick - shot blasted

- 1.0 **The scope of work:** It includes manufacturing, supplying and laying of Precast paver blocks at footpath, parking area, service lane and other areas.
The work includes:
 - 1.1 Paver block should be laid over prepared sub grade.
 - 1.2 Clearing the site by removing all obstacles such as stones, debris etc. for laying of paver blocks.
 - 1.3 Manufacturing of paver blocks by one of the approved suppliers as per requirements in technical specification enclosed.
 - 1.4 Supplying of paver blocks at site, including handling at both ends. The type of paver block may be interlocking or non-interlocking.
 - 1.5 Providing and laying 50 to 80 mm coarse sand bedding for laying blocks.
 - 1.6 Laying of paver blocks at site as per requirement in technical specification, within shortest possible time.
 - 1.7 Testing of paver blocks through reputed Govt. /Non Govt. Test house and submission of test results as per requirements in Technical Specifications. Client reserves the right to carryout test at random. Cost for such tests to be borne by contractor.
 - 1.8 The contractor shall guarantee that all material and components designed, fabricated, supplied and laid by him shall be free from any type of defect due to faulty material and/or workmanship/erection for a period of five year from the date of completion of work at individual sites. However, the contractor for five years shall render free maintenance.
- 2.0 **Technical Specifications:**
 - 2.1 **Paver Block Manufacturing Facilities:**
The Paver Block shall be made in factory with following minimum facilities:
Concrete Block making Machines:

The machine should be capable of producing high quality Paver Blocks by obtaining high level of compaction by application of hydraulic compaction and also by high intensity vibration to the moulds. The machine should have automatic control panel for uniformity in strength.

Concrete Batching & Mixing Plant: (Not essential)

The concrete Mix Design should be followed for each batch of materials. The concrete ingredient should be mixed in concrete Batching & Mixing plant with minimum capacity of 30 cum/hour. The plant should be equipped with automatic control panel for maintaining water cement ratio from batch to batch to obtain concrete of uniform quality and strength. The plant should be equipped with adequate mechanism for mechanized loading of raw materials into mixer and conveyor belt for transportation of concrete from mixer to concrete block making machine to maintain quality of wet cement.

Curing:

The factory should have well designed curing area to ensure adequate curing of paver blocks. Steam curing facility of the paver blocks is preferable.

Laboratory (Desirable but not essential) :

The factory should have the following:

Compression testing machine of adequate capacity.

Other tools and equipment for testing raw materials and paver blocks.

(1) Systematic record of test results of various paver blocks manufactured in the factory.

(2) Concrete Mix Design for various grade of concrete used for making of paver blocks.

2.2 Specifications for Coloured Paver Blocks:

Colour concrete paver blocks shall be manufactured as per attached specifications using approved colour Pigment of iron oxide of approved brand like Bayer, Tata etc. with minimum colour pigment of 3% by weight of cement. The colour shade shall be as selected by SRFDCL before commencement of the work. The job also includes providing 50 mm thick sand bedding to match the shade of the paver block.

The colour of the paver block shall be guaranteed against fading of colour for period of 12 months from the date of laying of the same at site.

All other technical specifications & Procedure for testing, laying & sampling of Colour pavers will be as per attachment.

2.3 Paver Block Characteristics:

The concrete pavers should have perpendicularities after release from the mould and the same should be retained until the laying.

The surface should be reasonably smooth and of anti skid and anti glare type.

The paver should have uniform chamfers to facilitate easy drainage surface run off.

The pavers should have uniform interlocking space of 2mm to 3mm to ensure compacted sand filling after vibration on the paver Surface.

The concrete mix design should be followed for each batch of materials separately and automatic batching plant is to be used to achieve uniformity in strength and quality.

The pavers shall be manufactured in Double layer only.

Skilled labour should be employed for laying blocks to ensure line and level of laying, desired shape of the surface and adequate compaction of the sand in the joints.

2.4 Paver Block Dimensions:

Thickness	60mm
Layers	Double layered, top layer minimum 8 to 10 mm
Shape	Irregular (Uniform Shape with no Hollow Or Cracks) / as per drawing
Chamfer	4mm to 6mm along top edges
Colour	Natural cement grey Colour without use of any pigment. For Colour pavers refer "specifications for Colour pavers"
Dimensional Tolerance	(+/-) 2mm for length & width, (+/-) 3mm for Height (Thickness)

2.5 Testing of Paver Blocks:

SR. NO.	* TEST	SPECIFICATION Average Values (Average of Minimum Five Samples/Site)
1.	Compressive Strength	Min. 30 N/Sq.mm & 20 N/Sq.mm for 60mm thick and Min. 40 N/Sq.mm for 80mm thick
2.	Flexural Strength	Minimum 3.80 N/Sq.mm (M-30), 3.00 N/Sq.mm (M-20) and 4.5 N/ Sq. mm for 60 and 80 mm thick paver block respectively.

3.	Abrasion Resistance	Maximum 1.5
4.	Water Absorption	Maximum 5.80%
5.	Minimum Cement Content	340 Kg/Cum for M 20 concrete 380 Kg/Cum for M 30 concrete and 430 Kg/Cum for M 40 concrete

* Sampling and testing procedure as per enclosed specifications

3.0 Sampling & Testing Procedures for Paver Blocks:

3.1 Sample Size:

INTERNAL – Average of minimum 3 samples per 10000 Blocks for compressive strength and water absorption.

EXTERNAL – Minimum 2 Blocks per 10000 blocks for abrasion and flexure.

3.2 Sampling For Testing: Sampling for testing of paver blocks shall be done in accordance with Appendix-A.

Compressive Strength: Testing for compressive strength shall be undertaken in accordance with Appendix-B. The average compressive strength of the blocks tested shall be 30/40 N/Sq.mm as per thickness.

Abrasion Resistance: Testing for abrasion shall be in accordance with IS 1237 (Specifications for Cement Concrete Floor Tiles).

Flexural Strength: Testing for flexural shall be in accordance with IS 1237 (Specifications for Cement Concrete Floor Tiles).

Water Absorption: Testing for water absorption shall be in accordance with IS 2185:1979: Part I (Specifications for Concrete Masonry Units).

APPENDIX A

Method of sampling: Before laying paver blocks, each designated section comprising not more than 10000 blocks, shall be divided into five approximately equal groups. One block shall be drawn from each group i.e. 3 for internal testing and 2 for external testing.

Marking and identification: All samples shall be clearly marked at the time of sampling in such a way that the designated sections of part thereof, and the consignment represented by the sample, are clearly defined.

The sample shall be dispatched to the approved test laboratory taking precaution to avoid damage to the paving in transit. Protect the paving from damage and contamination until they have been tested. The testing shall be carried as soon as possible, after the sample has been taken. As soon as practicable after sampling. The samples shall be stored in water at 20 degree C $\pm$ 5 degree C for 24 hours prior to testing.

APPENDIX B

Test For Compressive Strength:

Testing Machine: The testing machine shall be of suitable capacity for the test and capable of applying the load of the rate specified. It shall comply, as regards repeatability and accuracy, with the requirements of clause 2.1 of BS: 1881-Part 4.

Procedure: The sample specimen shall be tested in a wet condition after being stored for at least 24 hours in water maintained at a temperature of 20 °C + or – 5 °C. Before the specimens are submerged in water, the necessary area shall be determined.

The plates for testing machines shall be wiped clean and any loose grit or other material removed from the contact faces of the specimen. Plywood, nominally 4 mm thick shall be used as packing between the upper and lower faces of the specimen and the machine plates and these boards shall be larger than the specimen by the margin of at least 5 mm at all points. Fresh Packing shall be used for every specimen tested.

The specimen shall be placed in the machine with the wearing surface in the horizontal plane and in such a way that the axes of the specimen are aligned with those of the machine plates.

The load shall be applied without shock and increased continuously at the rate of approximately 15 N/ Sq.mm per minute until no greater load can be sustained. The maximum load applied to the specimen shall be recorded.

Calculation of corrected strength for individual Blocks: The compressive strength of each block specimen shall be calculated by dividing the maximum load by full cross section area of the block and multiplying with an appropriate factor of:-

a) For 100 mm thick blocks – 1.24

b) For 80 mm thick blocks – 1.18

c) For 60 mm thick blocks – 1.06

Compressive Strength Calculation: The average corrected compressive strength for the designed block section shall be calculated.

4.0 Method of laying:

Blocks shall be placed on the sand bedding etc. which were well rammed so as to act as firm bed. Blocks shall be laid in such manner that no gap shall be left in between. Blocks so laid shall be compacted by means of mechanical compactor or equivalent compacting method so as to obtain

required finished surface. All the joints shall be matched and if any manufacturing defect is detected the lot shall be replaced and relaying shall be done with out any extra cost up to satisfaction of Engineer in charge.

Measurement and payment shall be on Square meter basis.

50 mm thick coarse sand shall be laid as cushioning layer for arranging the paver blocks. Joints of the paver blocks shall be filled with the sand.

The paver blocks shall be laid properly on the prepared sub-base as per manufacturer's specification and as per Architect and Engineer-in-charge's instruction.

Paver block shall be laid by the approved agency only. If manufacturer of the paver block providing the laying services, then it shall be laid through the supplying agency only. The laborers for paver block fixing shall be skilled flooring mason only. Only cutting tool shall be used for cutting the paver block. Full depth cutting toll shall be used for proper finished surface after cutting. Manual cutting or breaking of the paver block is not permitted.

After laying of the paver block fine sand shall be spread over it and paver block shall be compacted with mechanical compactor. Any settlement or undulation in the laid area shall be repaired immediately.

5.0 Mode of Measurement and payment:

Measurement will be done in sqmt of the actual area laid.

ITEM NO-42

Providing and laying 600mm x 600 mm vitrified tiles of required surface (Matt, Satin, Glossy, Non skid, Rustic) and shade as per design in floor with residue and skirting of desired colors and size of first quality over a minimum 20 mm. thick cement mortar 1:3 bedding on 40 mm wired finish screed 1:2:4 and laid to proper slope and level. Finishing to be done with flush pointing in white cement and approved pigment including curing and cleaning with mild oxalic acid etc. complete as directed by Engineer-in-charge.

1.0 Material

1.1 Vitrified Tile

1.1.1 Vitrified Tile shall conform to M-36.

1.2 Cement Mortar

1.2.1 Cement Mortar shall conform to M-11.

1.3 Water

1.3.1 Water shall conform to M-1

1.4 Cementitious Grout

1.4.1 Cementitious Grout shall conform to M-38A.

2.0 Workmanship

2.1 Relevant specifications of clause no. 11.15.4, 11.15.5 to be followed except vitrified tile is to be used instead of ceramic tile.

2.2 Once the laying of flooring gets completed, it shall be covered with LDPE sheet and above it POP of 12 to 15 mm thickness OR other alternative of protecting the floor by using readymade available sheet as approved. Flooring shall be open only when area is ready for occupation. Newspaper below POP should not be used to avoid stains of printing ink of the newspaper on the tile.

2.3 Groove of (3mm to 5mm wide) using PVC spacer of approved make and filling in groove is to be done with cementitious grout of BAL or equivalent matching shade as per manufacture's specification. On completion of the work the cleaning shall be done properly to have a neat finished surface.

2.4 The grouting material shall be filled when the grooves are completely dry and only after proper cleaning of grooves which are to be grouted. On completion of the work the cleaning shall be done properly to have a neat finished surface

3.0 Mode of Measurement and Payment

3.1 CPWD specifications clause no. 11.15.6, 11.15.7 to be followed except vitrified tile is to be used all colors, all patterns and item shall be measured and paid in sq.mt.

3.2 Rate is inclusive of finishing and filling the groove as per sample approved with PVC spacer, grouting with polymer based cementitious grout as per manufacture's specification.

3.3 The rate shall include for fixing the flooring in composite pattern as per the drawings, using different

materials and sizes. The measurements of the different materials shall be taken category-wise separately and paid accordingly.

Item No. 43

Providing & laying machined cut/ hand cut natural rough finish 25 to 30 mm Red Mandana Stone of approved quality, selected and sorted for uniform color & texture, in external work, pavement, pathway, tread, riser, ramp etc as per drawings of size up to 900mm in any shape, any pattern. Red Mandana stone is to be laid over cement mortar 1:6 bedding of average 20 mm thickness with joints, pointing with cement mortar and matching pigment and finishing including curing and cleaning with wire brush to remove excess cement on the sides of stone, chamfering of exposed edges having polishing etc complete as directed by engineer in charge.

1.0 Material

1.1 Red Mandana Stone

1.1.1 Red Mandana stone shall conform to M-48.

1.2 Cement Mortar

1.2.1 Cement Mortar shall conform to M-11.

2.0 Workmanship

Stone shall be laid on 37 mm thick bedding of cement mortar 1:3. Sample shall be approved by Architect and engineer-in-charge. Acid-alkali proof powder shall be mixed with cement as per the manufacturer's specifications to prepare the cement mortar 1:3 for bedding. The stones of desired size shall be laid on the mortar bed of average thickness 37 mm. for flooring and 15-20 mm for dado/skirting, in proper line and level with joints of even thickness of 6 to 8 mm. all around. The joints shall be raked to 10 to 12 mm deep and filled with epoxy-basin resin.

3.0 Mode of Measurement and Payment

The Mode of measurement and rate shall be for Sq. Meter basis.

Item No. 44

Providing & laying approved quality machine cut mirror polished/flare finish (river wash) granite of approved shade, thickness 18-20 mm., in Basin top, floor, otta, sill, skirting, dado etc. in required sizes and shapes, including average 45 mm thick cement mortar bedding in 1:3 laid and jointed with white cement and matching pigment including rubbing, re-polishing after fixing to remove any undulation between the joints (if required) with different grades of Emery, refilling of open joints, curing, daily cleaning and mopping, as directed for at least 15 days or up to the satisfaction of the EIC (Only finished work will be measured.)

1.0 Material

1.1 Granite Stone

1.1.1 Granite stone shall conform to M-47.

2.0 Workmanship

2.1 For dressing Nabhi's commentary on CPWD specifications clause no. 11.20.2 shall be followed

2.1 For laying and preparation of surface Nabhi's commentary on CPWD specifications clause no. 11.20.3 shall be followed except average thickness of CM shall be 35mm to 50 mm, cement mortar shall be 1:6 (1 cement : 6 sand) used.

2.2 While laying any chiseling which may be required for making the skirting or dado flush with the plaster and/or other finishes shall be done. Necessary grooves of required size in cm. between plaster and/or other finishes, dado or skirting (if required) shall be provided. Forming machine-cut/rounded edges, gutters, sills, platforms, channels, curbing, etc. if any, if required, shall be provided as per the drawing and design.

2.3 In places where full tiles cannot be fixed, the tiles shall be cut to the size and smoothened at edge to give straight and true joints.

2.4 All necessary slopes, gradients and levels shall be truly maintained as required and directed by the Architect and Engineer-in-charge.

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

2.6 Polishing shall be normally commenced after 14 days of laying the slab. For special polish polishing to be done with 2 coats of 60, 120 grades of emery, balckchapadi and gutka. For semi mirror polish polishing to be done with 220, 320, 400, 600 grades of emery. Water shall be properly used during polishing. The flooring shall then be washed clean with oxalic acid. Daily moping for 15 days shall be done after polishing or up to the satisfaction of client and

- engineer-in-charge. All works shall be carried out as directed by the Architect and as specified in the item, no waxing will be permitted.
- 2.7 If any tile is disturbed or damaged it shall be refitted or replaced, properly jointed and polished.
- 2.9 The holes required for Nahni traps, pipes any other fittings shall be made without any extra cost.
- 4.0 Mode of Measurement and Payment**
- 3.1 Granite stone slab flooring shall be measured in m² for visible area of work done. Length and breadth shall be measured correct to a cm before laying skirting, dado or plaster.
- 3.2 No deductions shall be made or extra paid for any opening in the floor area upto 0.1 m². Nothing extra shall be paid for use of cut tiles or for laying the floors at different levels in the same room or courtyard. Kota slabs laid in floor boarders and bands etc. shall be measured in the same item and nothing extra shall be payable on account of these or similar bands formed of half or multiples of half size standard tiles/or other uncut tiles.
- 3.11 The treads of stairs and steps paved with tiles without nosing shall also be measured under this item.
- 3.12 The rate shall include the cost of all materials (inclusive of all taxes, levies, and delivery at site), labour & sundry involved in all the operations, at all floors, at any height and level, as described above. It shall also include for breakage and wastage. Floating materials and margin of profit shall also be included. All material samples shall be approved by the Architect/Engineer-in-charge before placing orders.
- 3.13 No extra shall be paid for any small quantities like narrow widths, mitred & returned ends, rounds & cutting, fixing and making good upto & around pipes, fittings and fixtures etc.
- 3.14 The rate shall include for fixing the flooring in composite pattern as per the drawings, using different materials and sizes. The measurements of the different materials shall be taken category-wise separately and paid accordingly.
- 3.15 The basic rate, if at all provided or agreed upon includes cost of material, all taxes, levies & cost of delivery at site.
- 3.16 The risers of steps, skirting or dado shall be measured in m². Length shall be measured along the finished faces of risers, skirting or dado. Height shall be measured from finished level of treads or floor to top. Lining of pillars shall be measured under this item.
- 3.17 The rate shall be for a unit of one m²

ITEM NO-45

Providing & laying broken china mosaic flooring, comprising of 12 to 20 mm. size broken pieces of glazed/ ceramic tiles (one or more in colours as suggested by Architect), laid over cement mortar 1:3 (1 cement: 3 coarse sand), with joints not exceeding 5 mm, including filling the gaps with ordinary cement mixture & mixing with synthetic polyester fibre, triangular in shape having specific gravity of 1.34 to 1.40, cross section size ranging from 10 to 40 micron & length upto 6 mm, mixing fibre @ 125 grams per 50 kg of cement in cement mortar, including providing and mixing water proofing material in mortar @ 1 kg per 50 kg of cement on terrace and fillet area, including rounding of the junctions and extending them upto 15 cm. along the parapet wall. The rate shall include any type of bands, vata, any colour, any pattern or design as per drawing, curing, cleaning with water and oxalic acid etc. complete as sample approved by Architect/ EIC. (Only plan area shall be measured and paid). Rates should be inclusive of acid washing and vata.

1.0 Material

- 1.1 Cement Mortar shall conform to M-11.
- 1.2 China Mosaic shall conform to M-42.
- 1.3 White cement shall conform to IS: 8042.

2.0 Workmanship

- 2.1 The relevant specifications of item no. 9.09.a shall be followed except the china mosaic is to be fixed on walls with 1:2 cement sand mortar of average 6 mm thickness over 12 to 15 mm thick wired finish plaster in cement mortar 1:4 (1 cement: 4 coarse sand) including applying a cement slurry at 2.75 Kg per sqm on the plastered surface. The dado shall be tampered to bring the mortar on the surface.
- 2.2 Relevant specification of 7.02.b shall be followed for wired finish plaster.

3.0 Mode of measurement and Payment

- 3.1 The rate shall be for a unit of one sq.mt. Length and height shall be measured correct to a cm and its area shall be calculated in sq.mt correct to two places of decimals. The rate of white cement is included in the item even if grey cement is supplied by the client. The rate is inclusive of bands if different color is used in any pattern or design as per drawing and direction, curing, scaffolding, cleaning with water etc. complete as directed by the engineer-in-charge.

ITEM NO-46

Providing and fixing Modular Concrete Cobble block in different sizes with 60mm thickness, in required finish, grey/ coloured, of Vyara (Beganit) make or equivalent as per design. Top coat/ wear coat (not less than 5mm) shall have using UV resistant colour pigments from Lanxess, compressive strength 400kg/ cm². Including providing and laying 50 to 80 mm thick average bedding layer of coarse sand below cobble block as per required grading and specification. Laid cobble block shall be mechanically compacted. Cutting of paver block by machine cut only and laying to be done by skilled flooring mason. cobbles shall be compacted and shall be re-laid if necessary. Sample to be approved by the Architect & Engineer-in-charge.

All clauses given under CPWD specifications clause 8.8 and 11.31 shall apply except concrete cobble square 60mm thick stone blasted finish will be used instead of granite stone. All cobble work shall average 50 mm coarse sand bedding over compacted sub-base (in required slope and of specified thickness). Sample to be approved by the Architect & Engineer-in-charge. Rate shall be exclusive of sub-base.

50 mm thick coarse sand shall be laid as cushioning layer for arranging the blocks. Joints of the blocks shall be filled with the sand. The blocks shall be laid properly on the prepared sub-base as per manufacturer's specification and as per Architect and Engineer-in-charge's instruction.

Cobble shall be in modular sizes, top layer/ wear layer (not less than 5mm) made of using UV resistant colour pigments from Lanxess & Premier Shield integral and topcoat treatment for satin finish, water and oil repellence, reduction of algae, moss and efflorescence.

The rate shall be for a unit of one **Sqm.**

ITEM NO-47

Structural steel work in riveted, bolted or welded in built up sections, trusses and framed work including supplying, fabricating, cutting, assembling, hoisting and fixing in position at all heights of all shapes and size with all leads and lifts . It should be including necessary rolled joists, channels, angles, tees, flats, angle cleats, gusset plates, position hip and jack lifters, purling, etc. including cutting and welding the members as per detailed drawing and design. The rate shall include dry sanding, degreasing (wet cleaning) & preparation of rust free surface manually or mechanically, metal putty to make the surface even and smooth, 1 coat of PU primer and 2 coats of PU Painting Etc. complete

a) Material**1.1 Structural steel**

1.2.1 Structural Steel shall conform to M-60.

b) Workmanship**2.1 Laying Out**

2.1.1 CPWD specifications clause no. 10.3.1 shall be followed.

1.0 Preparation of Surface

2.2.1 Surfaces which are to be welded together shall be free from loose mill scale, rust paint, grease or foreign matters. A coating of linseed oil shall be permitted.

f) Fabrication

g) CPWD specifications clause no. 10.3.2, 10.4.2.1, 10.4.2.2, 10.4.2.3 10.4.2.4, 10.4.2.5, 10.4.2.6 shall be followed.

h) Erection

i) CPWD specifications clause no. 10.3.3, 10.4.2.7 shall be followed. Grouting shall be done with cement mortar 1:3 (1 cement: 3 coarse sand) or non shrink free flow cement grout of approved make as per manufacture's specification as directed by engineer-in-charge.

j) Precautions

2.4.1 CPWD specifications clause no. 10.4.2.3 shall be followed.

2.4.2 The following points shall be borne in mind during the process of welding

(a) Welds shall be made in flat position wherever practicable.

- (b) Arc length, voltage and amperage shall be suited to the thickness of material, type of groove and other circumstances of the work.
- (c) The segments of welding shall be such that where possible, the members which offer the greatest resistance to compression are welded first.
- (d) Proper care shall be taken while welding, for shrinkage and distortions, as the drawing dimensions are the finished dimensions of the structure.
- (e) Cutting of plates shall be profile cut.
- (f) Welding rod shall be of Ishab Corporation or equivalent.
- (g) The drilling is to be done with drill or magnetic drill.

- 2.4.3 The defective welds which shall be considered harmful to the strength shall cut out and rewelded.
- 2.4.4 Finished welds and adjacent part shall be protected with clean boiled linseed oil and after all slag has been removed welds and adjacent parts shall be painted after the same are approved.
- 2.4.5 All the members shall be thoroughly cleaned of rust, cakes, dust etc. and given a priming coat of zinc chromate red oxide before fixing them in position. All fabricated members shall be suitably packed to be protected from any damage while transportation, if any.
- 2.4.6 Grinding to the finished level is to be done, if directed by Engineer in charge. All exposed weld shall be ground smooth. Welds which have not been ground shall be scrubbed with a 10% solution of Hydrochloric acid which shall be washed off with water before painting unless alkali resistant paint is used.
- 2.4.7 The following checking and inspection shall be carried out before, during and after erection :
- Damages during transportation
 - Accuracy of alignment of structures
 - Erection according to drawings and relevant specifications
 - Progress and workmanship

2.5 Painting

- 2.5.1 CPWD specification clause no. 10.2.2 shall be followed except paint shall be as per Item description.
- 2.5.2 First priming coat of zinc chromate yellow oxide is to be applied on the fresh steel arrived at site.
- 2.5.3 Once the cutting, fabrication, grinding work gets completed second coat of primer and first coat of enamel paint is to be applied on the priming coat.
- 2.5.4 After paint has been already dried erection is done as specified in the item or as directed by engineer-in-charge.
- 2.5.5 After the erection final coat or second coat of paint is to be applied on the structural steel.

3.0 Mode of Measurement and Payment

- 3.1 For Riveted and bolted sections CPWD specification clause no. 10.3.5, 10.3.6, 10.4.3 shall be followed except in case of skew cut if the balance material is used at other place, same shall be deducted from quantity of skew cut i.e. **Used wastage from skew cuts shall be deducted from its quantity and shall not be paid in skew cut.**
- 3.2 The weight of steel plates, sections and strips shall be taken from relevant IS Codes, based on 7.85 kg/m² for every mm. sheet thickness, if steel is supplied by the Contractor, otherwise, the weight shall be calculated on the actual weight basis on which steel is supplied to the Contractor by the Client. If the steel is supplied by the client, testing & checking as per relevant IS code, recording and intimation of quality of steel (to client and consultant) shall be sole responsibility of the contractor.
- 3.3 For forged steel and steel castings, weight shall be calculated on the basis of 7850 kg/m³.
- 3.4 Rolling Margin and wastage shall not be considered when weight is determined by standard weight on the basis of IS codes.
- 3.5 The rate includes cost of all material, labor involved in all operations as described above like erection, hoisting, scaffolding, painting as specified in item description, safety measures and sundry required for proper completion of the item of work, at all heights, all shapes and all places. This shall also include conveyance and delivery, handling, loading, unloading and storing etc. required for completion the item described above including necessary wastage involved.
- 3.6 The rate shall be for an unit of one Kg.

ITEM NO-48

Providing, Fabricating and fixing SS hand rail / railing, gratings, ladder, corner guard of 304 grade made out of round pipes, square or rectangle sections, angle, plate, flatinsatin/brushfinish including supporting fittings made out of SS304 grade solid rods ,flanges, compatible SS anchor fastener (mechanicalorchemical) of Hilti or as per approved make as per manufacturer' s specifications, SS connecting bolts of required size with washers, SS base plate, lath work, argon arc welding,buffing, bending and bends as per the detail drawing with best (high) quality finish & as per the a sample approved by Architect and as directed by engineer-in-charge. Rate shall be inclusive of all material, labour wastage and for all floors/ all levels/ all heights. Railings hall be measured in KG & paid accordingly. Actual consumable length of member shall be measured and no extra shall be paid for consumable fasteners..

1.0 Material

- 1.1 Stainless steel SS 304 grade of approved make shall be used.

2.0 Workmanship

- 2.1 Clean debris and dust from surfaces and embed holes thoroughly prior to installation. Prepare surfaces using the methods recommended by the manufacturer for achieving proper results given the substrate and project conditions.
- 2.2 Installation of the railing is to be done as per manufacture's specification. If required argon arc welding for joints, L & key joints as approved, polishing, CNC cutting is to be done. The railing should be in true line and level. Area where railing to be fixed should be cleared and neat workmanship manner.

3.0 Mode of Measurement and Payment

- 3.1 The item shall be measured and paid in Kg of steel. Rate shall be inclusive of protecting the Railing until handing over to client.

ITEM NO-49

Providing and fixing dustbins of structural steel work in sections and frame work at all heights and all shapes and size with all leads and lifts .Item includes supplying,fabricating,assembling, cutting and welding the members as per detailed drawing and design.complete as per the direction of engg. Incharge.(only for dustbin),One coat of PU primer and 2 coats of PU Painting Etc. complete

This item includes Providing and fixing dustbins of structural steel work in sections and frame work at all heights and all shapes and size with all leads and lifts .Item includes supplying,fabricating,assembling, cutting and welding the members as per detailed drawing and design.The rate shall include sand blasting, degreasing (wet cleaning) & preparation of rust free surface manually or mechanically, metal putty to make the surface even and smooth, 1 coat of epoxy primer of 50 to 60 micron DFT (dry film thickness) and 2 top coats of Metal PU Paint of having DFT 40 to 50 micron of approved shade of MRF or equivalent paint as per manufacture's specification over all the surfaces of the steel sections or as specified in the drawing.Rate shall be inclusive of cutting, wastage, welding, bending (shop at site), and bolting wherever necessary, in position welding of required length, anchor fastner for fixing, grinding, finishing edges, and filling the welded spots with metal putty. complete as per the direction of engg. Incharge.(only for dustbin)

The Mode of measurement and rate shall be given as per Kg. Workmanship shall be as per Item No. 44

ITEM NO-50

Supplying, drilling hole and injecting grouting chemical with the help of dispenser, into a hole of dia. and depth as per manufacture/ structural consultant's specification and fixing rebar of the required diameter subsequently. Fixing methodology shall be followed as per manufacturer's guidelines. Steel will be paid under relevant item. Manufacturer to submit Rebar Depth Calculation based on design loads and other parameters as provided by consultant and in accordance with EOTA-TR-023/029 "guidelines for post installed rebar

connections" for approval. Rate shall be inclusive of all material, labour, necessary scaffolding etc. complete for all height as directed by EIC.

- (A) 10 mm dia. and 125 mm depth
- (B) 12 mm dia. and 180 mm depth
- (C) 16 mm dia. and 240 mm depth
- (D) 20 mm dia. and 300 mm depth
- (E) 25 mm dia. and 375 mm depth

Chemical anchor shall be of approved make. The item shall be executed as per manufacturer's specification. Item shall be executed as directed by engineer in charge, not executed for installation tender item i.e. stair railing, doors windows, etc.

Rate shall be for unit of one No.

ITEM No-51

Only Labour charges for fixing/ repairing of existing Structural steel like Seater back rest, ghat railing, cycle track railing or any steel structure with riveted, bolted or welded etc. completed. Rate includes all material, power supply and machinery required for fixing work.

Measurement will be done in Kg. of the actual working area based on standard weights. Workmanship shall be as per Item No. 44.

ITEM No-52

Providing and fixing chain link fencing/barbed wire G I fencing wherever required including structural steel framework and all fixing material, clamps, two coat oil paint colour with primer etc. with foundation of size 450 mm x 450mm x600 mm deep for vertical supports in cement concrete etc. complete as directed by engineer in charge. One coat of PU primer and 2 coats of PU Painting Etc. complete

This item includes providing and fixing chain link fencing/barbed wire fencing wherever required including structural steel framework and all fixing material, clamps etc. with foundation of vertical supports in cement concrete etc. complete as directed by engineer in charge.

The Mode of measurement and rate shall be given as per Kilogram basis.

Item No. 53

Providing and fixing decorative architectural weld mesh system using post size of 50 mm x 200 mm box with wire diameter of 4.50 mm to 5.00 mm Aesthetic appeal of these fence are greatly enhanced by pattern of wire, V-bend attractive colors and specials profile post use for fittings. fencing where ever required including structural steel framework and all fixing material, clamps etc. with foundation of vertical supports in cement concrete foundation size 450 mm x 450 mm x600 mm deep etc. complete as directed by engineer incharge

This item includes Providing and fixing decorative architectural weld mesh system using post size of 50 mm x 200 mm box with wire diameter of 4.50 mm to 5.00 mm Aesthetic appeal of these fence are greatly enhanced by pattern of wire, V-bend attractive colors and specials profile post use for fittings. fencing where ever required including structural steel framework and all fixing material, clamps etc. with foundation of vertical supports in cement concrete foundation size 450 mm x 450 mm x600 mm deep etc. complete as directed by engineer incharge

The Mode of measurement and rate shall be given as per Kilogram basis.

Item No. 54

Providing, supplying and fixing heavy duty GI anchor bolt for the fixing of MS railing, hand rail, light pole, display panel, bracket, other street furniture etc. with injection adhesive (chemical grouting) of HILTI / Fischer or equivalent as approved by the Engineer / Architect for fixing in wet/Dry conditions of following dia. The installation and the setting instructions should be strictly followed as per the manufacturer's recommendations. The rate shall include making required drilling hole, all labour, scaffolding and other incidentals necessary to complete the work as per the drawing and specification.

(a) 12 mm dia & 153 mm long

(b) 16 mm dia & 252 mm long

12.1 Material

12.1.1 Threaded anchor bolt of HILTI / Fischer or equivalent as approved by the architect / engineer, shall conform to relevant latest I.S. Codes, Specifications.

12.1.2 The chemical shall be urethane methacrylate resin (Vinylester urethane resin). Proportion of hardener & resin shall have ratio of 1:3.

12.2 Workmanship

12.2.1 The holes shall be drilled with a rotary percussive drill to ensure adequate size, depth of hole for require diameter of anchor bolt. Diamond core drills shall not be used without subsequent surface roughening. Holes shall be dry at the time of drilling.

12.2.2 The hole shall be cleaned with blower and brush to ensure no dust is present inside.

12.2.3 Start injecting chemical from the bottom/end of the hole to ensure complete filling. Some mortar should overflow upon inserting the rebar anchor bolt to show complete filling.

12.2.4 Allow for complete curing before applying any load.

12.2.5 Necessary scaffolding shall be provided by the Contractor.

12.2.6 All the anchor bolt shall be accurately placed in exact position shown on the drawings and shall be securely held in position.

12.3 Mode of Measurement & Payment.

12.3.1 Rate shall be for per number.

12.3.2 Rate shall include all labour, materials, tools, equipment, safeguards and incidentals necessary to complete the work.

ITEM NO-55

Providing and fixing Cast Iron cover and frame of any size including fixing at site with all required material and labour etc. complete as directed.

This item includes providing and fixing Cast Iron cover and frame of any size including fixing at site with all required material and labour etc. complete as directed.

The rate shall be for a unit of on Kg

ITEM NO-56

Providing and fixing in position, interlocking mechanical operated rolling shutter of approved make, of 18 gauge, 75mm wide cold rolled MS lath interlocked, including top cover, spring, axles, guide rails, tees, iron pulleys, bearings, handles, holding down bolts embedded in CC 1:2:4 including 1 coat of PU primer and 2 coats of PU paint of approved make and shade, etc. as directed by engineer in charge. (Measurements considered for payments shall be clear size of opening plus guide channels on both the sides for width and 450mm on top for drum height).

Rolling Shutters

CPWD specification clause no. 10.1.1 shall be followed

1. The rolling shutters shall conform to IS: 6248. Rolling shutters shall be supplied of specified type, with accessories. The size of the rolling shutters shall be as specified in the drawings. The shutters shall be constructed with interlocking lath sections formed from cold rolled steel strips not less than 0.9 mm.. thick and 80 mm. wide, for shutters upto 3.5 m. width and not less than 1.25 mm. thick and 80 mm. wide, for shutters 3.5 m. in width and above, unless otherwise specified. 61.2 Guide channels

shall be of mild steel, deep channel section and roll pressed or built-up (fabricated), with joint less construction. The thickness of the sheet used shall not be less than 3.15 mm.

2. Hood covers shall be made of MS sheets, not less than 0.90 mm. thick. For shutters having width of 3.5 m. and above, the thickness of MS sheet for the hood cover shall be not less than 1.25 mm.
3. The spring shall be of best quality and shall be manufactured from tested high tensile spring steel wire or strip of adequate strength to balance the shutters in all positions. The spring pipe shaft etc. shall be supported on strong MS or malleable CI brackets. The brackets shall be fixed on or under the lintel as specified with rawlplugs and screws bolts, etc.
4. The rolling shutters shall be of self rolling upto 8 m². clear area, without ball bearing and upto 12 m². Clear area, with ball bearing. If the rolling shutters are of large area, then gear operated type shutters shall be used as per approved manufacturer's specifications.
5. The locking arrangement shall be provided at the bottom of shutter at both ends. The shutters shall be opened from outside.
6. The shutters shall be completed with door suspension shafts, locking arrangements, pulling hooks, handles and other accessories.

The rate shall be for a unit of on smt

ITEM NO-57

Providing and applying easy clean, washable interior 100% acrylic paint (Premium plastic paint) of approved make (first one coat with brush and final one coat with roller) like premium emulsion of Asian or easy clean Rangoli of Berger or as per approved make, color and shade dry interior plastered surface at an even shade, including preparing the surface even and sand papered smooth etc. complete as per the manufacture's specification and to the satisfaction of engineer in charge. The rate shall also include the coast of filler for cracks on the surfaces. Actual surface area shall be measured and considered without multiplying any coefficient for payment

- 1.0 **Materials:** Water shall conform to M-1 and acrylic paint shall conform to its supplier's specification
- 2.0 **Workmanship:**
 - 2.1 **General**
 - 2.1.1 **The materials required for work of painting work shall be obtained directly from approved manufacturers or approved dealer and brought to the site in maker's drums, cage etc. with seal unbroken.**
 - 2.1.2 All materials not in actual use shall be kept properly protected, lid of containers shall be kept closed and surface of paint in open or partially open containers covered with a thin layer of water to prevent formation of skin. The materials, which have become stale or flat due to improper and long storage shall not be used. The paint shall be stirred thoroughly in its container before pouring into small containers. While applying also, the paint shall be continuously stirred in smaller container. No left over paint shall be put back into stock tins when not in use. The paint shall be stirred thoroughly in its container before pouring into small containers.
 - 2.1.3 If for any reasons, thinning is necessary, water shall be added as per supplier's instructions
 - 2.1.4 The surface to be painted shall be thoroughly cleaned and dusted. All rust, dirt and grease shall be thoroughly removed before painting is started. No painting on exterior or other exposed parts of the work shall be carried out in wet, damp or otherwise unfavourable weather and all the surfaces shall be thoroughly dry before painting work is started.
 - 2.2 **Scaffolding:** The relevant specification in item 11.01.a para. 2.3 shall be followed.
 - 2.2.1 **Preparation of surface:** All unnecessary nails, hooks etc. shall be removed. Pitting in plaster shall be made good with plaster again and papered with a fine grade sand paper and made smooth. The surface affected by moulds,

moss, fungi, algae lichens, efflorescence etc. shall be treated in accordance with IS : 2395 (Part-1)-1966.

- 2.3 **Preparation of Mix:** This shall be done as per the manufacturer's instructions. The thinning of emulsion is to be done with water and not with turpentine. The quantity of thinner to be added to shall be as per manufacturer's instructions.
- 2.4 **Application:**
- 2.4.1 Before pouring into small containers for use of applying, the paint shall be stirred thoroughly in its container. Also, the paint shall be continuously stirred in the smaller container, so that its consistency is kept uniform.
- 2.4.2 The paint shall be laid on evenly and smoothly by means of crossing and laying off. The crossing and laying off consists of covering the area over with paint, brushing the surface hard for the first time over and then brushing alternately in opposite directions two or three times and then finally brushing lightly in direction at right angles to the same. In this process, no brush marks shall be left after the laying off is finished. The full process of crossing and laying off will constitute one coat. No hair marks from the brush or clogging of paint puddles in the corners of panels, angles of moldings etc. shall be left on the work.
- 2.4.3 On the newly plastered surface, the first coat shall be applied with 100% dilution and second and third coat shall be applied with 40 % dilution or as per the supplier's instructions. The second or subsequent coat shall not be started until the preceding coat has become sufficiently hard to resist marking of the brush being used.
- 2.5 **Precautions:**
- (a) Old brushes if they are to be used with paints, shall be completely dried of turpentine or oil paint by washing in warm soap water. Brushes shall be quickly washed in water immediately after use and shall be kept immersed in water during break periods to prevent the paint from hardening on the brush.
- (b) In the preparation of walls for plastic emulsion painting, no oil base putties shall be used in filling cracks, holes etc.
- (c) Splashes on floors etc. shall be cleaned out without delay, as they will be difficult to remove after hardening.
- (d) Washing of surfaces treated with emulsion paint shall not be done within 3 to 4 weeks of application.
- 2.6 **Protective measure:**
- The surface of doors, windows, ventilators, floors, of furniture etc. and such other parts of the building not to be white/colour washed shall be protected from being splashed upon. Such surfaces shall be cleaned of white/colour wash splashed, if any, immediately after completing the painting, at no extra cost.
- 3.0 **Mode of Measurements and Payment:**
- 3.1 The relevant specifications of item No. 11.01.a shall be followed.
- 3.2 The rate shall be for a unit of one m².

ITEM No-58

Providing & applying External 100% Acrylic Paint "Apex" of desired shed from Asian paint or equivalent in minimum three coats (first coat with external primer & balance two coat with apex or equivalent paint as per supplier's specification) with brush on exterior sand faced plastered surfaces / mala plastered surfaces with a minimum one coat of external cement based putty of Birla or equivalent at all heights / all floors / all heights & all places including scaffolding to give even shades including thoroughly brushing the surfaces free from mortar dropping and other foreign matter and sand papered smooth etc complete as per the manufacture's specification & to the satisfaction of Engineer in charge Newly plastered surfaces requires minimum three coats -first coat with exterior primer with 1 :1 ratio or as per supplier's specifications & balance coats with with 40% dilution). The rate shall also include the cost of filler for cracks on the surfaces.

Material

Acrylic paint shall conform to M-71.

Workmanship**General**

The materials required for work of painting work shall be obtained directly from approved manufacturers or approved dealer and brought to the site in maker's drums, cage etc. with seal unbroken.

All materials not in actual use shall be kept properly protected, lid of containers shall be kept closed and surface of paint in open or partially open containers covered with a thin layer of water to prevent formation of skin. The materials, which have become stale or flat due to improper and long storage, shall not be used. The paint shall be stirred thoroughly in its container before pouring into small containers. While applying also, the paint shall be continuously stirred in smaller container. No left over paint shall be put back into stock tins when not in use. The paint shall be stirred thoroughly in its container before pouring into small containers.

If for any reasons, thinning is necessary, water shall be added as per supplier's instructions.

The surface to be painted shall be thoroughly cleaned and dusted. All rust, dirt and grease shall be thoroughly removed before painting is started. No painting on exterior or other exposed parts of the work shall be carried out in wet, damp or otherwise unfavorable weather and all the surfaces shall be thoroughly dry before painting work is started.

Application

Before pouring into small containers for use of applying, the paint shall be stirred thoroughly in its container. Also, the paint shall be continuously stirred in the smaller container, so that its consistency is kept uniform.

The paint shall be laid on evenly and smoothly by means of crossing and laying off. The crossing and laying off consists of covering the area over with paint, brushing the surface hard for the first time over and then brushing alternately in opposite directions two or three times and then finally brushing lightly in direction at right angles to the same. In this process, no brush marks shall be left after the laying off is finished. The full process of crossing and laying off will constitute one coat. No hair marks from the brush or clogging of paint puddles in the corners of panels, angles of mouldings etc. shall be left on the work. On the newly plastered surface, the first coat shall be applied with 100% dilution or exterior grade primer second and third coat shall be applied with 40 % dilution or as per the supplier's instructions. The second or subsequent coat shall not be started until the preceding coat has become sufficiently hard to resist marking of the brush being used.

Precautions

- (a) Old brushes if they are to be used with emulsions paints, shall be completely dried of turpentine or oil paint by washing in warm soap water. Brushes shall be quickly washed in water immediately after use and shall be kept immersed in water during break periods to prevent the paint from hardening on the brush.
- (b) In the preparation of walls for plastic emulsion painting, no oil base putties shall be used in filling cracks, holes etc.
- (c) Splashes on floors etc. shall be cleaned out without delay as they will be difficult to remove after hardening.
- (d) Washing of surfaces treated with emulsion paint shall not be done within 3 to 4 weeks of application.
- (e) paint shall be applied in dry weather only. Paint shall be applied on dry plastered surface and if the surface becomes wet due to any reason first it shall be allowed to 100% dry as directed by EIC.
- (f) Wet surface shall be protected with plastic sheet or by convenient means before it gets dry in monsoon season.

Protective measures

The surface of doors, windows, ventilators, floors, furniture etc. and such other parts of the building not to be white/colour washed shall be protected from being splashed upon. Such surfaces shall be

cleaned of with white/colour wash splashed, if any, immediately after completing the painting, at no extra cost.

Mode of measurement and payment

The Mode of measurement and rate shall be given as per Sq. meter Basis.

ITEM NO-59

Painting two coats (excl. priming coat) on previously painted steel & other Metal surface with enamel paint to give an even shade incl. cleaning the surface of all dirt, dust and other foreign matter.

1.0 Materials : The enamel paint shall conform to M-44 B.

2.0 Workmanship :

2.1 General :

2.1.1 The materials required for work of painting work shall be obtained directly from approved manufacturers or approved dealer and brought to the site in maker's drums, kegs etc. with seal unbroken.

2.1.2 All materials not in actual use shall be kept properly protected, lids of containers shall be kept closed and surface of paint in open or partially open containers covered with a thin layer of turpentine to prevent formation of skin. The materials which have become stale or flat due to improper and long storage shall not be used. The paint shall be stirred thoroughly in its container before pouring into small containers. While applying also the paint shall be continuously stirred in smaller container. No left over paint shall be put back into stock tins. When not in use, the containers shall be kept properly closed.

2.1.3 If for any seasons, thinning is necessary, the brand of thinner recommended by the manufacturer shall be used.

2.1.4 The surface to be painted shall be thoroughly cleaned and dusted. All rust, dirt and grease shall be thoroughly removed before painting is started. No painting on exterior or other exposed parts of the work shall be carried out in wet, damp or otherwise unfavourable weather and all the surfaces shall be thoroughly dry before painting work is started.

2.2 Application :

1.1.1 Brushing operations are to be adjusted to the spreading capacity advised by the manufacture of particular paint. The paint shall be applied evenly and smoothly by means of crossing and laying off. The crossing and laying off consists of covering the area over with paint, brushing the surface hard for the first time over and then brushing alternately in opposite directions two or three times and then finally brushing lightly in direction at right angles to the same. In this process, no brush marks shall be left after the laying off is finished. The full process of crossing and laying off will constitute one coat.

1.1.2 Each coat shall be allowed to dry completely and lightly rubbed with very fine grade of sand paper and loose particles brushed off before next coat is applied. Each coat shall vary slightly in shade and shall be got approved from Engineer-in-charge before next coat is started.

1.1.3 Each coat except the last coat shall be lightly rubbed down with sand-paper of fine pumice stone and cleaned of dust before the next coat is applied. No hair marks from the brush or clogging of paint puddles in the corners of panels angles of mouldings etc. shall be left on the work.

1.1.4 special care shall be taken while painting over bolts, nuts, rivets, overlaps etc. Approved best quality brushes shall be used.

1.2 The relevant specifications mentioned above shall be followed for mode of measurements and payment. The rate is excluding priming coat.
The rate shall be for a unit of one sq. metre.

The relevant specifications mentioned above shall be followed except that painting shall be carried out in two coat with enamel paint on previously painted steel and metal surface.

ITEM No-60

Painting one coat on previously painted steel & other Metal surface like electric pole, railing, Back rest railing etc. with P.U. Paint to give an even shade incl. cleaning the surface of all dirt, dust and other foreign matter with applications of spray

This item includes painting one coat on previously painted steel & other Metal surface like electric pole, railing, back rest railing etc. with P.U. Paint to give an even shade incl. cleaning the surface of all dirt, dust and other foreign matter with applications of spray as directed by engineer in charge.

The Mode of measurement and rate shall be given as per Sq. meter basis.

ITEM No-61

Providing & applying Coal Tar Epoxy of approved make like Dr. Fixit, (Pidilite), Fosroc, clean coats, Sika, two component epoxy coating in two coats as per the mixing and application procedure suggested by manufacturer on the concrete surfaces. Coverage recommended is 3.0 – 4.0 m² Per ltr for two coat application at the coverage rate of approx. 250 - 300 micron DFT.

GENERAL

This Section covers the Work of chemically resistant coating to the surfaces of the RCC retaining wall.

APPLICATOR

Ensure that all Work is done by a competent applicator licensed and/or approved by the chemically resistant coating material manufacturer. Submit the manufacturer's certification of this approval.

PRODUCTS

Coating for Application on RCC Retaining wall surface

System Design – Epoxy Tar Based Coating

The coating shall be corrosion resistant coal tar epoxy coating with minimum of 50% solids content. The dry film thickness shall not be less than 200 microns per coat and should be applied in minimum two (2) coats. The cured film shall be tough and abrasion resistant.

The Contractor must follow the manufacturer's guidelines for the preparation of surfaces, for mixing and application of coating.

EXECUTION

General

The Contractor shall store the materials to protect them from damage.

Surface Preparation and Inspection

Clean surfaces of deleterious material in accordance with the manufacturer's recommended practice.

Prepare surfaces to be coated in accordance with manufacturer's instructions.

Verify the surfaces are dry. (ASTM D4263)

Have the coating manufacturer's authorized agent inspect surfaces to be coated and certify in writing to the Engineer-in-Charge that the surfaces are acceptable for the application of the coating. Do not apply the coating until written certification is received by the Engineer-in-Charge.

CONCRETE REPAIRS

Chip out damaged concrete to sound concrete. Repair rebar if damaged.

Clean concrete surfaces, dampen and hand place patching concrete in accordance with the pipe manufacturer's recommended practice. Wet cure immediately and as recommended by the manufacturer.

APPLICATION OF COATING

Conform to the coating manufacturer's instructions for application. Schedule the Work to allow

application to be performed in a manner that it conforms to the Manufacturer's recommendations.

Apply coating only when atmospheric conditions are suitable and as recommended by the Manufacturer.

Protection of coating

Protect the coating from damage. Allow to cure before further work or putting the coating into service.

Clean-up

Promptly, as the Work proceeds and upon completion, clean up and remove from the site, rubbish and surplus material resulting from the Work of this Section.

Mode of Measurements and Payments

The item shall be measured and paid in the unit of Sq.mt.

ITEM No-62

Providing and applying One coat of oil paint of Asian paints/Nerolac/Berger/Nippon/Indigo company on existing curb of previously painted of central Verge and foot path as directed

This item includes painting one coat on previously painted existing curb of previously painted of central Verge and foot path to give an even shade incl. cleaning the surface of all dirt, dust and other foreign matter with applications of spray as directed by engineer in charge.

The Mode of measurement and rate shall be given as per Sq. meter basis.

ITEM NO-63

Scraping/chipping of existing RCC structure up to 25 mm to 75 mm depth with all tools and tackles including finishing/rendering (with required proportion of grey and white cement and bonding agent of pidilite/ fosrock or equivalent) at any height including scaffolding, curing of the surface up to line and level etc. complete as per the direction of engg. In charge.

1 Workmanship

- 1.1 The item includes Scraping/chipping of existing RCC structure up to 25 mm to 75 mm depth with all tools and tackles including finishing/rendering (with required proportion of grey and white cement and bonding agent of pidilite/ fosrock or equivalent) at any height including scaffolding, curing of the surface up to line and level etc shall be as per approved sample as directed by engineer in charge.

2 Mode of measurement:

- 2.1 The rate shall be inclusive of labour, grooves, machinery cost.
- 2.2 The item shall be measured and paid in Sq.mt. (Square meter)

The Mode of measurement and rate shall be given as per one square meter basis.

Item No. 64

Dismantling existing plain or reinforced concrete by Vibration free cutting to shape and size for RCC wall, thickness may vary as per drawing using "Hydraulic Wall saw system or wire saw system " with complete mechanical, electrical and control system including site inspection, planning as per approved working method; executing work at site by authorized and trained applicator of the manufacturer of the above equipment, applicator guaranting successful execution of work, including all necessary tools and tackles; checking for safety of all working men and existing structures all complete as per direction of engineer-in-charge. The mode of measurement for Dismantling will be actual cross section of cut made by the hydraulic wall saw system.(Length x Thickness of piece which has been cut by blade).Rate shall also include lifting of concrete without effecting / disturbing the existing retaining wall and unloading the concrete piece within the range of 100mtrs from the cutting area as per directions of engineer in

charge. Minimum weight for lifting is 2.5 Ton.

Dismantling existing plain or reinforced concrete by Vibration free cutting to shape and size for RCC wall, thickness may vary as per drawing using “Hydraulic Wall saw system or wire saw system ” with complete mechanical, electrical and control system including site inspection, planning as per approved working method; executing work at site by authorized and trained applicator of the manufacturer of the above equipment, applicator guarantying successful execution of work, including all necessary tools and tackles; checking for safety of all working men and existing structures all complete as per direction of engineer-in-charge. The mode of measurement for Dismantling will be actual cross section of cut made by the hydraulic wall saw system.(Length x Thickness of piece which has been cut by blade).Rate shall also include lifting of concrete without effecting / disturbing the existing retaining wall and unloading the concrete piece within the range of 100mtrs from the cutting area as per directions of engineer in charge. Minimum weight for lifting is 2.5 Ton.

The Mode of measurement and rate shall be given as per Sqmt meter basis.

Item No. 65

Supply of Fuji Silver tech or equivalent approved make Precast Boundary Wall units of height as per drawing. Product should be confirming to IS requirements, by using advanced precast technology having High Performance Self Compacting Concrete of M-40 grade cylinder strength / M-50 cube strength and using Fe 500D reinforcement bar. The product should have flange coupling jointing arrangements, one each at bottom & both the side walls, at appropriate location for shear connection between two units. The Precast boundary wall should have special provisions at appropriate location for mechanical installation. The rate is including supply, transportation, loading, unloading and installing at site. The rate is inclusive of labor and machinery required for installation, average 10 mm thick dry cement mortar (CM 1:6) but excluding the plain cement concrete (PCC) M-15 Grade foundation and excavation The cost of M15 Grade PCC and Excavation for foundation shall be paid in relevant tender item.

a) 1800 mm height

b) 2000 mm height

Materials should be of best quality confirming to IS requirements of FUJI Silvertch Concrete Pvt Ltd or as per approved make. Cement should be OPC grade 53 or the grade as specified by manufacturer and as per relevant material specifications mentioned in M-3. Steel used shall be Fe 500 TMT confirming to relevant material specifications M-17 and IS Codes. Water should be confirming to material specifications mentioned in M-1. Chemicals used should be of BASF or as specified by manufacturer.

2.0 Workmanship

Relevant manufacturer's specifications shall be followed.

3.0 Mode of measurement:

3.1 The rate is including supply, transportation, loading, unloading and installing at site. The rate is inclusive of labor and machinery required for installation.

3.2 The Mode of measurement and rate shall be given as per one Running meter basi

ITEM No-66

Providing & fixing precast wall (50 mm thick) as directed by engineer in charge.

2.0 Workmanship

Precast Reinforced Concrete Wall Panel

Panel Thickness 50 mm , OPC 53 Grade or PPC conforming to applicable standards, Smooth mould finish, fair-face, textured, or architectural finish as specified

The Mode of measurement and rate shall be given as per Sq. meter basis.

ITEM NO-67

WATER SUPPLY PIPING

Providing, fixing, testing & commissioning of CPVC SDR-13.5 pipes & fittings according to ASTM D-2846 with solvent weld socket joints and necessary fittings of brass threaded such as socket, elbows, bends, tees etc. The work shall include cutting jointing & hydraulic testing the joints & pipes for as mention in the specification etc. making holes including chasing in solid block masonry walls with groove cutting machine to required width and depth, making holes in wall as applicable clearing the debris, grouting of concealed pipes, making good the chase by using 1:3 cement mortar, brackets / support for fixing pipes and making good the wall and floors to satisfaction of engr / arch with proper care, protecting fittings & pipes till the final handing over etc as directed by E-I-C complete as per specifications

- (a) 20mm
- (b) 25mm
- (c) 32 mm
- (d) 40 mm
- (e) 50 mm

1.0 Materials:

Pipe (CTS)	Temperature (° C)	Pressure rating (Kg/cm ²)
SDR 13.5	23	22.50
	82	5.6

The make of pipe to be adopted shall be from approved make list and as approved by the Architect / Engineer-in-charge. The pressure rating at different temperatures shall be as follows:

Pipe: CPVC shall be manufactured from specialty plastic compounds known as post-chlorinated polyvinyl chloride (CPVC).

Pipe shall meet or exceed the requirements of ASTM F441 in Schedule 40 and 80 dimensions. Available in size range 1/2"-12".

Fittings: Fittings shall meet or exceed the requirements of ASTM F437 (Schedule 80 threaded) or ASTM F439 (Schedule 80 socket). Available in size range 1/2"-12". Brass or gunmetal fittings shall be heavy quality, of approved manufacturer & pattern with screwed or flanged ends as specified. The standard size of brass or gunmetal fittings shall be designated by the nominal bore of the pipe outlet to which the fittings are to be attached.

Prime/Solvent Cement: All socket type joints shall be made up employing primers and solvent cements that meet or exceed the requirements of ASTM F656 and ASTM F493 respectively. The standard practice for safe handling of prime and cement shall be in accordance with ASTM F402. Both primer and solvent cement shall conform with the requirements of NSF Standard 14. Only CPVC primer and solvent cement joints.

Marking and Uniformity: Pipe and fittings made from CPVC compounds shall be clearly marked with the manufacturer's name or trademark, material designation, applicable ASTM Standard, and the NSF seal for potable water use.

System Design: System design shall be in accordance with standard industry practice for thermoplastic industrial piping systems and shall take into consideration such factors as pressure and shall take into consideration such factors as pressure and flow requirements, friction loss, operating temperatures, support spacing, anchoring, bracing and thrust blocking, temperature correction factors, joining methods, chemical environment, collapse and loading and thermal expansion and contraction.

2.0 Workmanship:

Chases: Chases of size 75 mm x 75 mm shall be cut in the wall where ever required or as directed by chases cutting machine. After testing the pipe line the chases shall be filled with cement mortar 1:3 and surface made good to its original condition.

CUTTING AND JOINTING AND INSTALLATION OF CPVC PIPES & FITTINGS:

All CPVC pipes shall be laid and jointed as per manufacturer's specifications and relevant I.S codes. Solvent cement used shall confirm to ASTM 493 and jointing shall be carried out as per steps outlined in ASTM D-2846, joining of pipes and fittings. The no. of joints per litre of cement solvent by pipe size is given in the table below:

Dia. of Pipe	Appr. No of joints
½"	1200
¾ "	750
1"	500
1 ¼"	450
1 ½"	325
2"	225

- i. **CUTTING:** In order to make a proper and neat joint, the pipe length shall be measured accurately and make a small mark. Ensure that the pipe and fittings are size compatible. It shall be easily cut with a wheel type plastic pipe cutter or hacksaw blade. Cutting tubing as squarely as possible shall provide optimal bonding area within a joint.
- ii. **DEBURRING / BEVELING:** Burrs and filings shall prevent proper contact between tube and fitting during assembly and should be removed from the outside and inside of the pipe. A pocket knife or file shall be used for this purpose. A slight bevel on the end of the tubing shall ease the entry of the tubing into the fitting socket.
- iii. **FITTING PREPARATION:** Using a clean, dry rag, wipe dirt and moisture from the fitting sockets and tubing end. The tubing should make contact with the socket wall 1/3 to 2/3 of the way into the fitting socket.
- iv. **SOLVENT CEMENT APPLICATION:** Use only CPVC cement or an all – purpose cement conforming to ASTM -493 or joint failure may result. When making a joint, apply a heavy, even coat of cement to the pipe end. Use the same applicator without additional cement to apply a thin coat inside the fitting socket. Too much cement can cause clogged water ways.
- v. **ASSEMBLY:** Immediately insert the tubing into the fitting socket, rotate the tube ¼ to ½ turn while inserting. This motion will ensure and even distribution of cement within the joint. Properly align the fittings. Hold the assembly for approximately 10 seconds, allowing the joint to set-up.
- vi. **SET AND CURE TIMES:** Solvent cement set and cure times are a function of pipe size, temperature and relative humidity. Curing time is shorter for drier environments, smaller sizes and higher temperatures. It requires 10 to 20 minutes for perfect joint.
- vii. **CEMENTING:**

- Verify the cement is the same as the pipes and fittings being used.
- Check the temperature where the cementing will take place.
- Cement take longer time to set up in cold weather. Be sure to allow extra time for curing. Do not try to speed up the cure by artificial means – this could cause porosity and blisters in the cement film.
- Solvents evaporate faster in warm weather. Work quickly to avoid the cement setting up before the joint is assembled. Keep the cement as cool as possible. Try to stay out of direct sunlight.
- Keep the lid on cements, cleaner and primers when not in use. Evaporation of the solvent will affect the cement.
- Stir or shake cement before using.
- Use ¾" dauber on small diameter pipes, 1 ½" dauber up through 3" pipe, and a natural bristle brush, swab or roller ½ the pipe diameter on pipes 4" and up.
- Do not mix cleaner or primer with cement.
- Do not use thickened or lumpy cement. It should be like the consistency of syrup or honey.
- Do not handle joints immediately after assembly.
- Do not allow dauber to dry out.
- Maximum temperature allowable for CPVC pipe is 180° F.
- All colour cements, primers and cleaners will have a permanent stain. There is no known cleaning agent.
- Use according to the step outline in ASTM D – 2846, joining of pipe and fittings.

Testing the Joints:

After jointing, the pipes & the fittings shall be inspected under working conditions of pressure & flow. Any joint found leaking shall be redone & all leaking pipes removed & replaced without extra cost.

The pipe & fittings after they are laid shall be tested to a hydraulic pressure of 1.5 to 2 times working pressure or 10kg/sq.cm whichever is higher shall be adopted and maintained for 2 hours. The pipes shall be slowly & carefully charged with water allowing all air to escape & avoiding all shocks or water hammer. The draw off taps & stopcocks shall then be closed & specified hydraulic pressure applied gradually. Pressure gauge must be accurate & should be calibrated before the test. The test pump shall be stopped and the test pressure shall be maintained without loss for at least half an hour. The pipes & fitting shall be tested in sections as the work of laying proceeds, keeping the joints exposed for inspection during the testing.

Fixing: The entire pipe line shall be fixed in position as shown in the drawing or as directed by the Engineer-in charge. All pipes and fittings, which are to be concealed, shall be properly embedded in the wall etc. after being treated.

3.0

Mode of Measurement:

- a) The description of each item shall unless otherwise stated, shall be held to include wherever necessary, conveyance, delivery, handling, unloading, storing, fabricating, hoisting and execution.
- b) The length shall be measured on RM basis of the finished work. The length shall be taken along the centre line of the pipe and fittings. The pipes fixed to walls, ceiling, floors, etc., shall be measured and paid under this item.
- c) All the work shall be measured in decimal system as fixed in its place subject to tolerance given below, unless otherwise stated:
 - (i) Dimension shall be measured to the nearest 0.01 m.
 - (ii) Area shall be worked out to the nearest 0.01 m².
- d) All measurements of cutting shall unless otherwise stated, be held good to include the consequent wastage.
- e) In case of fitting of pipe of unequal bore, the largest bore shall be measured for the test.
- f) Testing of pipe lines, fittings and joints include for providing all plant and appliances necessary for obtaining access to the work to be tested and carrying out the tests.
- g) The rate shall include the cost of pipe tubing together with all fittings and specials and fixing complete with clamping wall-hooks, anchor fasteners etc., and also for cutting, screwing, for making forged (or hand made) bends on piping as required. Connector shall be inserted, where required or directed.

The rate shall include manual cutting through walls, floors etc. and their making good, pressure testing, providing sleeves and sand filling under floors all as specified. The rate shall be for all labour required for finishing to required shape and size, testing, fitting in position,

straight cutting and waste return of packing.

On prior approval of EIC (well before execution), making holes through RCC., masonry or any other surface using core cutting machine shall be paid extra, but the rate shall be inclusive of making the surface good after core cutting work is over.

- h) The rate shall be for a unit of one RM.

ITEM NO-68

Providing, laying and jointing in true line and level U.P.V.C. pipe (SCH-40) of following dia. including fittings of standard make as approved by Engineer-in-charge. Pipe shall be fixed on the wall with the help of clamp at every 2000 mm center to center or shall be concealed as directed including necessary fittings etc. Including testing of pipe and joints and fixing the same with adhesive solvent, including cost of all materials.

Providing, laying and jointing in true line and level U.P.V.C. pipe (SCH-40) of following dia. including fittings of standard make as approved by Engineer-in-charge. Pipe shall be fixed on the wall with the help of clamp at every 2000 mm center to center or shall be concealed as directed including necessary fitting setc. Including testing of pipe and joints and fixing the same with adhesive solvent, including cost of all materials as directed by engineer in charge.

The Mode of measurement and rate shall be given as per one Running meter basis.

ITEM NO-69

Providing and fixing gun metal check or non-return valve (A) 15 mm. dia. (B) 20 mm. dia. (C) 25 mm. dia. (D) 32 mm dia (E) 40 mm dia (F) 50 mm dia

Materials :

The gun metal check or non return full way wheel valve of specified dia. shall conform to I.S. 778-1964. The non return valve shall be of tested quality.

Workmanship :

The gun metal check or non return valve shall be fully cleared of all foreign matter before fixing. The fixing of valve shall be done by means of bolts nuts and 3 mm. rubber insertions with flanges of spigot and socketed tail pieces, drilled to the same specification as in case of socket and spigot and with flanges in case of flanged pipes. The jointing shall be done leak proof.

Mode of measurements & payment :

The rate includes all labour, materials, tools and plant etc. required for satisfactory completion of this item.

The rate shall be for a unit of one number.

ITEM NO-70

Providing, laying and jointing in true line and level 160 diameter U.P.V.C (Type 'B') conforming to IS 13592-1992 with one end plain and other end socketed with rubber ring, & fittings conforming to ISI 14735-1999 if approved make for drainage system pipe line, pipe shall be jointed with each other with rubber lubricant, pipe shall be fixed on wall using of PVC clamp of the size 160 mm diameter X 210 mm length X 196 mm height at every 2000 mm center to center or shall be concealed in walls as directed including necessary fittings such as bends, shoes etc. including testing of pipes and joints with adhesive solvent cement including cost of all materials.

Providing, Fixing, testing & commissioning 6 kg/ sq. cm UPVC Pipe ISI marked brand as per IS 4985 above 50mm dia (self fit type) complete with PVC Fittings conforms to IS: 7834 / IS: 10124 including all fittings (plain or door) e.g. bend, single tee, double tee, single Y, double Y, junction, offsets, access pieces etc. The work including solvent jointing hydraulic testing the joints & pipes as mentioned in the specification etc. making holes including chasing in solid block masonry walls with groove cutting machine to required width and depth, making holes in brick or RCC wall as per requirement ,clearing the debris, grouting of concealed pipes, making good the chase by using 1:3 cement mortar, covering of pipe with PCC 1:4:8, making good the wall and floors, making connection with down take to satisfaction of engr / arch with proper care, protecting fittings & pipes till the final handing over etc as directed by E-IC

complete as per specifications & drawing provided for all places, all heights & all levels (Internal work for toilet block) 75mm , 110mm, 160 mm.

Materials:

The uPVC pipe conforming to I.S. 4985:2000 of specified diameter with 6 Kg/Sq.cm. working pressure shall confirm to 3076-1968.

Fittings: Fittings shall be of the same make as that of pipes, injection moulded and shall confirm to Indian Standard. The specials and fitting shall be confirms to IS: 7834 shall be of best quality. The pipe shall be provided with bends, junctions, inspection doors, offsets, cowl, access pieces/plugs etc. jointing with Solvent cement (lubricant) including cutting holes in walls and making good the same. The Access door shall be secured air and water tight with 3mm thick insertion rubber washer and white lead. The bolts shall be lubricated with grease or white lead for easy removal. Lubricant: **Lubricant is available in 100 gms, 250 gms & 500 gms packing. It is specially formulated for compatibility with rubber seal as well as PVC. It does not support the growth of bacteria or fungi. Solvent joints shall be used as per manufacturer's recommendations.**

Workmanship:

The P.V.C. Pipes of specified diameter shall be fixed as directed. Due to thermal expansion of rigid P.V.C. Pipes, due allowance shall be made particularly in over ground pipe lines for any change in length of pipe line which may occur during installation or when pipe line is in service. All pipes shall be fixed in gradient towards the outfalls of drains. Pipes inside a toilet room shall be in chase unless otherwise shown on drawings. Where required pipes may be run at ceiling level in suitable gradient and supported on structural clamps

Jointing the pipes:

The jointing of the pipes to the fittings shall be done as per the manufacturer's instructions / recommendation. The rubber ring socket fittings and pipes shall be jointed as follows: The pipes and sockets shall be accurately cut. Clean the outside of the pipes spigot end and the inside of the ceiling groove of the fitting. Apply the lubricant uniformly to the spigot end, sealing ring and pass the spigot end into the socket containing sealing ring until fully home. Since solvent cement is aggressive to P.V.C., care must be taken to avoid applying excessive cement to the inside of pipe sockets as any surplus cement cannot be wiped off after jointing. Mark the position of the socket edge with pencil or felt open on the pipe, then withdraw the pipe from the socket by approximately 10 mm to make the pipe fully fitted to the fitting. If manufacture recommends its own methods of jointing, the same shall be adopted after necessary approval from the Engineer-in-charge. Fixing of the pipe with fittings on the sunk and in below ground or in plinth. In case of fixing of pipes and fittings on the slab & below flooring these shall run on the surface of the slab Under the floors, the pipe shall be laid in layer of sand filling & then apply PCC cover of 1:4:8 on the pipe.

Repairs:

While temporary or emergency repairs may be made to the damaged pipes, permanent repairs should be made by replacement of the damaged section. If any split or chip out occurs in the wall of the pipe, a short piece of pipe of sufficient length to cover the damaged portion of the pipe is cut. The sleeve is cut longitudinally and heated sufficiently to soften it so that it may be slipped over the damaged hard pipe.

Mode of measurement:

The description of each item shall unless otherwise stated, be held to include where necessary, conveyance, and delivery, handling unloading, storing fabrication, hoisting, all labour for finishing to required shape and size; testing, fitting in position, straight, cutting and waste, return of packing etc.

The length shall be measured on running meter basis of finished work. The length shall be taken along the center line of the pipe and fittings. The pipes fixed to floors etc shall be measured and paid under this item. All measurements of cutting shall unless otherwise stated be held to include the consequent waste. In case of fitting of unequal bore, the largest bore shall be measured for the rest. Connection to down take pipe Testing of pipe lines fittings and joints include for providing all plant and appliances necessary for obtaining access to the work to be tested and carrying out the tests. The rate shall be exclusive of encasing of pipe with sand or PCC, and same shall be paid in relevant tender items.

The rate shall be for a unit of one running meter.

The rate shall be for a unit of on Rmt

ITEM NO-71

**Providing and fixing C.P brass waste coupling for wash basin or sink (A) 32 mm diameter (full thread).
Make: Cera**

This item includes providing and fixing C.P brass waste coupling for wash basin or sink as directed by engineer in charge.

The Mode of measurement and rate shall be for unit of each.

ITEM No-72

Providing and fixing C.P brass waste pipe or bottle trap for wash basin or sink as directed by engineer in charge.

This item includes providing and fixing C.P brass waste pipe or bottle trap for wash basin or sink as directed by engineer in charge.

The Mode of measurement and rate shall be for each unit of bottle trap or waste pipe fixed.

ITEM No-73

Providing and fixing pvc waste pipe (flush) for sink ,urinal and wash basin etc.

This item includes Providing and fixing pvc waste pipe (flush) for sink ,urinal and wash basin as directed by engineer in charge.

The Mode of measurement and rate shall be for unit of each.

ITEM No-74

Providing and fixing 15 mm dia x 450 mm long PVC Connections with ABS Nuts-Chrome Plated including O-Ring & Rubber Washer (Suitable for Wash Basin, Kitchen Sink etc) as per specification and conforming to Manufacturers Standards. Make: Prayag / PolyTUF / WaterTECH / Equivalent.

This item includes Providing and fixing 15 mm dia x 450 mm long PVC Connections with ABS Nuts-Chrome Plated including O-Ring & Rubber Washer as directed by engineer in charge.

The Mode of measurement and rate shall be for unit of each.

ITEM No-75

Providing and fixing Urinal spreader for urinal

This item includes Providing and fixing Urinal spreader for urinal as directed by engineer in charge.

The Mode of measurement and rate shall be for unit of each.

ITEM No-76

Providing and fixing PTMT Prismatic Urinal cock 15 mm connection as per approved quality and colour.

This item includes providing and Prismatic Urinal cock 15 mm connection as per approved quality and colour as per direction of engineer in charge.

The Mode of measurement and rate shall be for each basis.

ITEM No-77

**Providing and fixing PTMT stop cock / Flush cock for WC of approved quality and colour.
(A) 25mm dia.**

This item includes providing & fixing PTMT stop cock / Flush cock for WC of approved quality and colour as directed by engineer in charge.

The Mode of measurement and rate shall be for each basis.

ITEM No-78

Providing and fixing PTMT Jet with flexible tube up to 1.5 meter long with PTMT triangular plate to European type W.C. of approved make and quality and as approved by Engineer - In - Charge. Make: Prayag / PolyTUF / WaterTECH / Equivalent.

This item includes Providing and fixing PTMT Jet with flexible tube up to 1.5 meter long with PTMT triangular plate to European type W.C. of approved quality and make as directed by engineer in charge.

The Mode of measurement and rate shall be for each basis.

ITEM No-79

Providing and fixing Jet Spray with 1.0 Meter Tube of approved quality and colour.

- (a) Cera/Jaquar make**
- (b) Other then cera/jaquar make**

This item includes providing and fixing Jet Spray with 1.0 Meter Tube of approved quality and colour as per direction of engineer in charge.

The Mode of measurement and rate shall be for each basis.

Item No-80

Providing & fixing 15mm C.P. bib cock with all nuts, washer and brass flange complete as per drawings & specification.(b) Bib tap other then cera/jaquar make(c) 2-Way Brass Bib Tap in Polished Chrome of approved quality and conforming to manufacturers standards. 2 Way Bib Tap. JAQUAR, CERA or equivalent(d) 2-Way Brass Bib Tap Other than Hindware, Cera, Jaquar(e) Providing and fixing PTMT 2-Way Bib Tap s per specification and conforming to Manufacturers Standards. Make: Prayag / PolyTUF / WaterTECH / Equivalent.

Materials:

The capstan head pillar tap of specified dia. of C.P. over brass shall be of best quality and shall conform to I.S: 1795-1961 and as specified in item and approved by Architect / EIC. The pillar taps shall be of tested quality. Sensor shall be provided with a solenoid valve connected to a 6 volts lithium battery. Unit automatically serves the range in about 40 cms.

2.0 Workmanship:

The screw down bib cock OR angle cock or pillar tap with or without sensor of 15 mm dia. As specified above shall be fixed with CP Brass or GI specials as directed. The threaded portion of the tap shall be smeared with Teflon tape and around with a few turns around the screwed end of the pipe. The bib cock OR angle cock shall be than screwed and fixed to water tight position. Angle cock and pillar cock shall be connected with braided hose, as specified in the item. Every tap complete with its component shall withstand an internally applied hydraulic pressure of 2 Mpa (20 kg/sq.cm) maintained for a period of 2 minutes during the period it shall neither leak nor sweat. Leaky joint shall be remade to make it leak proof without any extra cost from contractor.

3.0 Mode of measurements & payment:

The rate includes cost of all labor and materials, tools and plant etc. required for satisfactory completion of the item.

The rate shall be for a unit of one number.

ITEM No-81

Providing and Fixing in position CP brass Pressmatic Pillar cock lift type including 450mm long braided hose of approved make and quality, and as approved and directed by the Engineer-in-charge, including all necessary materials required for fixing.

This item includes providing and Fixing in position CP brass Pressmatic Pillar cock lift type including 450mm long braided hose of approved make and quality, and as approved and directed by the Engineer-in-charge, including all necessary materials required for fixing. (b) other then cera / jaquar make

The Mode of measurement and rate shall be for each basis.

© Providing and Fixing PTMT piller cock as per specification and conforming to Manufacturers Standards. Make: Prayag / PolyTUF / WaterTECH / Equivalent.

This item includes providing and Fixing in position Providing and Fixing PTMT piller cock as per specification and conforming to Manufacturers Standards. Make: Prayag / PolyTUF / WaterTECH / Equivalent.

The Mode of measurement and rate shall be for each basis.

(F) Providing and Fixing in position CP brass Pressmatic cartridge (spindal) approved make and quality, and as approved and directed by the Engineer-in-charge, including all necessary materials required for fixing.(a) HINDWARE, CERA, JAQUR OF Equivalent.

This item includes providing and Fixing in position CP brass Prismatic cartridge (spindal) approved make and quality, and as approved and directed by the Engineer-in-charge, including all necessary materials required for fixing.(a) HINDWARE, CERA, JAQUR OF Equivalent.

The Mode of measurement and rate shall be for each basis.

ITEM No-82

Providing and fixing SS grating (jali) of size 150 x 150 mm as directed by eng. In charge.

This item includes providing and fixing SS grating (jali) of size 150 x 150 mm as directed by eng. In charge.

The rate shall be for a unit of No Basis.

ITEM NO-83

Service work for flush tank including necessary labour and material like acid etc. as per direction of engg. In charge.

(B) Providing and fixing syphone set other then cera/jaquar make

(C) Providing and fixing syphone set of approved make and quality, and as approved and directed by the Engineer-in-charge, including all necessary materials required for fixing.(a) HINDWARE, CERA, JAQUR OF Equivalent.

1.0 Workmanship :

1.1 The item includes Service work for flush tank ,etc. complete as directed by engineer-in-charge. The rate includes all labour, materials like acid etc. required for satisfactory completion of this item.

2.0 Mode of measurements & payment :

2.1 The rate shall be for a unit of one number.

Item No-84

Providing and fixing wash down Floor mounting ORISSA PAN TUB of approved shade with P or S trap, SWR Selfit Soil pipe and plug bend as per specifications; rubber gaskets, connecting PVC

110mm dia soil pipe with PVC coupling, and cutting and making jari work etc. complete. Orissa Pan: HINDWARE, CERA, JAQUR or equivalent.

1.0Material:

2.0Squatting Pan (Orissa Pattern) is of white or colour glazed vitreous China conforming IS 2556 Part III. Pan shall have flushing rim and are inlet of self draining type. It shall have weep hole at the following inlet to the Pan. The flushing inlet shall be in front unless otherwise specified. The inside of the bottom of the pan shall have sufficient slope from the front to the outlet and surface shall be uniform and smooth to enable easy and quick disposal while flushing. The exterior surface of the outlet below the flange shall be an unglazed surface which shall have groove at right angle to the axis of the outlet. In all the cases pan shall have be provided with 100 mm Glazed Vitreous China 'P' or 'S' trap with 50 mm water seal and 40 mm size vent harm.

2.0Workmanship:

The water closet pan shall be placed in position as shown in the drawing. The IWC shall be supported on brick masonry in CM 1:4 or as directed by the Engineer-in-charge. The pan shall be fixed slightly lower than the floor level. If the pan or trap is damaged during handling of fixing, it shall be replaced by the contractor at his own cost. The pan, trap and C.I. pipe shall be jointed in 1:1 Cement Mortar with hemp yarn caulked. The gap between W.C. and floor shall be finished with white/matching cement as directed.

PROTECTION AND FINAL CLEANING:

The IWC shall be covered with husk and sand till all the civil and electrical works are completed and shall be removed and cleaned on completion of civil and electrical works prior to testing and handing over. However the contractor should ensure that the out let is plugged with gunny bags or similar materials to avoid the pipe getting blocked.

Measurement:

1. Water Closet pan with SCI trap 'P' or 'S' type and jointing in 1:1 cement mortar with hemp yarn caulked.
2. Cutting wall / slab / beam etc. and making all the damage goods to original condition after completion of work.
3. Testing the entire system and rectification of defects, if any.
4. All necessary labour, material and use of tools.

Mode Of Measurement :

- 4.1 The measurement shall be for each unit of W.C. Pan fixed.

Mode Of Payment :

- 4.2 The contract rate shall be for each unit of W.C. pan fixed.

Item No-85

Providing & fixing of first quality white vitreous china Wash basin as per product detail, including specially fabricated M.S. / C.I. brackets with studs painted with two or three coats of enamel paint of approved shade over a coat of primer, 32mm CP brass half waste coupling as per product detail, Bottle Trap & Pipe to wall with CP brass flange & rubber adopter for waste connection, 1 no of 15mm nominal bore heavy rating CP brass inlet connection with unions at end for connection of angular valve to basin as per product detail complete including filling gap between counter and wash basin with approved sanitary grade material, cutting & making good the walls where required.: HINDWARE, CERA, JAQUR OF Equivalent.

1.0 Materials:

Wash basin shall be of white porcelain first quality best Indian make and it shall conform it I.S. 2556 (Part-IV) 1972 and I.S. 771-1979. The bracket shall conform to IS: 775-1962. Approved GI coated rag bolts shall be used for fixing the wash basin over and above the brackets.

The type (like over counter, under counter, with/without pedestal etc.) of the wash basin shall be as specified in the item. Wash basin shall be of one piece construction with continued over-flow

arrangements. Each basin shall have circular waste hole or 5 sq.cm slot type over flow. All internal angles shall be designed so as to facilitate cleaning. Wash basin shall have single tap hole or two holes as specified. Each basin shall have a circular waste hole which is either rebated or beveled internally with 65 mm diameters at top and 10 mm depth to suit the waste fitting. The necessary stud slot to receive the bracket on the underside of the basin shall be provided. Basin shall have an internal soap holder recess which shall fully drain into the bowl. The C. P. brass waste trap and unions shall be of 32 mm dia. and of best quality, size, colour and make as specified in item and as approved by Architect / EIC.

PVC water inlet connection shall conform to IS specifications and shall be of standard pattern with braided hose of minimum 450 mm long with CP brass check nut at both the end and shall be able to withstand the testing pressure of 1 Mpa (10 kg/sq. cm.)

Waste Coupling shall confirm to IS 3311, and as specified in the item and of approved make. Waste fittings shall be of with thickness of coating not less than service Grade No.2 of IS 4827 which is capable of receiving polish and will not easily scale off. The fitting shall conform in all respect to IS 2963 and shall sound, free from laps below, holes and fittings and other manufacturing defect. External and internal surface shall be clean and smooth. They shall be neatly dressed. The waste fitting for wash basin shall be of nominal size of 32 mm.

The bottle trap shall be as specified in the item and of approved make. The bottle-trap shall be provided with a CP brass extension piece to the wall flange on one hand and on the other with a rubber adopter for waste connection.

Bottle trap shall be of thickness of coating not less than service grade No. 2 of IS 4827 which is capable of receiving polish and will not easily scale off. The fitting shall conform in all respect of IS 2963 and shall be sound, free from laps below, holes and fittings and other manufacturing defects. External and internal surface shall be clean and smooth. They shall be neatly dressed and be truly machined so that nut smoothly moves on the body. The Bottle trap for wash basin shall be of nominal size of 32 mm.

2.0 Workmanship:

The wash basin shall be fixed on the wall as and where directed. The wash basin shall be supported on a pair of M. S. or C.I. brackets fixed in C.M. 1:3 (1cement: 3sand). Bracket shall be fixed in the position before dado work is done. The wall plaster on the rear shall be cut to rest the top edge of the wash basin. The gap between counter and wash basin shall be filled with approved sanitary grade silicone sealant. After fixing the basin, plaster shall be made good and surface finished matching with the existing one. The bracket shall be painted with two or three coats of enamel paint of approved shade over a coat of primer

Oval shape or round shape wash basins are required to be fixed in RCC platform with stone tapping either fully sunk in stone top or flush with stone topping. The wall plaster on seat shall be cut to rest over the top edge of the basin so as not to leave any gap for water seepage through between wall plaster & skirting of basin. The gap between counter and wash basin shall be filled with approved sanitary grade silicone sealant.

The trap and union shall be connected to 32 mm. dia. waste pipe which shall be suitably bent towards the wall and which shall discharge into an open drain leading to a gully trap or direct into the gully-trap on the ground floor and shall be connected to a waste pipe through a floor trap on the upper floors. C. P. brass trap and union may not be provided where the surface drain or a floor trap is placed directly under the basin and the waste is discharged into vertically.

The height of the front edge of the wash basin from the floor level shall be 80 cms.

The necessary inlet, outlet connections and fittings such as sensor operated pillar cock. C. P. dress waste trap waste pipe, stop cock, chain with rubber plug etc. shall be fixed.

3.0 Mode of Measurement:

These items shall be measured in numbers and rate quoted shall be per number only. The quoted rate shall include:

- a) The cost of wash basin with brackets and other items stated.
- b) Jointing and fixing materials.
- c) Painting of brackets.
- d) And necessary fittings, hardware, etc. to complete the above.
- f) Cutting hole in wall / slab / beam etc. wherever required. and making all damages good to original condition after completion of work.

The rate quoted shall be excluding cost of sensor tap / pillar tap and angle cock.

- h) The rate shall be for a unit of one number and include cost of all labour, materials, tools and plant etc., required for satisfactory completion of this item as specified.

Item No-86

Providing & fixing vitreous chinaware URINAL in one sleek supported by CI / MS bracket (duly painted with 2 coats of paints over a coat of primer) with CP brass heavy quality spreaders, CP brass waste coupling grating, CP brass bottle trap with extension piece, pipe to wall with C.P. flange, CP urinal auto closing system with wall flange white vitreous china large urinal partition with concealed CI bracket etc. with all necessary connection complete including cutting and making good the walls to the satisfaction of project manager / Arch. and floors wherever required. HINDWARE, CERA, JAQUR OF Equivalent.

1.0 Materials:

The lipped type urinal shall be flat back or corner type as specified in the item and shall conform to I.S. 771-1979. It shall be of best Indian make, size and colour as specified and approved by Architect / EIC. It shall be of the first class quality and free from any defects.

The urinals shall have fixing arrangement for 15 mm dia spreader, 32 mm dia CP domicile waste and CP pipes with a wall flange. The urinal shall be fixed to the wall by one CI bracket and two CI wall clips, as approved by the manufacture complete as directed.

Sensors shall be provided with a solenoid valve and valve connected to a 6 volts lithium battery. Unit automatically serves (the range in about 40 cms.) and flushes in two steps. The pre flush is for 2 seconds duration and the final flushing is for 7 seconds duration.

2.0 Workmanship:

The urinals shall be fixed in position by using MS / CI brackets and shall be at a height 60 cms from the floor level to the top of the lip or urinal, unless otherwise directed. The bracket shall be 50 mm. x 50 mm. at base lapping to 38 mm. x 38 mm. at top and 50 mm. in length shall be fixed in wall in cement mortar 1 : 3 (1 cement : 3 coarse sand). The urinal shall be connected to 50MM mm. dia. PVC waste pipe (through bottle trap) which shall discharge in the channel or floor / Nani trap. The connection between the urinal bottle trap and flush or waste pipe shall be made by means of putty or white lead mixed with chopped hemp/rubber gasket of bottle trap. The outlet from the flusher shall be connected to urinal spreader with required braided pipes from sensor to spreader.

3.0 Mode of measurements & payment:

The rate shall be for a unit of one number and include cost of all labour, materials, tools and plant, etc., required for satisfactory completion of this item as specified.

Item No-87

Providing & fixing specified Divisional plate of approved make & color with all necessary, concealed clamps, brassed screws & filling the gape wall & divisional plate with sanitary grade silicon sealant etc. complete to the satisfaction of project manager / Arch. DIVISION PLATE: HINDWARE CERA, JAQUR OF Equivalent.

1.0 Materials:

Division plate shall be white or colour glazed of size as specified in the schedule.

2.0 Workmanship:

Division plate shall be fixed vertically in position at proper height with expandable anchor fasteners, CP brass screws, wooden plugs etc.

3.0 Mode of measurements & payment:

- 1) Glazed division plate including the cost of CP brass screws, wooden plugs, expandable anchor fasteners etc.
- 2) Cutting wall / slab / beam etc. and making all the damage goods to original condition after completion of work.
- 3) All necessary labour, material and use of tools.
- 4) The rate shall be for a unit of one number and include the cost of all labour and material as specified in item for fixing etc. complete, including testing and commissioning.

ITEM No-88

Supply and installation of urinal modesty panels of make Merino or equivalent as per approved make with width and depth as per specifications with 1200 mm height x 450 mm depth with Solid Grade 304 Satin Finish Stainless Steel Accessories, the modular shall possess 100% resistant properties towards: Water, Moisture chemicals, & bacteria. The partition will be made of Phenolic Base Compact Boards as per IS-2046 (Indian Standards). The partition panel shall be of one continuous panel without any joint. The compact laminate shall be impregnated with phenolic resin based on thermosetting technology, homogeneously reinforced with cellulose fibers and Décor on both sides with Suede finish and having melamine coating on its surface. Performance of the panel shall possess the characteristics of colour, scratch & impact resistance. The sheets shall be bonded at high pressure greater than 110Kg/cm² at temperature of about 150°C.

This item includes supply and installation of urinal modesty panels of make Merino or equivalent as per approved make with width and depth as per specifications with 1200 mm height x 450 mm depth with Solid Grade 304 Satin Finish Stainless Steel Accessories, the modular shall possess 100% resistant properties towards: Water, Moisture chemicals, & bacteria. The partition will be made of Phenolic Base Compact Boards as per IS-2046 (Indian Standards). The partition panel shall be of one continuous panel without any joint. The compact laminate shall be impregnated with phenolic resin based on thermosetting technology, homogeneously reinforced with cellulose fibers and Décor on both sides with Suede finish and having melamine coating on its surface. Performance of the panel shall possess the characteristics of color, scratch & impact resistance. The sheets shall be bonded at high pressure greater than 110Kg/cm² at temperature of about 150°C as directed by engineer in charge.

The Mode of measurement and rate shall be for Nos. basis.

ITEM No-89

Providing and fixing wash down water closet (European type W.C pan/wall mounted) with integral P or Strap including jointing the trap with soil pipe in cement mortar 1:1 (1 cement : 1 fine sand) (seat and cover to be measured and paid for separately)

- (A) Vitreous China : Hindware, Cera, Jaqur**
- (B) Other than Hindware, Cera, Jaqur**

This item includes providing & fixing wash down water closet (European type W.C pan/wall mounted) with integral P or Strap including jointing the trap with soil pipe in cement mortar 1:1 (1 cement : 1 fine sand) (seat and cover to be measured and paid for separately) as directed by engineer in charge.

The Mode of measurement and rate shall be for each basis.

ITEM No-90

Providing and fixing urinal as per specification including connection with trap and with integral longitudinal flush pipe.

- (A) Squatting pattern white Cera/Jaquar/Hindware make
 (B) Other then Hindware/Cera/jaquare make

This item includes providing and fixing urinal as per specification including connection with trap and with integral longitudinal flush pipe as per direction of engineer in charge.

The Mode of measurement and rate shall be for each basis.

ITEM NO: 91

Providing and fixing plastic seat & cover for wash down water closet with CP brass hinges & rubber buffers.

Materials:

European type water closet shall be white glazed porcelain first quality & shall be of wash down pattern unless otherwise specified. Water closet shall be vitreous china conforming to IS 2556 (Part-I & II). The closet shall be of one piece construction and shall have minimum two hole of 6.5 mm diameter for fixing closet to floor. Closet shall have an integral flushing rim of self draining type. Each water closet shall have an integral 'P' trap with water seal not less than 50 mm. with outlet and trap shall be uniform and smooth in order to enable an efficient flush. It shall be of approved color and make as mentioned in the schedule of quantities.

The seat and cover shall be of the best Indian make conforming to I.S. 2548-1980. They shall be made of molded from PP heavy duty material which shall be tough and hard with high resistance to solvents and shall be free from blisters and other surface defects and shall have chromium plated brass hinges and rubber buffer of suitable size.

Workmanship: Closet shall be fixed to the floor so as not to allow any lateral displacement. The joint between the W.C. outlets with soil down take pipe shall be made with rubber seal gasket joint

3.0 Mode of measurements & payment:

- 1) European type wall mounted water closet with an integral 'S' trap, seat cover, etc. jointing with soil down take
- 2) Cutting hole in wall / slab / beam etc. wherever required. and making all damages good to original condition after completion of work
- 3) Cost of jointing materials.
- 4) Painting all the metallic parts with two coats of flat oil paint over a coat of primer.
- 5) Testing the entire system and rectification of defect if any.
- 6) All necessary labour, material and use of tools.
- 7) **MODE OF PAYMENT:** The rate shall be for a unit of one number and include the cost of all labour and material as specified in item for fixing etc. complete, including testing and commissioning.

Item No. 92

Providing & fixing of open cistern with dual flush facility comprising of actuator button fascia assembly, lid, valve, PVC siphon, fittings in built including brass / SS screws & washer complete, providing protection cover over cistern, flush pipe, bend connecting cistern to WC etc. including cutting & making good the walls wherever required with all accessories. The scope include following items:

a) COMMANDER EGRET Dual flush OR EQ.

1.0 Materials:

The cistern shall be of approved make, and color with dual flush type with inbuilt actuated and top cover and accessories Raw material of cistern body shall be of virgin polypropylene with critical and functional parts molded from Engineering grade ABS, Acetyl, Nylon and Nylon glass. The float shall work on clock valve mechanism with concealed air pocket to give upward thrust of 75 gm by Archimedes principle. Derlin valve made from an Acetyl compound shall withstand an inlet pressure up to 20 kg/cm². Main rubber valve shall be of parabolic design on ball and socket joint for better seal. Valve seat shall be of engineering grade ABS plastic for long scratch free life. Cistern shall be of 6 liter capacity and flow can be adjusted from 3 to 6 liters. It shall conform to IS 7231. Polyethylene flush pipe shall be low density confirming to IS 3076 or high density confirming to IS 4984 or UPVC pipe confirming to IS 4965 of 40 mm outer diameter. PVC water inlet connection of approved make as specified in item, and shall conform to IS specifications and

shall be of standard pattern minimum 450 mm long with CP brass check nut at both the end and shall be able to withstand the testing pressure of 1 Mpa (10 kg/sq.cm.)

2.0 Workmanship:

The open type cistern shall be fixed firmly as per manufacturer's recommendations. A high level cistern is intended to operate with minimum height of 125 cm and a low level cistern with maximum height of 30 cm between the top of the pan and under side of the cistern. The flushing cistern shall be connected to the closet by means of PVC flush bend using Indian rubber adapts joint. The flush pipe shall be securely connected to the cistern outlet by means of coupling nut made of any non-corrosive materials non-ferrous metal or galvanized steel. The flush pipe from the cistern shall be connected to the closet by means of solvent cement. The inlet end of the cistern shall be connected to the water distribution pipe through a angular stopcock and braided hose pipe. The cistern shall be provided with an overflow pipe with mosquito proof jali at end. The whole installation shall be tested for leak-proof joints and satisfactory functioning.

3.0 Mode of measurement:

- 1) Supply and fixing flush tank, flush pipe, water inlet flexible connection without cost of angular stop cock.
- 2) Painting all the metallic parts with two coats of flat oil paint over a coat of primer.
- 3) Cutting hole in wall / slab / beam etc. wherever required and making good the same to original condition after fixing.
- 4) Cost of jointing materials
- 5) Testing the entire system and rectification of defects, if any.
- 6) The rate shall be for a unit of one number and include the cost of all labour and material as specified in item for fixing etc. complete, including testing and commissioning.

ITEM NO-93

Providing and fixing chromium plated brass half turn flush cock of approved quality including fixing in pipe line etc. complete

Materials:

Chromium plated brass half turn flush cock with lever of "Ess Ess" – Trend series or equivalent make shall conform to M-67.

Workmanship:

The flush cock of specified diameter shall be fixed as directed. The flush cock shall be fixed in UPVC / G. I. pipeline with necessary fittings. The joints shall be made leak proof by using Solutions / spun yarn and white zinc. The fixing work shall be carried out as per relevant specifications.

Mode of measurements & payment:

The rate includes cost of all materials and labour required for satisfactory completion of this item including fittings.

The rate shall be for a unit of one number.

ITEM NO-94

Providing & fixing PVC MFT of self cleansing design having water seal not less than 50mm with necessary distance piece & making connection with grating, making necessary slab / wall holes & cutting walls, grouting with M-15 CC all around with brick masonry support of 350x350 mm up to bottom of trap etc. complete as per specifications & drawing provided at all places, all levels & all height

a) 110 mm inlet and 75 mm outlet

This item includes providing & fixing PVC MFT of self cleansing design having water seal not less than 50mm with necessary distance piece & making connection with grating, making necessary slab / wall holes & cutting walls, grouting with M-15 CC all around with brick masonry support of 350x350 mm up to bottom of trap etc. complete as per specifications & drawing provided at all places, all levels & all height as directed by eng. In charge.

Mode of measurements & payment : The rate shall be for a unit of one No.

ITEM NO-95

Providing F.R.C. MH seat cover incl. carting to the work site etc. comp. Directed.

Frame and covers for manholes shall be of required type and dimensions as per the item description. Following information shall be clearly marked on each cover.

Year of manufacture
Identification mark of the purchaser
SEWER/SWD
Arrow showing direction of flow

Rate shall be for unit of one No.

ITEM No-96

Job work for removing choking of manholes , chambers , drainage lines and desilting the same if required with labours , hand bucket , lari & other tools i.e. Trikam , Pavda , Rassa , Battery , G.T. Salia etc. with disposing silt as shown places. Nothing extra to be paid for any insurance or depreciation of tools etc. (Rate is for 8 hour shift with minimum 3 labours with mukadam to be provided .) or in case of pollution/ pre. monsoon action plan / drainage desilting work / min 7 nos of MH or 14 NOS of chamber Should be Desilted.)

(a) Manhole for storm water

(b) in SWD Channel for RCC block/MS grating channel

This item includes Job work for removing choking of manholes, chambers, drainage lines and desilting the same if required with labours, hand bucket, lari & other tools i.e. Trikam , Pavda , Rassa , Battery , G.T. Salia etc.with disposing silt as shown places. Nothing extra to be paid for any insurance or depreciation of tools etc. (Rate is for 8 hour shift with minimum 3 labours with mukadam to be provided.) or in case of pollution/ pre. Monsoon action plan / drainage desilting work / min 7 nos of MH or 14 NOS of chamber should be Desalted.) as directed by engineer in charge.

The Mode of measurement and rate for Manhole for storm water shall be given as per Shift basis.

The Mode of measurement and rate for Manhole for storm water shall be given as per Rmt. basis.

ITEM No-97

Providing and supplying departmental labour for all type of work including all tools and tackles.

This item includes providing and supplying departmental labour for all type of work including all tools and tackles as directed by engineer in charge.

The rate per No. for day work with 8 hour working shift/day.

ITEM No-98

Providing and supplying departmental mason/carpenter/fabricator/Plumber for all type of work including all tools and tackles.

This item includes providing and supplying departmental mason/carpenter/fabricator/Plumber for all type of work including all tools and tackles as directed by engineer in charge.

The rate per No. for day work with 8 hour working shift/day.

ITEM No-99

Re fixing of Traffic Bollard of any size and shape at different locations of SRFDCL Road Junctions.

This item includes re fixing of Traffic Bollard of any size and shape at different locations of SRFDCL Road Junctions as directed by engineer in charge.

The Mode of measurement and rate shall be given as per No. Basis.

ITEM No-100

Labour work for fixing any kind of paving with cement pointing in CM 1:2, including watering, ramming etc comp. as directed For pavement.

(a) Laying on Sand bedding as per requirement to fix the C.C. Paver Block in Line & Level.

(b) For Water Table & Kerb on Cement bedding/Concrete as per requirement to fix the C.C.Block / Nibhada Stone in Line & Level.

Measurement will be done in sq.mt of the actual area laid. Workmanship shall be as per Item No. 39.

ITEM No-101

Providing & fixing minimum M25 grade of customized concrete factory-made precast exposed concrete finish kerb of approved make and as per sample approved of specified sizes, specified shape etc. complete. (finish of precast element shall be upto the satisfaction of the engineer in charge & Architect.) Kerb shall have chamfered type/ pencil corner edges. Kerbs shall be fixed on the base PCC with cement mortar 1:2 including flush pointing in CM (1:2) or suitable approved make adhesive for all joints of the kerbstones, curing, etc, complete. The rate shall also include erecting and fixing in position all varieties/ shapes of kerbs (i.e. radius kerbs, comer kerb, quadrant kerbs, drain out kerb, flat kerb, parking edge kerb, ramp kerb or other any type of kerb with any shape as per drawing/design intent etc) as per drawing. Precast kerb shall be protected with good quality plastic sheet for protection against bituminous/ concrete work. The rate shall include the joining, curing, finishing, protection etc complete as directed by the engineer in charge. Actual installed kerb volume shall be measured in payment.

The rate shall include the cost of base excavation, base PCC M15 grade, joining, curing, protection etc complete as directed by engineer in charge. Rate shall be unit of One Cum. For the payment kerb volume shall be considered. (Sample must be approved). Sample and Mock-up shall be carried out as suggested by the Architect and as directed by the Engineer in charge. Sample and mock shall not be payable if rejected.

- 1.0 Materials:** Water, Cement, Grit, Sand, Graded stone aggregate 20-mm. nominal size as per general specification of other concreting.
- 2.0 General:**
- 2.1 Contractor shall have to manufacture the blocks as per the dimensions given in the drawing.
- 2.2 Specific machineries shall be used to manufacture the precast blocks. These machineries should be compatible to produce blocks of required strength and dimensions. Moulds/ Dies of the machine shall be dimensionally checked & to be got approved before commencing the production.
- 2.3 Contractor shall prepare proper Drying Yard for keeping the blocks before curing. The drying yard shall be levelled and covered so that no shrinkage cracks are formed.
- 2.4 Contractor shall prepare adequate size curing pond to cure the blocks for not less than 21 Days. No other means of curing shall be allowed.
- 2.5 The technical specification of concrete shall confirm to IS 456-1978.
- 2.6 The concrete mix shall be M25. Concrete work shall have exposed concrete surface or as specified in the item.
- 2.7 The ingredients required for ordinary concrete containing one bag of cement of 50 Kg. by weight (0.0342 m³.) for different proportions of mix shall be as per IS 456-1978. The proportion of the aggregate for the kerb stone shall be modified as per the approval of the engineer-in-charge.
- 2.8 The water cement ratios shall not be more than those specified as per IS. The cement of the mix shall be increased, if the quantity of water in a mix has to be increased to overcome the difficulties of placement and compaction so that the water cement ratio specified in the table is not exceeded.

- 2.9 The maximum size of coarse aggregate shall be as large as possible within the limits specified but in no case greater than 1/4th of the minimum thickness of the member, provided that the concrete can be placed without difficulty so as to surround all reinforcement thoroughly and to fill the corners of the form.
- 2.10 For reinforced concrete work, coarse aggregates having a nominal size of 20 mm. are generally considered satisfactory.
- 2.11 Admixture shall be used in concrete only with approval of the Architect and Engineer-in-charge based upon the evidence that with the passage of time, neither the compressive strength of concrete is reduced nor are other requisite qualities of concrete impaired by the use of such admixtures.
- 3.0 Workmanship:**
- 3.2 Mixing:**
- 3.2.1 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 maintained throughout the construction. Measured quantity of aggregate, sand and cement required for each batch shall be poured into the drum of the mechanical mixer while it is continuously running. After about half a minute of dry-mixing, measured quantity of water required for each batch of concrete mix shall be added gradually and mixing continued for another one and a half minute. 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 shows 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.
- 3.2.3 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 by the Architect and Engineer-in-charge, the first batch of concrete from the mixture shall contain only 2/3rds of normal quantity of coarse aggregate. Mixing plant shall be thoroughly cleaned before changing from one type of cement to another.
- 3.3 Consistency:** The degree of consistency which shall depend upon the nature of the work and methods of vibration of concrete, shall be determined by regular slump tests in accordance with IS: 1199-1959. The slump of 10 mm. to 25 mm. shall be adopted when vibrators are used.
- 3.4 Inspection:**
- 3.4.1 All Moulds shall be cleaned and made free from standing water, dust, snow or ice immediately before placing of concrete.
- 3.4.2 Formwork/Metal Mould for exposed concrete surface (If indicated):
- 3.4.3 All the moulds shall be checked for exact dimensions of the Precast blocks. All the edges of the Precast blocks shall confirm the profile of the final drawing & edges/ curvatures of the moulds shall be checked accordingly. Moulds shall be regularly checked for correctness of dimensions of Blocks, twists, bends due to handling, etc. before starting every days work.
- 3.4.4 Care shall be taken to set all formwork/Mould in perfect line, level (or in required camber or slope as specified) and plumb. Formwork/Mould propping shall be strong, rigid and sturdy. The formwork/Mould shall be as per pattern & design shown in drawings. Formwork/Mould shall be done accurately and precisely so as to achieve neat, clean and smooth concrete surface, in line, level and plumb. Clinks, twists, offsets, warps, riveting etc. in plates or forms shall not be allowed. Before placing concrete, forms shall be thoroughly cleaned off of all rust, dust and loose materials. Colorless oil or grease of approved quality shall be applied before placing steel. Also the formwork material will be of wood/plywood/steel or any sort of such material, as approved by the Architect, so that all exposed concrete surfaces have uniform colour.
- 3.4.5 For all kind of exposed concrete work only one brand (to be approved by the Architect or Engineer-in-charge) of cement shall be used.
- 3.4 Removal of Moulds:**
- Specific time shall be identified for removal of moulds, such that the concrete of the Precast blocks shall gain strength to withstand the stresses generated due to self weight and handling to drying yards without any deformation to shape/ dimensions/ edges.
- 3.5 Drying Period:**
- Sufficient time shall be given to the block after it is removed from the mould so that it can gain strength and dry in shade to prevent any cracks due to shrinkage. This shall be done in drying yards.
- 3.6 Curing Period:**
- Curing of block shall be done only in curing pond and curing shall be done for minimum 14 days.
- 3.7 Drying period after removing from pond & before delivery to site:**
- Water should be drained of from the block before it is actually sent to the site. Time should be provided for proper draining of water, which may be present in the block kept for curing in the pond.
- 3.8 Precautions:**
- 3.8.1 Precaution shall be taken while transporting of the blocks to site.
- 3.8.2 The blocks should be loaded and unloaded with due care so as to avoid generation of stresses leading to breaking of block.
- 3.8.3 Care should be taken to prevent the block from breaking during transporting.
- 3.9 Laying:**
- 3.9.1 The pits of the required size shall first be excavated, true to line and level. The relevant specifications shall be followed for excavation work.
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- 3.9.2 The pits shall be filled with a layer of 100mm thick PCC bedding. The curbs then shall be Placed in position as per drawing. The concrete kerb shall be cured minimum for 7 days. All concrete shall be compacted to produce a dense homogeneous mass with the assistance of vibrators, unless otherwise, permitted by the Architect and Engineer-in-charge. Sufficient vibrators in serviceable condition shall be kept at site so that spare equipment is always available in the event of breakdowns.
- 3.9.3 Concrete shall be judged to be compacted when the mortar fills the spaces between the coarse aggregate and begins to cream up to form an even surface. Compaction shall be completed before the initial setting starts i.e. within 30 minutes of addition of water to dry mixture.
- 3.11 Curing:**
Only pond curing shall be adopted and curing shall be done for min. 14 days.
- 3.12 Sampling and testing of concrete:**
- 3.12.1 Samples from fresh concrete shall be taken as per IS : 1199-1959 and cubes shall be made, cured and tested at 7 days or 28 days as per requirements in accordance with IS : 516-1959. A random sampling procedure shall be adopted to ensure that each concrete batch shall have a reasonable chance of being tested i.e. the sampling should be spread over the entire period of concreting and cover all mixing units.
- NOTE :** At least 1 sample shall be taken from each shift. Ten test specimens shall be made from each sample, 5 for testing at 7 days and the remaining 5 at 28 days. The samples of concrete shall be taken on each day of the concreting as per above frequency. The number of specimens may be suitably increased as deemed necessary by the Architect and Engineer-in-charge when procedure of tests given above reveals a poor quality of concrete and in other special cases.
- 3.12.2 The average strength of the group of cubes cast for each day shall not be less than the specified cube strength of 250 Kg/cm² at 28 days. 20% of the cubes cast for each day may have value less than the specified strength provided the lowest value is not less than 85% of the specified strength. If the concrete made in accordance with the proportions given for a particular grade, does not yield the specified strength, such concrete shall be classified as belonging to the appropriate lower grade. Concrete made in accordance with the proportions given for a particular grade shall not, however, be placed in a higher grade on the ground that the test strength are higher than the minimum specified.
- 3.12.3 If rock pockets/honeycombs in the opinion of Architect and Engineer-in-charge are of such an extent or character so as to effect 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 portion of the structure affected.

Mode of Measurements and Payment:

The Mode of measurement and rate shall be for Cubic Meter.

ITEM No-102

Providing, supplying and operating required vehicles/machineries on riverfront for diff. maintenance work including diesel, driver etc. all complete as directed by eng. In charge.

- (A) DUMPER
- (B) JCB
- (C) JCB BREAKER
- (D) Welding machine including welder
- (E) Electric Breaker with operator
- (F) TRACTOR
- (G) Tractor Breaker
- (H) Rent of DG set per shift in (with diesel)
- (I) Excavator
- (J) Tractor Pavdi

Measurement will be done in day work for dumper/tractor/ Tractor Breaker /JCB/JCB breaker/ Welding machine including welder/ Rent of DG set /Electric Breaker , Excavator , Tractor Pavdi with operator for per day.

ITEM No-103

Providing & Supplying hydra carne Machine of 12 tone capacity on rental basis in case of emergency situation and break down type work & also during unavoidable condition as per instruction of engg.in charge , rate includes all nece. shifting, fuel and operating charges . (No payment should be allowed for non working condition of machinery

This item includes providing & Supplying hydra carne Machine of 12 tone capacity on rental basis in case of emergency situation and break down type work & also during unavoidable condition as per instruction of engg. in charge , rate includes all necessary shifting, fuel and operating charges as directed by engg. In charge. (No payment should be allowed for non working condition of machinery)

The Mode of measurement and rate shall be given as per Shift basis

ITEM NO-104

Manufacturing testing, supplying, loading, transporting to site, unloading, ,lowering in trenches, laying on bedding as per drawing and jointing NP3 class RCC pipes with SRC cement as per IS 458-1986 with socket and spigot with rubber ring joint incl all materials

- b) 300 mm dia
- c) 450 mm dia
- d) 600 mm dia

REINFORCED CEMENT CONCRETE PIPES**Scope**

This specification covers the requirements for manufacturing, testing, supplying, jointing and testing at work sites of Reinforced Cement Concrete (RCC) pipes, of both pressure and non pressure varieties used for pumping mains, sewers and storm water drains. Laying of pipes and fittings/specials is covered in Technical Specifications: Section-D6. The two parts are complementary and are to be read together for a correct interpretation of the provisions of this specification.

Applicable Codes

The manufacturing, testing, supplying, jointing and testing at work sites of RCC pipes shall comply with all currently applicable statutes, regulations, standards and codes. In particular, the following standards, unless otherwise specified herein, shall be referred. In all cases, the latest revision of the codes shall be referred to. If requirements of this specification conflict with the requirements of the codes and standards, this specification shall govern.

Materials

IS: 458 – Specification for precast concrete pipes (with and without Reinf.)

IS: 3597 – Method of tests for concrete pipes.

IS: 5382 – Specification for rubber sealing rings for gas mains, water mains and sewers.

IS: 516 – Method of test for strength of concrete.

Code of Practice

IS: 456 – Code of practice for plain and reinforced concrete

IS: 783 – Code of practice for laying of concrete pipes

Design

Design of RCC pipes including reinforcement details and the ends of pipes shall be in accordance with the relevant clauses of IS: 458.

Manufacturing**General**

The method of manufacture shall be such that the form and the dimensions of the finished pipes are accurate within the limits specified in relevant clause of IS: 458. The surfaces and edges of the pipes shall be well defined and true, and their ends shall be square with the longitudinal axis. The ends of the pipes shall be further reinforced by an extra ring of reinforcement to avoid breakage during transportation.

The RCC pipes and collars/rubber rings shall be systematically checked for any manufacturing defects by experienced supervisors so as to maintain a high standard of quality.

Owner/Engineer shall at all reasonable times have free access to the place where the pipes and collars/rubber rings are manufactured for the purpose of examining and testing the pipes and collars/rubber rings and of witnessing the test and manufacturing.

All tests specified either in this specification or in the relevant Indian Standards shall be performed by the supplier/contractor at his own cost and in presence of Owner/Engineer if desired. For this, sufficient notice before testing of the pipes and fittings shall be given to Owner/Engineer.

If the test is found unsatisfactory, Owner/Engineer may reject any or all pipes of that lot. The decision of Owner/Engineer in this matter shall be final and binding on Contractor and not subject to any arbitration or appeal.

Materials**Cement**

Cement used for the manufacture of RCC pipes and collars should be Ordinary Portland Cement (OPC) only and shall conform to relevant IS codes.

Aggregates

Aggregates used for the manufacture of RCC pipes and collars shall conform to IS: 383. The maximum size of aggregate should not exceed one-third the thickness of the pipe or 20 mm, whichever is smaller.

Mixing and Curing Water

Water shall be clean, colorless and free from objectionable quantities of organic matter, alkali, acid, salts or other impurities that might reduce the strength, durability or other desirable qualities of concrete and mortar.

Reinforcement

Reinforcement used for the manufacture of the RCC pipes and collars shall be mild steel Grade I or medium tensile steel bars conforming to IS: 432 (Part-I) or hard-drawn steel wire conforming to IS: 421 (Part-2). Reinforcement cages for pipes and collars shall be as per relevant requirements of IS: 458.

Concrete

Concrete used for the manufacture of RCC pipes and collars shall conform to IS: 456. The minimum cement content and minimum compressive strength of concrete shall be as per relevant requirements of IS:458 (Latest Edition). Compressive strength tests shall be conducted on 15 cm cubes in accordance with the relevant requirements of IS: 456 and IS: 516.

Rubber Ring

Rubber ring chords used in pipe joints shall confirm to 1A of IS: 5382-1967

Curing

Pipes manufactured in compliance with IS:458 (Latest Edition) shall be either water cured or steam cured for minimum stipulated curing period in accordance with relevant requirements of the latest revised IS:458 (Latest Edition).

Dimensions

The internal diameter, wall thickness and length of barrel and collar of pipes, reinforcement (longitudinal and spiral), type of ends and minimum clear cover to reinforcement and strength test requirements shall be as per the relevant clauses/tables of IS: 458 for different classes of pipes. The tolerances regarding overall length, internal diameter of pipes or sockets and barrel wall thickness shall be as per relevant clause of IS: 458.

Workmanship And Finishes

Pipes shall be straight and free from cracks except that craze cracks may be permitted. The ends of the pipes shall be square with their longitudinal axis so that when placed in a straight line in the trench no opening between ends in contact shall exceed 3 mm in pipes up to 600 mm diameter (inclusive), and 6 mm in pipes larger than 600 mm diameter.

The outside and inside surfaces of the pipes shall be smooth, dense and hard, and shall not be coated with cement wash or other preparation unless otherwise agreed to between Owner/Engineer and the manufacturer or supplier.

The pipes shall be free from defects resulting from imperfect grading of the aggregate, mixing or moulding.

The pipes shall be free from local dents or bulges greater than 3 mm in depth and extending over a length in any direction greater than twice the thickness of barrel.

The deviation from straight in any pipe throughout its effective length, tested by means of a rigid straight edge parallel to the longitudinal axis of the pipe shall not exceed, for all diameters 3 mm forever meter run.

Testing

All pipes for testing purposes shall be selected at random from the stock of the manufacturer and shall be such as would not otherwise be rejected under the criteria of tolerances as mentioned in IS:458 (Latest Edition).

During manufacture, tests on concrete shall be carried out as per IS:456. The manufacturer shall supply, when required to do so by Owner/Engineer the results of compressive tests of concrete cubes and split tensile tests of concrete cylinders made from the concrete used for the pipes. The manufacturer shall supply cylinders or cubes for test purposes required by the Owner/Engineer and such cylinders or cubes shall withstand the tests prescribed by the manufacturer for the hydrostatic test pressure. For non-pressure pipes, 2 percent of the pipes shall be tested for hydrostatic test pressure.

The specimen of pipes for the following tests shall be selected in accordance with relevant Clause of IS:458 (Latest Edition) and tests in accordance with the methods described in IS:3597.

- > Hydrostatic test
- > Three edge bearing test

Note: Three edge bearing strength to produce 0.25 mm crack in case of special design of pipes shall be as per IS 458 – Latest Edition.

Sampling and Inspection

In any consignment, all the pipes of same class and size and manufactured under similar conditions of production shall be grouped together to constitute a lot. The conformity of a lot to the requirements of this specification shall be ascertained on the basis of tests on pipes selected from it.

The number of pipes to be selected from the lot for testing shall be in accordance with Table 15 of IS: 458 (Latest Edition).

Pipes shall be selected at random. In order to ensure randomness, all the pipes in the lot may be arranged in a serial order and starting from any pipe, every 'n'th pipe be selected till the requisite number is obtained, n being the integral part of N/n , where N is the lot size and n is the sample size. All pipes selected as per clause 4.7.2 shall be inspected for dimensional requirements, finish and deviation from straight. A pipe failing to satisfy one or more of these requirements shall be considered as defective.

The number of pipes to be tested for tests under clause 4.6.3 shall be in accordance with column 4 of Table 15 of IS:458 (Latest Edition). These pipes shall be selected from pipes that have satisfied the requirements mentioned in Clause 4.7.4.

A lot shall be considered as conforming to the requirements of IS:458 (Latest Edition) if the following conditions are satisfied.

- > The number of defective pipes shall not be more than the permissible number given in column 3 of Table 15 of IS: 458 (Latest Edition).
- > All the pipes tested for various tests as per Clause 4.6.3 shall satisfy corresponding requirements of the tests.
- > In case the number of pipes not satisfying requirements of any one or more tests, one or two further samples of same size shall be selected and tested for the test or tests in which failure has occurred. All these pipes shall satisfy the corresponding requirements of the test.

Marking

The following information shall be clearly marked on each pipe :

Internal diameter of pipe

Class of pipe

Date of manufacture, and

Name of manufacturer or his registered trademark or both.

Laying Of Pipes

The laying of RCC pipes shall conform to Technical Specifications mentioned in Section of Laying of Pipes and Fittings/Specials.

Jointing

General

Jointing of RCC pipes shall be done with OPC cement only and as per the requirements of following specifications and as per the relevant IS. The type of joints shall be as per Bill of Quantity. After jointing, extraneous material, if any, shall be removed from the inside of the pipe and the newly made joints shall be thoroughly cured. In case, rubber-sealing rings are used for jointing, these shall conform to IS 5382.

Spigot and Socket Joint (Rigid)

The spigot of each pipe shall be slipped home well into the socket of the pipe previously laid and adjusted in the correct position. The opening of the joint shall be filled with stiff mixture of cement mortar in the proportion as specified, which shall be rammed with caulking tool. This joint is used for low-pressure pipeline.

Collar Joint (Rigid)

After laying the RCC pipes at proper alignment and gradient their abutting faces shall be coated with hot bitumen in liquid condition by means of a brush. The wedge-shaped groove in the end of the pipe shall then be filled with a tarred gasket in one length for each joint. The collar shall then be slipped over the end of the pipe and the next pipe butted well against the tarred gasket by suitable appliances approved by Owner/Engineer so as to thoroughly compress the tarred gasket into the grooves, care being taken that the concentricity of the pipes and levels are not disturbed during this operation. The collar shall then be placed symmetrically over the end of the two pipes and the space between the inside of the collar and the outside of the pipe filled with a mixture of cement and sand as specified, tempered with just sufficient water to have a consistency of the semi-dry conditions, well packed and thoroughly rammed with caulking tools. The joints shall be finished off with a fillet sloping at 45° to the side of the pipe. The finished joints shall be protected and cured thoroughly as directed by Owner/Engineer. Any

plastic solution or cement mortar that may have been squeezed into the inside of the pipe shall be removed so as to leave the inside of the pipe perfectly clean.

Flush Joint (Internal)

This joint shall be generally used for culvert pipes of 900-mm diameter and over. The ends of the pipes are specially shaped to form a self-centering joint with an internal jointing space 13-mm wide. The finished joint is flush with both inside and outside with the pipe wall. The jointing space is filled with cement mortar in the proportion as specified in IS Code, mixed sufficiently dry to remain in position when forced with a trowel or rammed.

Flush Joint (External)

This joint is suitable for pipes which are too small for jointing from inside. This joint is composed of specially shaped pipe ends. Each end shall be butted against each other and adjusted in correct position. The jointing space shall then be filled with cement mortar as specified in IS Code, sufficiently dry and finished off flush. Great care shall be taken to ensure that the projecting ends are not damaged as no repairs can be readily affected from inside the pipe.

Spigot and Socket (Semi-Flexible)

This joint is composed of specially shaped spigot and socket ends on the RCC pipes. A rubber ring as specified in IS Code, shall be lubricated and then placed on the spigot, which is forced into the socket of the pipe previously laid. This compresses the rubber ring as it rolls into the annular space formed between the two surfaces of the spigot and socket, stiff mixture of cement and mortar as specified in Data Sheet-A, shall then be filled into the remaining annular space with a caulking tool.

Collar Joint (Semi-Flexible)

This joint is made up of a loose collar, which covers two specially shaped pipe ends. Each end shall be fitted with a rubber ring as specified in Data Sheet-A which when compressed between the spigot and collar, seals the joint. Stiff mixture of cement mortar shall then be filled into the remaining annular space and rammed with a caulking tool.

Spigot And Socket Joint(Flexible)

The RCC pipe with the rubber ring accurately positioned on the spigot shall be pushed well home into the socket of the previously laid pipe by means of uniformly applied pressure with the aid of a jack or similar appliance. The RCC pipes shall be of spigot and socket type and rubber rings as specified in IS Code, shall be used, and the manufacturers instructions shall be deemed to form a part of these specifications. The rubber rings shall be lubricated before making the joint and the lubricant shall be soft soap water or an approved lubricant supplied by the manufacturer.

Cleaning Of Pipes

As soon as a stretch of RCC pipes has been laid complete from manhole to manhole or for a stretch as directed by Owner/Engineer, contractor shall run through the pipes both backwards and forwards a double disc or solid or closed cylinder 75 mm less in diameter than the internal diameter of pipes. The open end of the incomplete stretch of pipeline shall be securely closed as may be directed by Owner/Engineer to prevent entry of mud or silt etc.

If as a result of the removal of any obstructions Owner/Engineer considers that damages may have been caused to the pipelines, he shall be entitled to order the stretch to be tested immediately. Should such test prove unsatisfactory, contractor shall amend the work and carry out such further tests as are required by Owner/Engineer.

It shall also be ascertained by contractor that each stretch from manhole to manhole or the stretch as directed by Engineer is absolutely clear and without any obstruction by means of visual examination of the interior of the pipeline suitably enlightened by projected sunlight or otherwise.

Measurement

All RCC pipes shall be measured according to the work actually done and no allowance will be made for any waste in cutting to the exact length required. The measurement for pipes shall be in running meter nearest to a cm. of length along the centre line of pipe as actually laid at work sites.

The rate for providing, laying and jointing of RCC pipes shall be deemed to include the cost of collars/rubber rings, jointing material, testing and extra excavation required for ordinary bedding of pipes and also for collars and pipe sockets, if any.

Notes

If any damage is caused to the pipeline during the execution of work or while cleaning/testing the pipeline as specified. Contractor shall be held responsible for the same and shall replace the damaged pipeline and retest the same at his own cost to the full satisfaction of Engineer.

Pipes shall be brought on site proportionate to the required progress

Cutting and making of groove up to depth of 25 to 50 mm, 100 to 125 mm for repairing of cracks in RCC floors with cutter machine and operator etc. complete as directed by engineer in charge.

This item includes Cutting and making of groove up to depth of 100 to 125 mm for repairing of cracks in RCC floors with cutter machine and operator etc. complete as directed by engineer in charge.

The Mode of measurement and rate shall be given as per Running meter basis.

ITEM No-107

Cleaning and Washing of kerbing of existing road and footpath with high jet water pressure pump including tractor/tanker/pump etc.all as per direction of engg. Incharge

This item includes cleaning and Washing of kerbing of existing road and footpath with high jet water pressure pump including tractor/tanker with water/pump/operator etc.all as per direction of engg. Incharge.

The rate shall be for a unit of Running meter.

ITEM NO-108

Making pipe connection to existing R.C.C manhole in running sewer of following dia pipe at any depth, ie making hole to R.C.C wall of any thickness ,fixing pipe in hole to flush the wall, filling gap around pipe with rich concrete of M20 ,finishing it with 15 mm thick plaster(1:3). Rate include removing debris from M.H cutting extra reinforcement in hole to connect the pipe with all tools and tackles as directed by engineer in charge.

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Making connection to the ex. M.H. in running sewer of following dia. Pipes, at any convenient time when M.H. is found empty. All damaged work shall be well repaired as per inst. Etc. complete.

Making connection to the existing M.H. in running sewer of the said dia Pipe at any convenient time and M.H. is found be empty. All damaged work shall be well repaired as per instruction proposed R.C.C. / G.S.W pipe should be connected with the existing M.H. as directed. Hole made In the wall of existing M.H. should be finished smooth in circular shape as directed. Rate also incl. making or repairing of damaged brick, plaster, and channel. As per instruction of E.I.C. rate also incl. of watering etc. comp.

Mode of M/s and payment shall be on unit No. basis.

ITEM No-109

Charges for making holes in RCC walls, slabs or any other RCC member by core cutting machine of HILTI or equivalent including disposing the debris. Measurement will be taken for the depth of holes in running meter for specified diameter. For disposal of the debris specification of relevant items shall be followed.

- (a) Holes of 52 mm, 67 mm, 77mm clear diameter**
- (b) Holes of 102mm clear diameter**
- (c) Holes of 152 mm clear diameter**

This item includes charges for making holes in RCC walls, slabs or any other RCC member by core cutting machine of HILTI or equivalent including disposing the debris. Measurement will be taken for the depth of holes in running meter for specified diameter. For disposal of the debris specification of relevant items shall be followed as directed by engineer in charge.

The Mode of measurement and rate shall be given as per Running meter basis.

ITEM No-110

Labour work for pushing below existing R.C.C/ Bituminous road for cable /pipe crossing at any location as directed by engineer in charge. (Dredging of hole is suitable for pushing of pipe from (b) 100 mm to (c) 200 mm dia.)

This Item includes labour work for pushing below existing R.C.C/ Bituminous road for cable /pipe crossing at any location as directed by engineer in charge. (Dredging of hole is suitable for pushing of pipe from 100 mm to 200 mm dia.)

The Mode of measurement and rate shall be given as per Running meter basis.

ITEM No-111

Extra rate over item of excavation of earth for excavation of asphalt pavement / RCC of thickness up to 0.20 meter including demolishing the asphalt carpet, metal, soiling/cutting Reinforcement etc. comp. with stacking the material as directed. Up to 0.20 meter thickness

This item includes extra rate over item of excavation of earth for excavation of asphalt pavement / RCC of thickness up to 0.20 meter including demolishing the asphalt carpet, metal, soiling/cutting Reinforcement etc. comp. with stacking the material as directed. Up to 0.20 meter thickness

The Mode of measurement and rate shall be given as per Cubic meter basis.

Item No. 112

Providing and laying stone pitching 22.5 cm thick in cement mortar 1:4 (1 cement : 4 Sand) including supply of stones and preparing surface complete as directed by engineer in charge. Base layer of stone pitching shall be paid in relevant tender item.

PITCHING**1.0 Curing**

1.1 CPWD specifications clause no. 7.1.12 shall be followed.

2.0 Protection

2.1 CPWD specifications clause no. 7.1.13 shall be followed.

3.0 Mode of Measurement and Payment

3.1 CPWD specifications clause no. 7.1.14.1, 7.1.14.2, 7.1.14.3, 7.1.14.5, 7.1.14.8, 7.1.14.9 shall be followed.

3.2 Square, rectangular and circular pillars shall be measured as walls and extra will not be paid for.

3.3 For rate CPWD specifications clause no. 7.1.15 shall be followed.

3.4 For rate CPWD specifications clause no. 7.1.15 shall be followed.

The Stone Pitching work shall be measure in sq. meter.

Item No. 113**GRANULAR SUB-BASE**

GSB: -Construction of granular sub-base by providing close graded Material, mixing in a mechanical mix plant at OMC, carriage of mixed Material to work site, spreading in uniform layers with motor grader on prepared surface and compacting with vibratory power roller to achieve the desired density, complete as per clause 401

107.1 Scope

This work shall consist of laying and compacting well-graded material on prepared subgrade in accordance with the requirements of these Specifications. The material shall be laid in one or more layers as sub-base or lower sub-base and upper sub-base (termed as subcase hereinafter) as necessary according to lines, grades and cross-sections shown on the drawings or as directed by the Engineer.

107.2 Materials

401.2.1 The material to be used for the work shall be natural sand, crushed gravel, crushed stone, crushed slag, or combination thereof depending upon the grading required. Use of materials like brick metal, Kankar and crushed concrete shall be permitted in the lower sub-base. The material shall be free from organic or other deleterious constituents and shall conform to the grading given in Table 400-1 and physical requirements given in Table 400-2. Grading III and IV shall preferably be used in lower sub-base. Grading V and VI shall be used as a sub-base-cum-drainage layer. The grading to be adopted for a project shall be as specified in the Contract. Where the sub-base is laid in two layers as upper sub-base and lower sub-base, the thickness of each layer shall not be less than 150 mm.

401.2.2 If the water absorption of the aggregates determined as per IS: 2386 (Part 3) is greater than 2 percent, the aggregates shall be tested for Wet Aggregate Impact Value (AIV) (IS:5640). Soft aggregates like Kankar, brick ballast and laterite shall also be tested for Wet AIV (IS:5640).

Table 400-1: Grading for Granular Sub-base Percent by Weight Passing the IS Sieve Materials IS Sieve

Designation

Grading I	Grading II	Grading III	Grading IV	Grading V	Grading VI
75.0 mm	100	-	-	100	-
53.0 mm	80-100	100	100	80-100	100
26.5 mm	55-90	70-100	55-75	55-90	75-100
9.50 mm	35-65	50-80	-	35-65	55-75
4.75 mm	25-55	40-65	10-30	25-50	30-55
2.36 mm	20-40	30-50	-	10-20	10-25
0.85 mm	-	-	-	2-10	-
0.425 mm	10-15	10- 15	-	0-5	0-8
0.075 mm	<5	<5	<5	-	0-3

Table 400-2: Physical Requirements for Materials for Granular Sub-base

Aggregate Impact Value (AIV)	IS:2386(Part4) or IS:5640	40 maximum
Liquid Limit	IS:2720 (Part 5)	Maximum 25
Plasticity Index	IS:2720 (Part 5)	Maximum 6
CBR at 98% dry density (at IS:2720-Part 8)	IS:2720 (Part 5)	Minimum 30 unless otherwise specified in the Contract

401.3 Construction Operations

401.3.1 Preparation of Sub-grade

Immediately prior to the laying of sub-base, the subgrade already finished to Clause 301 or 305 as applicable shall be prepared by removing all vegetation and other extraneous matter, lightly sprinkled with water, if necessary and rolled with two passes of 80-100 kN smooth wheeled roller.

401.3.2 Spreading and Compacting

The sub-base material of the grading specified in the Contract and water shall be mixed mechanically by a suitable mixer equipped with provision for controlled addition of water and mechanical mixing so as to ensure homogenous and uniform mix. The required water content shall be determined in accordance with IS: 2720 (Part 8). The mix shall be spread on the prepared subgrade with the help of a motor grader of adequate capacity, its blade having hydraulic controls suitable for initial adjustment and for maintaining the required slope and grade during the operation, or other means as approved by the Engineer.

Moisture content of the mix shall be checked in accordance with IS: 2720 (Part 2) and suitably adjusted so that, at the time of compaction, it is from 1 to 2 percent below the optimum moisture content.

Immediately after spreading the mix, rolling shall be done by an approved roller. If the thickness of the compacted layer does not exceed 100 mm, a smooth wheeled roller of 80 to 100 kN weight may be used. For a compacted single layer up to 200 mm the compaction shall be done with the help of a vibratory roller of minimum 80 to 100 kN static weight capable of achieving the required compaction. Rolling shall commence at the lower edge and proceed towards the upper edge longitudinally for portions having unidirectional cross fall or on super elevation. For carriageway having cross fall on both sides, rolling shall commence at the edges and progress towards the crown.

Each pass of the roller shall uniformly overlap not less than one-third of the track made in the preceding pass. During rolling, the grade and cross fall (camber) shall be checked and any high spots or depressions which become apparent, corrected by removing or adding fresh material. The speed of the roller shall not exceed 5 km per hour.

Rolling shall be continued till the density achieved is at least 98 percent of the maximum dry density for the material determined as per IS:2720 (Part 8). The surface of any layer of material on completion of compaction

shall be well closed, free from movement under compaction equipment and from compaction planes, ridges, cracks or loose material. All loose, segregated or otherwise defective areas shall be made good to the full thickness of layer and re-compacted.

401.4 Surface Finish and Quality Control of Work

The surface finish of construction shall conform to the requirements of Clause 902. Control on the quality of materials and works shall be exercised by the Engineer in accordance with Section 900.

401.5 Arrangements for Traffic

During the period of construction, arrangements for the traffic shall be provided and maintained in accordance with Clause 112.

401.6 Measurements for Payment

Granular sub-base shall be measured as finished work in position in cubic metres.

The protection of edges of granular sub-base extended over the full formation as shown in the drawing shall be considered incidental to the work of providing granular sub-base and as such no extra payment shall be made for the same.

401.7 Rate

The Contract unit rate for granular sub-base shall be payment in full for carrying out the required operations including full compensation for:

- i) making arrangements for traffic to Clause 112 except for initial treatment to verges, shoulders and construction of diversions;
- ii) supplying all materials to be incorporated in the work including all royalties, fees, rents where applicable with all leads and lifts;
- iii) all labour, tools, equipment and incidentals to complete the work to the Specifications;
- iv) carrying out the work in part widths of road where directed; and
- v) carrying out the required tests for quality control.

Item No. 114

WET MIX MACADAM SUB-BASE/BASE

WMM (Wet Mix Macadam): Providing , laying and compacting clean, crushed, graded aggregate and granular material, premixed with water, to a dense mass on a prepared subgrade/sub-base/base in accordance with the requirements of these Specifications. The material shall be laid in 100 mm layers to lines, grades and cross-sections shown on the approved drawings or as direction by the Engineer. The contractor unit rate includes furnishing all materials to be incorporated in the work including all royalties, fees, rents where necessary and all leads and lifts, all labour, tools, equipment and incidentals to complete the work to the Specifications,)carrying out the work in part widths of road where directed; and carrying out the required tests for quality.

113.1 Scope

This work shall consist of laying and compacting clean, crushed, graded aggregate and granular material, premixed with water, to a dense mass on a prepared sub-grade/sub- base/ base or existing pavement as the case may be in accordance with the requirements of these Specifications. The material shall be laid in one or *more* layers as necessary to lines, grades and cross-sections shown on the approved drawings or as directed by the Engineer.

The thickness of a single compacted Wet Mix Macadam layer shall not be less than 75 mm. When vibrating or other approved types of compacting equipment are used, the compacted depth of a single layer of the sub-base course may be up to 200 mm with the approval of the Engineer.

113.2 Materials

113.2.1 Aggregates

113.2.1.1 Physical Requirements

Coarse aggregates shall be crushed stone. If crushed gravel/shingle is used, not less than 90 percent by weight of the gravel/shingle pieces retained on 4.75 mm sieve shall have at least two fractured faces. The aggregates shall conform to the physical requirements set forth in Table 107-12.

If the water absorption value of the coarse aggregate is greater than 2 percent, the soundness test shall be carried out on the material delivered to site as per IS: 2386 (Part-5).

Table 113-12: Physical Requirements of Coarse Aggregates for

Wet Mix Macadam for Sub-base/Base Courses

S.NO	Test	Test Method	Requirements
1)	Los Angeles Abrasion value or	IS:2386 (Part-4) IS:2386 (Part-4) or IS:5640	40 percent (Max.) 30 percent (Max.)
2)	Impact value Combined Flakiness and Elongation indices (Total)	IS:2386(Part-1)	35 percent (Max.)*

To determine this combined proportion, the flaky stone from a representative sample should first be separated out. Flakiness index is weight of flaky stone metal divided by weight of stone sample. Only the elongated particles be separated out from the remaining (non-flaky) stone metal. Elongation index is weight of elongated particles divided by total non-flaky particles. The values of flakiness index and elongation index so found are added up.

Grading Requirements

The aggregates shall conform to the grading given in Table 400-13.

Table 113-13: Grading Requirements of Aggregates for Wet Mix Macadam

IS Sieve Designation	Percent by weight passing the IS Sieve
53.00mm	100
45.00mm	95-100
26.50mm	-
22.40mm	60-80
11.20mm	40-60
4.75mm	25-40
2.36mm	15-30
600.00 micron	8-22
75.00 micron	0-5

Material finer than 425 micron shall have Plasticity Index (PI) not exceeding 6.

The final gradation approved within these limits shall be graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieve or vice versa.

113.3 Construction Operations

113.3.1 Preparation of Base

Clause 404.3.1 shall apply.

113.3.2 Provision of Lateral Confinement of Aggregates

While constructing wet mix macadam, arrangement shall be made for the lateral confinement of wet mix. This shall be done by laying materials in adjoining shoulders along with that of wet mix macadam layer and following the sequence of operations described in Clause 108.3.3.

113.3.3 Preparation of Mix

Wet Mix Macadam shall be prepared in an approved mixing plant of suitable capacity having provision for controlled addition of water and forced/ positive mixing arrangement like pugmill or pan type mixer of concrete batching plant. The plant shall have following features:

- i) For feeding aggregates- three/ four bin feeders with variable speed motor
- ii) Vibrating screen for removal of oversize aggregates
- iii) Conveyor Belt
- iv) Controlled system for addition of water
- v) Forced/positive mixing arrangement like pug-mill or pan type mixer
- vi) Centralized control panel for sequential operation of various devices and precise process control
- vii) Safety devices

Optimum moisture for mixing shall be determined in accordance with IS: 2720 (Part-8) after replacing the aggregate fraction retained on 22.4 mm sieve with material of 4.75 mm to 22.4 mm size. While adding water, due allowance should be made for evaporation losses. However, at the time of compaction, water in the wet mix should not vary from the optimum value by more than agreed limits. The mixed material should be uniformly wet and no segregation should be permitted.

113.3.4 Spreading of Mix

Immediately after mixing, the aggregates shall be spread uniformly and evenly upon the prepared sub-grade/sub-base/base in required quantities. In no case shall these be dumped in heaps directly on the area where these are to be laid nor shall their hauling over a partly completed stretch be permitted.

The mix may be spread by a paver finisher. The paver finisher shall be self-propelled of adequate capacity with following features:

- i) Loading hoppers and suitable distribution system, so as to provide a smooth uninterrupted material flow for different layer thicknesses from the tipper to the screed.
- ii) Hydraulically operated telescopic screed for paving width up to 8.5 m and fixed screed beyond this. The screed shall have tamping and vibrating arrangement for initial compaction of the layer.
- iii) Automatic levelling control system with electronic sensing device to maintain mat thickness and cross slope of mat during laying procedure.

In exceptional cases where it is not possible for the paver to be utilized, mechanical means like motor grader may be used with the prior approval of the Engineer. The motor grader shall be capable of spreading the material uniformly all over the surface.

The surface of the aggregate shall be carefully checked with templates and all high or low spots remedied by removing or adding aggregate as may be required. The layer may be tested by depth blocks during construction. No segregation of larger and fine particles should be allowed. The aggregates as spread should be of uniform gradation with no pockets of fine materials.

The Engineer may permit manual mixing and /or laying of wet mix macadam where small quantity of wet mix macadam is to be executed. Manual mixing/laying in inaccessible/ remote locations and in situations where use of machinery is not feasible can also be permitted.

Where manual mixing/laying is intended to be used, the same shall be done with the approval of the Engineer.

113.3.5 Compaction

After the mix has been laid to the required thickness, grade and cross fall/camber the same shall be uniformly compacted to the full depth with suitable roller. If the thickness of single compacted layer does not exceed 100 mm, a smooth wheel roller of 80 to 100kN weight may be used. For a compacted single layer up to 200 mm, the compaction shall be done with the help of vibratory roller of minimum static weight of 80 to 100 kN with an arrangement for adjusting the frequency and amplitude. An appropriate frequency and amplitude may be selected. The speed of the roller shall not exceed 5 km/h.

In portions having unidirectional cross fall/super elevation, rolling shall commence from the lower edge and progress gradually towards the upper edge. Thereafter, roller should progress parallel to the center line of the road, uniformly over-lapping each preceding track by at least one-third width until the entire surface has been rolled. Alternate trips of the roller shall be terminated in stops at least 1 m away from any preceding stop.

In portions in camber, rolling should begin at the edge with the roller running forward and backward until the edges have been firmly compacted. The roller shall then progress gradually towards the centre parallel to the centre line of the road uniformly overlapping each of the preceding track by at least one-third width until the entire surface has been rolled.

Any displacement occurring as a result of reversing of the direction of a roller or from any other cause shall be corrected at once as specified and/or removed and made good.

Along forms, kerbs, walls or other places not accessible to the roller, the mixture shall be thoroughly compacted with mechanical tampers or a plate compactor. Skin patching of an area without scarifying the surface to permit proper bonding of the added material shall not be permitted.

Rolling should not be done when the sub-grade is soft or yielding or when it causes a wavelike motion in the sub-base/base course or sub-grade. If irregularities develop during rolling which exceed 12 mm when tested with a 3 m straight edge, the surface should be loosened and premixed material added or removed as required before rolling again so as to achieve a uniform surface conforming to the desired grade and cross fall. In no case shall the use of unmixed material be permitted to make up the depressions.

Rolling shall be continued till the density achieved is at least 98 percent of the maximum dry density for the material as determined by the method outlined in IS:2720 (Part-8).

After completion, the surface of any finished layer shall be well-closed, free from movement under compaction equipment or any compaction planes, ridges, cracks and loose material. All loose, segregated or otherwise defective areas shall be made good to the full thickness of the layer and re compacted.

113.3.6 Setting and Drying

After final compaction of wet mix macadam course, the road shall be allowed to dry for

24 hours.

113.4 Opening to Traffic

No vehicular traffic shall be allowed on the finished wet mix macadam surface. Construction equipment may be allowed with the approval of the Engineer.

113.5 Surface Finish and Quality Control of Work

113.5.1 Surface Evenness

The surface finish of construction shall conform to the requirements of Clause 902.

113.5.2 Quality Control

Control on the quality of materials and works shall be exercised by the Engineer in accordance with Section 900.

113.6 Rectification of Surface Irregularity

Where the surface irregularity of the wet mix macadam course exceeds the permissible tolerances or where the course is otherwise defective due to sub-grade soil getting mixed with the aggregates, the full thickness of the layer shall be scarified over the affected area, re-shaped with added premixed material or removed and replaced with fresh premixed material as applicable and re compacted in accordance with Clause 108.3. The area treated in the aforesaid manner shall not be less than 5 m long and 2 m wide. In no case shall depressions be filled up with unmixed and ungraded material or fines.

113.7 Arrangement for Traffic

During the period of construction, arrangements for traffic shall be done as per Clause 113.

113.8 Measurements for Payment

Wet mix macadam shall be measured as finished work in position in cubic metres.

113.9 Rate

The Contract unit rate for wet mix macadam shall be payment in full for carrying out the required operations including full compensation for all components.

Item No. 115

DRY LEAN CEMENT CONCRETE SUB-BASE

Providing and laying of Dry Lean Concrete (DLC) of M15 grade below concrete pavement, cycle track and footpath and compacting the same with 8 to 10 Tone vibratory roller as per the specifications and as per drawing and as directed by the Engineer. Rate shall include cost of formwork if any.

Scope

The work shall consist of construction of (zero slump) dry lean concrete sub-base for cement concrete pavement 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. The work shall include furnishing of all plant and equipment, materials and labour and performing all operations, in connection with the work, as approved by the Engineer.

The design parameters of dry lean concrete sub-base, viz., width, thickness, grade of concrete, details of joints, if any, etc. shall be as stipulated in the drawings.

Materials

Sources of Materials

The Contractor shall indicate to the Engineer the source of all materials with relevant test data to be used in the dry lean concrete work sufficiently in advance and the approval of the Engineer for the same shall be obtained at least 45 days before the scheduled commencement of the work in trial length. If the Contractor later proposes to obtain the materials from a different source during the execution of main work, he shall notify the Engineer with relevant test data for his approval at least 45 days before such materials are to be used.

Cement

Any of the following types of cement may be used with prior approval of the Engineer:

S. No.	Type	Conforming to
i)	Ordinary Portland Cement 43 Grade	IS-.8112
ii)	Portland Slag Cement	IS:455

- iii) Portland Pozzolana Cement IS:1489-Part I

If the subgrade soil contains soluble sulphates in a concentration more than 0.5 percent, sulphate resistant cement conforming to IS:6909 shall be used.

Cement to be used may preferably be obtained in bulk form. It shall be stored in accordance with stipulations contained in Clause 1014 and shall be subjected to acceptance test prior to its immediate use.

114.2.3 Fly-ash

Fly-ash up to 20 percent by weight of cementitious material (cement+flyash) may be used along with 43/53 grade cement may be used to replace OPC cement grade 43 up to 30 percent by weight of cement. Fly-ash shall conform to IS:3812 (Part 1) and its use shall be permitted only after ensuring that facilities exist for uniform blending through a proper mechanical facility with automated process control like batch mix plant conforming to IS:4925 and IS:4926.

114.2.4 Aggregates

114.2.4.1

Aggregates for lean concrete shall be natural material complying with IS:383.

The aggregates shall not be alkali reactive. The limits of deleterious materials shall not exceed the requirements set forth in Table 114-2. In case the Engineer considers that the aggregates are not free from dirt, the same may be washed and drained for at least 72 hours before batching, or as directed by the Engineer.

114.2.4.2 Coarse Aggregates

Coarse aggregates shall comply with Clause 114.2.6.2, except that the maximum size of the coarse aggregate shall be 26.5 mm, and aggregate gradation shall comply with Table 600-1.

114.2.4.3 Fine Aggregates

The fine aggregate shall comply with Clause 109.2.6.3.

114.2.4.4 The material after blending shall conform to the grading as indicated in Table 600-1.

Table 114-1: Aggregate Gradation for Dry Lean Concrete

Sieve Designation	Percentage by Weight Passing the Sieve
26.50 mm	100
19.0 mm	75-95
9.50 mm	50-70
4.75 mm	30-55
2.36 mm	17-42
600 micron	8-22
300 micron	7-17
150 micron	2-12
75 micron	0-10

114.2.5 Water

Water used for mixing and curing of concrete shall comply with Clause 602.2.7.
Concrete Pavement Section 600

114.2.6 Storage of Materials

All materials shall be stored in accordance with the provisions of Clauses 602.2.12 of these Specifications and other relevant IS Specifications.

114.3 Proportioning of Materials for the Mix

114.3.1 The mix shall be proportioned with a maximum aggregate cementitious material ratio of 15:1. The water content shall be adjusted to the optimum as per Clause 109.3.2 for facilitating compaction by rolling. The strength and density requirements of concrete shall be determined in accordance with Clauses 109.7 and 109.8 by making trial mixes. Care should be taken to prevent one size of aggregate falling into the other size of the hopper of the feeding bin while loading the individual size of aggregates into the bins.

601.3.2 Moisture Content

The optimum water content shall be determined and demonstrated by rolling during trial length construction and the optimum moisture content and degree of compaction shall be got approved from Engineer. While lying in the main work, the lean concrete shall have a moisture content between the optimum and optimum +2 percent, keeping in view the effectiveness of compaction achieved and to compensate for evaporation losses.

601.3.3 Cement Content

The cement content in the dry lean concrete shall be such that the strength specified in Clause 601.3.4 is achieved. The minimum cement content shall be 150 kg/cu.m of concrete. In case fly ash is blended at site as part replacement of cement, the quantity of fly ash shall not be

more than 20 percent by weight of cementitious material and the content of OPC shall not be less than 120 kg/cu.m.

If this minimum is not sufficient to produce dry lean concrete of the specified strength, it shall be increased as necessary by the Contractor at his own cost.

114.3.4 Concrete Strength

The average compressive strength of each consecutive group of 5 cubes made in accordance with Clause 903.5.1.1 shall not be less than 10 Mpa at 7 days. In addition, the minimum compressive strength of any individual cube shall not be less than 7.5 Mpa at 7 days. The design mix complying with the above Clauses shall be got approved from the Engineer and demonstrated in the trial length construction.

114.4 Sub-grade

The sub-grade shall conform to the grades and cross-sections shown on the drawings and shall be laid and compacted in accordance with Clause 305. The subgrade strength shall correspond to the design strength specified in the Contract. As far as possible, the construction traffic shall be avoided on the prepared sub-grade.

114.5 Drainage Layer

A drainage layer conforming to Clause 401 shall be laid above the subgrade before laying the Dry Lean Concrete sub-base, as specified in the drawings and the Contract.

114.6 Construction**114.6.1 General**

The Dry Lean Concrete shall be laid on the prepared granular drainage layer. The pace and programme of the Dry Lean Concrete sub-base construction shall be matching suitably with the programme of construction of the cement concrete pavement over it. The Dry Lean Concrete sub-base shall be overlaid with concrete pavement only after 7 days of sub-base construction.

114.6.2 Batching and Mixing

The batching plant shall be capable of proportioning the materials by weight, each type of material being weighed separately. The design features of Batching Plant should be such that the plant can be shifted quickly.

114.6.3 Transporting

Plant mix lean concrete shall be discharged immediately from the mixer, transported directly to the point where it is to be laid and protected from the weather by covering the tipping trucks with tarpaulin during transit. The concrete shall be transported by tipping trucks, sufficient in number to ensure a continuous supply of material to feed the laying equipment to work at a uniform speed and in an uninterrupted manner.

114.6.4 Placing

Lean concrete shall be placed by a paver with electronic sensor on the drainage layer or as specified in the Contract. The equipment shall be capable of laying the material in one layer in an even manner without segregation, so that after compaction the total thickness is as specified.

114.6.5 Compaction

114.6.5.1 The compaction shall be carried out immediately after the material is laid and leveled. In order to ensure thorough compaction, rolling shall be continued on the full width till there is no further visible movement under the roller and the surface is well closed. The minimum dry density obtained shall not be less than 98 percent of that achieved during the trial length construction in accordance with Clause 109.7. The densities achieved at the edges i.e. 0.5 m from the edge shall not be less than 96 percent of that achieved during the trial construction.

114.6.5.2

Segregation of concrete in the tipping trucks shall be controlled by moving the dumper back and forth while discharging the mix into the same or by any appropriate means. Paving operation shall be such that the mix does not segregate.

114.6.6 Joints

Construction and longitudinal joints shall be provided as per the drawings.

114.6.7 Curing

Curing may be done by covering the surface by gunny bags/hessian, which shall be kept wet continuously for 7 days by sprinkling water.

114.7 Trial Mixes

The Contractor shall make trial mixes of dry lean concrete with moisture contents like 5.0, 5.5, 6.0, 6.5 and 7.0 percent using specified cement content, specified aggregate grading and aggregate-cement ratio specified in Clause 109.3.1. Optimum moisture and density shall be established by preparing cubes with varying moisture contents. Compaction of the mix shall be done in three layers with vibratory hammer fitted with a square or rectangular foot as described in Clause 903.5.1.1. After establishing the optimum moisture, a set of six cubes shall be cast at optimum moisture for the determination of compressive strength on the third and the seventh day. Trial mixes shall be repeated if the strength is not satisfactory by increasing cement content. After the mix design is approved, the Contractor shall construct a trial section in accordance with Clause 109.8.

If during the construction of the trial length, the optimum moisture content determined as above is found to be unsatisfactory, the Contractor may make suitable changes in the moisture content to achieve the satisfactory mix. The cube specimens prepared with the changed mix content should satisfy the strength requirement. Before production of the mix, natural moisture content of the aggregate should be determined on a day-to-day basis so that the moisture content could be adjusted. The mix finally designed should neither stick to the rollers nor become too dry resulting in ravelling of surface.

Trial Length

The trial length shall be constructed at least 14 days in advance of the proposed date of commencement of work. At least 30 days prior to the construction of the trial length, the Contractor shall submit for the Engineer's approval a "Method Statement" giving detailed description of the proposed materials, plant, equipment, mix proportions, and procedure for batching, mixing, laying, compaction and other construction procedures. The Engineer shall also approve the location and length of trial construction which shall be a minimum of 100 m length laid in two days and for full width of the pavement. The trial length shall be outside the main works. The trial length shall contain the construction of at least one transverse construction joint involving hardened concrete and freshly laid Dry Lean Concrete sub-base. The construction of trial length shall be repeated till the Contractor proves his ability to satisfactorily construct the Dry Lean Concrete sub-base.

114.8.2 After the construction of the trial length, the in-situ density of the freshly laid material shall be determined by sand replacement method. Three density holes shall be made at locations equally spaced along a diagonal that bisects the trial length and average of these densities shall be determined. The density holes shall not be made in the strip 500 mm from the edges. The average density obtained from the three samples collected shall be the reference density and is considered as 100 percent. The field density of regular work will be compared with this reference density in accordance with Clauses 109.6.5.1

114.8.3 The hardened concrete shall be cut over 3 m width and reversed to inspect the bottom surface for any segregation taking place. The trial length shall be constructed after making necessary changes in the gradation of the mix to eliminate segregation of the mix. The lower surface shall not have honey-combing and the aggregates shall not be held loosely at the edges.

114.8.4 The main work shall not start until the trial length has been approved by the Engineer. After approval has been given, the materials, mix proportions, moisture content, mixing, laying, compaction plant and construction procedures shall not be changed without the approval of the Engineer.

114.9 Tolerances for Surface Regularity, Level, Thickness, Density and

Strength

Control of quality of materials and works shall be exercised by the Engineer in accordance with Section 900. Sabarmati River Front Development Corporation Limited

114.10 Traffic

No heavy commercial vehicles like trucks and buses shall be permitted on the dry lean concrete sub-base. Construction vehicles at slow speed may be permitted after 7 days of its construction with the prior approval of the Engineer.

114.11 Measurement for Payment

The unit of measurement for dry lean concrete pavement shall be in cubic metre of concrete placed, based on the net plan area for the accepted thickness shown on the drawings or as directed by the Engineer.

114.12 Rate

The Contract unit rate payable for dry lean concrete sub-base shall be for carrying out the required operations including full compensation for all labour, materials and equipment, mixing, transport, placing, compacting, finishing, curing, rectification of defective surface testing and incidentals such as trial length to complete the work as per Specifications, all royalties, fees, storage and rents where necessary and all leads and lifts.

Item No. 116

Providing and fixing approved quality flexible spring post rubber bollard of height 0.80 meter with reflective tapes. Rate including for all material used for fixing

This item includes providing Providing and fixing approved quality flexible spring post rubber bollard of height 0.80 meter with reflective tapes. Rate including for all material used for fixing and tackles as directed by engineer in charge.

The Mode of measurement and rate shall be for each/Nos basis.

Item No. 117

Providing and laying wooden polish as per the specifications and as per drawing and as directed by the Engineer. Rate shall include cost of formwork if any.

This item includes Providing and laying wooden polish as per the specifications and as per drawing and as directed by the Engineer. Rate shall include cost of formwork if any and as per directed by engineer in charge.

The Mode of measurement and rate shall be for Smt.

Item No. 118

Aluminum door repairing as per directed by engineer in charge.

The Mode of measurement and rate shall be for Sft.

Item No. 119

Providing & fixing switches for pelini system curtain riverside faced of riverfront house with labor etc. completes per directed by engineer in charge.

Mode of measurements & payment : The rate shall be for a unit of one No.

Item No. 120

Electrician for pelini system

Electrician for pelini system as per directed by engineer in charge.

Mode of measurements & payment : The rate shall be for a unit of Day.

Item No. 121

Loose Furniture Works

1.1 Providing and Fixing in position bought out Loose furniture as sample approved by Architect and Engineer In charge and as per below specifications. The work shall be measured and paid in Nos. The

rates shall be inclusive of Veneer/wood Surfaces, laminates, fabric, MS, etc. and all materials, labour, wastages, taxes, transportation, loading, unloading, fixing in position, etc. complete to the satisfaction of the Architect and EIC. The contractor shall get the photograph and one sample of each category. as per finish specified, approved with the Architect, client and Engineer in charge before purchase and installation. In case of veneer finish furniture, the veneer shall be 4mm thick having base of IS 303 BWR ply of greenply or approved make and monocoat polish over the surface as per manufacturer's specifications. Laminate shall be 1 mm thick of approved shade as per selection of Architect. All the hardware like handles, hinges, channels for drawers, etc. shall of Hettich, Hafele, Dorma, Kich or as per approved make of grade SS304/SS316 as per relevant manufacturer's specifications. In case of brass hardware shall be of EPPW, Magnum, etc. as per drawing. All storage units shall have shutters with hinges and adjustable shelves with lock and handles as per manufacturer's specification and as approved by Architect. The furniture in all rooms shall be having laminate/veneer finish of approved shade as per selection of Architect and Engineer in charge. The dimensions of all the furniture may vary by 10-20% based on actual site conditions and relevant manufacturer's specifications. Sample to be approved by Architect/Engineer in Charge before execution and mass production.

Storage Units

Workstation area-SU4-

Storage Unit of Size 1200/1050 mm W x 450 mm D x 900 mm H having shutters with auto closing hinges and adjustable shelves with lock and handles. All specifications mentioned in above items are also applicable.

Storage Unit - SU2 -

Storage unit of Size 1200 mm W x 450 mm D x 1200 mm H having shutters with auto closing hinges and adjustable shelves with lock and handles. All specifications mentioned in above items are also applicable.

Storage Unit -side Table

Storage unit of Size 450 mm W x 380 mm D x 600 mm H having shutters with auto closing hinges and adjustable shelves with lock and handles. All specifications mentioned in above items are also applicable.

Mode of measurements & payment : The rate shall be for a unit of No.

Item No. 122

Providing and fixing approved quality FRP (Fibre Reinforced Plastic) sheets of 2 mm to 3 mm thickness, including necessary MS (Mild Steel) supporting structure, complete. The rate shall include drilling of required holes, cutting, fitting, fastening with suitable nuts, bolts, washers and accessories, all labour, scaffolding, tools and plants, transportation, and all other incidental charges necessary to complete the work in accordance with the drawings, specifications, and as directed by the Engineer-in-Charge.

FRP (Fibre Reinforced Plastic) sheets of 2 mm to 3 mm thickness, including necessary MS (Mild Steel) supporting structure, complete. The rate shall include drilling of required holes, cutting, fitting, fastening with suitable nuts, bolts, washers and accessories, all labour, scaffolding, tools and plants, transportation, and all other incidental charges necessary to complete the work

Mode of measurements & payment : The rate shall be for a unit of Smt.

Item No. 123

13.52 mm [6+1.52 PVB+6] thick Straight Laminated Toughened 1 Glass (Up to 755mm height) including Transportation and Installation of Glass

13.52 mm [6+1.52 PVB+6] thick Straight Laminated Toughened 1 Glass (Up to 755mm height) including Transportation and Installation of Glass as directed by the Engineer-in-Charge.

Mode of measurements & payment : The rate shall be for a unit of No.

Item No. 124

Wooden templates cost [Procurement of wooden ply, transport of wooden ply till site, labour cost of making wooden template, transport of wooden ply till glass factory]

Procurement of good-quality plywood/wooden sheets and timber sections required for fabrication. Loading, unloading, and transportation of plywood, timber, and other materials from the supplier to the fabrication/workshop/site as directed by the Engineer-in-Charge.

Mode of measurements & payment : The rate shall be for a unit of No.

Item No. 125

Providing and fixing in 25mm expansion joints, SILFLEX/Capcell HD 100 Supreme or equivalent (Polyurethane foam filler) of the best quality, including in all shapes and all levels etc. complete as directed by Engineer-in-Charge and as per specification.

Synthetic Joint filler board for expansion joints shall be used only at abutting structures like bridges and shall be of 25 mm thickness within a tolerance of ± 1.5 mm and of a firm compressible material and complying with the requirements of IS: 1838, with a compressibility more than 25 percent. It shall be 25 mm less in depth than the thickness of the slab within a tolerance of ± 3 mm and provided to the full width between the side forms. It shall be in suitable lengths which shall not be less than one lane width. If two pieces are joined to make up full width, the joint shall be taped such that no slurry escapes through the joint. Holes to accommodate dowel bars shall be accurately bored or punched out to give a sliding fit on the dowel bars. as directed by the Engineer-in-Charge.

Mode of measurements & payment : The rate shall be for a unit of Smt.

Item No. 126**Chair Repairing work**

Chair Repairing work, Chair top, Handel S S, Hydraulic cylinder, Side stand, Chair Wheel, Labour charge for chair service, Chair Handel cover as directed by the Engineer-in-Charge.

Mode of measurements & payment : The rate shall be for a unit of No.

Item No. 127**Supplying Chairs with SS Base and castors**

Type - 2 - High back chair with multilock mechanism and two way adjustable arms with leather seat and back and relevant specifications as per the manufacturer. (Amardeep/Godrej/Hof)

Type - 3 - Medium back chair with multilock mechanism and Aluminium Buffed arms with leather seat and back without head rest and relevant specifications as per the manufacturer. (Amardeep/Godrej/Hof)

Mode of measurements & payment : The rate shall be for a unit of No.

Item No. 128

Providing and laying, exterior grade wooden deck flooring (Series: IPE, Type: Brazilian Walnut, Colour: Natural manufactured by Xylos Arteriors India Pvt. Ltd. or approved equivalent) in 1500mm x 90mm size & 19mm thick sized planks, air dried to moisture content not exceeding 12%, tested for strength as per ASTM-D143 & for slip resistance as per ASTM C-1028-89 and laid in approved pattern and in required position on base frame work made out of salwood battens of 60mm x 30mm size at 450mm c/c (one way) drilling & fixing to the floor base using concrete screws with rawl plug or any other approved fixing arrangements.

The salwood frame work shall be treated with approved wood preservative. The IPE decking shall be fixed to the base battens by drilling counter sunk wooden screws or any other approved fixing arrangements and the sides of the planks shall be joined by approved clipping arrangements including providing joints of 2 to 3mm, finished with linseed oil, all accessories for fixing, cleaning the base of the floor etc. complete including providing 10 years performance guarantee on approved proforma for the entire installed system all as per manufacturer's specifications, detailed shop drawings and as directed by the Engineer. The rate shall include cleaning the surface, supply & fixing the base frame work, supply & installation of wooden plank flooring, polishing etc complete.

The salwood frame work shall be treated with approved wood preservative. The IPE decking shall be fixed to the base battens by drilling counter sunk wooden screws or any other approved fixing arrangements and the sides of the planks shall be joined by approved clipping arrangements including providing joints of 2 to 3mm, finished with linseed oil, all accessories for fixing, cleaning the base of the floor etc. complete including providing 10 years performance guarantee on approved proforma for the entire installed system all as per manufacturer's specifications, detailed shop drawings and as directed by the Engineer.

Mode of measurements & payment : The rate shall be for a unit of Smt.

Item No. 129

Sealing of crack / porous concrete with Epoxy Grout by injection through nipples complete as per MORTH Clause 2803.1

General The work of structural bonding of concrete using epoxy adhesive shall conform to these Specifications.

Section 2800 Repair of Structures 2803.2 The Contractor shall furnish a method statement giving details of methodology of construction, sources of supply of materials, tools, equipment, and appliances to be used on work, personnel and supervision.

2803.3 Personnel The Contractor's personnel shall be qualified and experienced in epoxy injection process.

2803.4 Material The material for injection shall be suitable two-component low viscosity epoxy resin, having the required characteristics of bonding with concrete and resistance to moisture penetration. Epoxy mortar or polysulphide resin may be used for sealing the surface. The material for epoxy injection shall conform to the following:

i) The resin and hardener shall be mixed by weight and the mixing ratio shall generally be between 1 pbw (parts by weight) to 50 pbw subject to manufacturer's recommendation.

ii) Neither the mixed epoxy adhesives nor their individual component shall contain solvents and thickeners.

iii) The components shall be free of lumps or foreign material. The viscosity of the individual components shall not change more than ± 15 percent kept in closed containers at 25°C after two weeks.

iv) Consistency of mixed adhesive shall satisfy the requirements given in Table 2800-1. Table 2800-1: Consistency of Adhesive Standard Version Low Viscosity (cps) Version (cps) Viscosity of Mixed Adhesive at 25° C (200-300) (100-190) Pot Life of mixed adhesive at 25° C 1 hour $\pm$ 15 minutes* Set time of mixed adhesive at 25°C 3- 6 hours * In the case of two component injection system where resin and hardener get mixed at point of injection pot life at 25°C shall be not greater than 15 minutes $\pm$ 10 minutes, 2803.5

Equipment for Injection The equipment shall be portable positive displacement type pumps with interlock to provide positive ratio control of exact proportions of the two components at nozzle. The pumps shall be generally electrically powered and shall provide in-time metering and mixing. The tolerance\ Repair of Structures Section 2800 on mix ratio shall be 5 percent by volume. The injection equipment shall have automatic pressure control capable of discharging mixed adhesive at any pre-set pressure within the prescribed limits and shall be additionally equipped with a manual pressure control. The injection equipment shall be equipped with sensors on both the components A and B reservoirs that will automatically stop the machine when only one component is being pumped to the mixing head. If considered appropriate, suitable compressed air operated epoxy injection gun can be used with prior approval of the Engineer for manual injection of mix when resin and hardener had been mixed in a separate unit.

2803-6 Preparation Surfaces adjacent to cracks or other areas of application shall be cleaned of dirt, dust, grease, oil efflorescence or other foreign matter by brushing/water jetting/sand blasting. Acids and corrosives shall not be permitted for cleaning. Entry ports shall be provided along the crack at intervals of not more than the thickness of concrete at the location. Surface seal shall be applied to the face of the crack between the entry ports. For through cracks, surface seal shall be applied to both faces. Before proceeding with the

injection, it shall be ensured that the surface seal has gained adequate strength corresponding to concrete strength of the member and to withstand the injection pressure.

2803.7 Epoxy Injection Injection of epoxy adhesive shall begin at the lowest entry port and continue until the epoxy adhesive appears at the next adjacent entry port. The injection shall then be discontinued at the first entry port which shall be sealed. Thereafter, epoxy injection shall be carried out from the next adjacent port and continued successively from each port until the crack is completely filled. If travel of epoxy adhesive from one port to the next does not occur, the work shall be stopped immediately. In case the volume of the injected material exceeds 2 litres for a particular entry port, the work shall be stopped and the specifications may be reviewed. Section 2800 Repair of Structures.

2803.8 Precautions for Application 2803.9 2803.9.1

- a) Temperature of components A and B, i.e., resin and hardener shall be between 10°C and 35°C at the time of mixing unless otherwise specified.
- b) Temperature of structural member during epoxy injection shall be between 10°C and 35°C unless otherwise specified.
- c) Immediately prior to use, each component shall be thoroughly mixed with a clean paddle. The paddle shall be of a type that does not propel air into the material. Separate clean paddle shall be used for each component.
- d) Any heating of the adhesive components shall be done by application of indirect heat; in case the work is to be done in cold climate.
- e) Just before use, the two components shall be thoroughly mixed in the ratios specified by the manufacturer. The mixing time shall be strictly in accordance with manufacturer's recommendations. When adhesives with different coloured components are mixed, the mixture shall have a uniform colour without streaks.
- f) The use of solvents and thinners shall not be permitted except for cleaning of equipment. Testing Material Testing Prior to approval of material, the following tests shall be carried out by the Contractor at site or in an authorised laboratory for each batch of resin and hardener and each combination.
 - i) Viscosity test for resin and hardener and the mix: three specimens each.
 - ii) Pot life test: three specimens each.
 - iii) Bond test: three specimens each.
 - iv) Shear test: six specimens each, 3 after 24 hours and the other three after 72 hours of curing. Subsequent tests shall be carried out as directed by the Engineer. Procedure for tests shall be as below:
 - i) Pot Life Test a) 500 gm of resin formulation shall be prepared by thoroughly mixing the resin and hardener/ accelerator/ catalyst component in proposed proportion in a 1 kg capacity hemispheric Repair of Structures Section 2800 porcelain bowl by means of a spatula or any other agitating device and time and the ambient temperature noted.
 - b) The resin formulation shall be applied with a clean dry 25 mm size painter's brush, on a clean dry surface such as cement concrete over 150 mm - 200 mm length, starting immediately after mixing the formulation and repeating the operation every five minutes. When it becomes just difficult to spread the resin properly with the brush, the time is noted. The time elapsed since completion of mixing of resin formulation, is taken as its pot life.
 - c) One pot life test shall be performed on commencement of work and the same shall be repeated every four hours.
 - d) In case the material fails to satisfy the pot life test, it shall not be used for injection. Where the resin and hardener get mixed at point of injection, the pot life is not important and no tests may be required.
 - ii) Bond Test A standard 150 mm diameter and 300 mm long concrete cylinder shall be cast in 2 pieces by providing a separating medium at an axis of 45 degrees to the longer axis of the cylinder as shown in Fig. 1 of Appendix 2800/1. Three such split cylinders

shall be prepared. Two pieces of each cylinder shall be joined with epoxy mortar at four points to give a clear gap of about 0.2 mm, which will be injected with epoxy resin at site. After epoxy has been cured, load test shall be carried out on the cylinder. The failure shall not take place at the joint injected with epoxy resin. Also the strength of cylinder at failure shall not be less than 80 percent of the 28 days' cube strength of the concrete mix. iii) Shear Tests Two steel plates, minimum 3 mm thick, shall be bonded with epoxy at site using the same resin mix as used/proposed to be used for injection. The assembly shall be kept in mechanical clamp till epoxy is cured. A total of six specimens shall be prepared for each batch of materials. Three test specimens shall then be subjected to a shear force along the axis after 24 hours and the minimum shear strength before failure shall not be less than 1 MPa (Refer Fig. 2 of Appendix 2800/1). The remaining test specimens shall be similarly tested after 72 hours of curing. The shear strength before failure shall not be less than 2.5 MPa. Section 2800 Repair of Structures 2803.9.2 Core Test If directed by the Engineer, cores shall be tested for the acceptance of the work. The selection of the location of cores shall be as directed by the Engineer in such a way that damage in critical/stressed areas of the structure is avoided. The Contractor shall obtain 50 mm diameter initial core samples in the first 50 linear metres. Thereafter, frequency of core sampling shall be as specified or as agreed by the Engineer. The depth of the core shall normally be less than 200 mm. Tests and Acceptance Criteria shall be as follows: a) Penetration- Visual examination of the core should show epoxy adhesive filling a minimum of 90 percent of the crack.

b) Bond Strength- When tested for bond, concrete failure should occur before adhesive failure. Also, minimum bond strength of 40 MPa should be developed with no failure of either concrete or adhesive. If the cores taken in first 50 m length pass tests as specified above, epoxy adhesive injection work at area represented by cores will be accepted. If cores fail either by lack of penetration or bond strength, work shall not proceed further until the areas represented by the cores are re-injected and re-tested for acceptance. Filling of Core Holes Two-component bonding agent shall be applied to surfaces of cored holes followed by filling of non-shrink cement grout mix placed by hand trowel, thoroughly rodded and tamped in place. The surface shall be finished to match the finish and texture of existing concrete to the satisfaction of the Engineer. Materials to be used and procedures for filling core holes shall be got approved by the Engineer before proceeding with work.

2803.9.3 Test for Injection Equipment At all times during the course of the work, the Contractor shall keep complete and accurate records and make available to the Engineer, the results of the pressure and ratio tests specified below so that the efficacy and accuracy of the injection equipment is verified. The Engineer at any time may direct the Contractor to conduct additional tests in his presence.

Pressure Test The mixing head of the injection equipment shall be disconnected and the two adhesive component delivery lines shall be attached to Repair of Structures Section 2800 the pressure check device, which shall consist of two independent valved nozzles capable of sensing the pressure. The check device shall be closed and equipment operated until the gauge pressure in each line reads 5 MPa. The pumps shall be stopped and the gauge pressure shall not drop below 4 MPa within 2 minutes. The pressure test shall be run for each injection unit at the beginning and after break of every shift.

Ratio Test The mixing head of the injection equipment shall be disconnected and the two adhesive components shall be pumped simultaneously through the ratio check device, which shall consist of two independent valved nozzles. There shall be a pressure gauge capable of controlling back pressure by opening or closing valved nozzles capable of sensing the back pressure behind each valve. The discharge pressure shall be adjusted to read 5 bar for both adhesive components, which shall be simultaneously

discharged into separate calibrated containers during the same time period. The amounts thus discharged shall be compared to determine whether the volume/discharge conforms to the manufacturer's recommended ratio for applicable material.

159 Mode of Measurement: Measurement for sealing of cracks and injection shall be made by weight of epoxy consumed in kg for epoxy grouting. The rate includes all materials, labour, and everything required to execute this item. Note: Item rate is inclusive of total no. of nozzles or nipples (calculation for number of nozzle or nipple = $\text{grout kg}/3.625 = 7975/3.625 = 2200$).

Item No. 130

Guniting concrete surface with cement mortar applied with compressor after cleaning surface and spraying with epoxy complete as per Technical specification. (Reference to MORT&H's specification 2807)

Grouting done by inject process in RCC/PCC irrigation structure's components through Nipples with pressure 3 to 7 kg/cm² and as per instruction, with materials

(1 bag cement of 50kg of 53 grade with Sika latex of FBR of equivalent quality 2Lit + Sika 4A or equivalent quantity 1 Lit + FL 40 or equivalent quantity 8kg + Fair add or intra plast or equivalent quantity 400 grams with sufficient water for easy grout)

The rate includes cost of materials ,labours scaffolding ,equipment etc. and materials to be used of BIS quality only.

The measurement shall be in Smt. The rate includes all materials, labour, and everything required to execute this item.

Item No. 131

Barricading the entire break down or excavated area on rental basis using wooden ballies / M.S.angles at max. 2.00 meter centre to centre, C.G.I. Sheet, reflective paint / Board out side to avoid accident & for smooth traffic diversion & movement including cautionary board etc. Item also includes for making temporary sufficient nos of lighting arrangement through out the work with necessary required arrangement...The same shall be removed after completion of work. (Only for break down work from start to complete)

Break down or excavated area on rental basis using wooden ballies / M.S.angles at max. 2.00 meter centre to centre, C.G.I. Sheet, reflective paint / Board out side to avoid accident & for smooth traffic diversion & movement including cautionary board etc.

The measurement shall be in Rmt. The rate includes all materials, labour, and everything required to execute this item.

Item No. 132

Providing and carry out waterproofing treatment to sound concrete surface of toilets, sunken slabs, corridors, wet areas etc. after proper surface preparation to remove loose dust, dirt etc., repairing of cracks (if any) using polymer modified mortar, carry out cementitious injection grouting at leakage points modified with Plasticized Expansive Grout Admixture @ 225 gms per bag of cement, carry out 50 mm thick cement mortar (1:3) vatta/ corner modified with Styrene Butadine Polymer bonding agent at dosage of 2.5 Ltr per 50kg cement, Pre-dampening concrete surface, mixing and application of two coats of Elastomeric Polymer modified cementitious waterproofing coating by incorporating 45 gsm glass fibremesh between 1st and 2nd coat using suitable brush or roller as per coverage etc. complete including all tools and tackles as per manufacturer's specification.

Repair cracks, honeycombs, and surface defects, Sealant for joints and cracks and Surface shall be clean, dry, and free from dust, oil, grease, and loose particles.

Cured Polymer modified cementitious waterproofing coating shall comply with ASTM D4060, ASTM D4541, ASTM D638, ASTM C836 and possess below properties: Mixed density: 1.68 g/cc, Adhesion to concrete-> 1 N/mm², Non-toxic, Static crack accommodation-1 mm

Water proofing system shall be executed by only approved applicator of approved brand and under strictly supervision of technical fellow of manufacturer. The rate includes giving 10 year guarantee for waterproofing on a Rs.100/- stamp paper in approved proforma.

The measurement shall be in Smt. The rate includes all materials, labour, and everything required to execute this item.

Item No. 133

Providing and laying Pavit vitrified tile 100x100x12mm as floor tiles with water absorption's less than 0.08% and conforming to IS : 15622 of approved make in all colours and shades, laid on 20mm thick cement mortar 1:4 (1 cement : 4 coarse sand) including grouting the joints with white cement and matching pigments etc., complete.

Tiles shall be fixed over a clean, level, and cured cement concrete or screed surface.

Pavit vitrified tile 100x100x12mm as floor tiles with water absorption's less than 0.08% and conforming to IS : 15622 of approved make in all colours and shades, laid on 20mm thick cement mortar 1:4 (1 cement : 4 coarse sand)

Maintain minimum 8 mm joint width.

Fill joints with suitable polymer-modified or epoxy grout.

Ensure alignment, level, and slope as per drawings.

Clean the finished surface and protect it until handover.

The measurement shall be in Smt. The rate includes all materials, labour, and everything required to execute this item.

Item No. 134

Providing and fixing VYARA-PEBBLINO or equivalent Tiles 300 x 300 mm with exposed pebbled aggregate great for landscaping and decorative application pabble may be natural or machine made of required size of approved shade, colour and texture laid over 20mm thick base cement mortar 1:4 (1 cement : 4 coarse sand) with joints treated with cement, including curing, etc. complete at all levels.

Exposed **pebbled aggregate Pebblino (Washbeton) paving tile** manufactured by **VYARA** or approved equivalent.

Suitable for pedestrian walkways, landscapes, plazas, podiums, pool decks, and light vehicular traffic areas.

Nominal Size: **300 × 300 mm**

Dimensional Tolerance: **±2 mm** (length and width).

High-strength precast cement concrete with selected natural coloured pebble aggregates.

UV-resistant inorganic pigments.

Factory-applied **PremierShield** (or equivalent) protective treatment providing water and oil repellence and resistance to algae, moss, and efflorescence.

Lay over a prepared cement-sand mortar bed or concrete base as detailed in drawings.

Maintain joints of **3–5 mm** or as specified.

Fill joints with cement mortar or polymeric jointing material.

Tiles shall be true to line, level, and required slope for drainage.

Replace cracked, chipped, or damaged tiles before acceptance.

Tiles shall be fixed over a clean, level, and cured cement concrete or screed surface.

The measurement shall be in Smt. The rate includes all materials, labour, and everything required to execute this item.

Item No. 135

Supplying chhota hathi (Light Weight vehicle) with driver at shown site incl. necessary oil, diesel, petrol for vehicle and all other charges Work done as per inst. of incharge etc. comp. as directed (8 hours)

Chhota hathi (Light Weight vehicle) with driver at shown site incl. necessary oil, diesel, petrol for vehicle and all other charges Work done as per engineer in charge.

The measurement shall be in Shift.

Item No. 136

Providing and fixing pre-coated GI (PPGI) 0.45–0.50 mm roofing sheet of approved profile and colour, manufactured from minimum 240 MPa steel grade GI sheet conforming to IS 14246:1995, having minimum 120 GSM zinc coating as per IS 277, epoxy primer coating of 5–7 microns on both sides and polyester top coat of 15–18 microns, including 25 micron protective guard film, fixed with self-drilling screws with EPDM washers and complete with all necessary accessories, overlaps, flashings, and sealants as required.(excluding structural steel work)

1. Scope

Providing and fixing pre-coated galvanized iron (PPGI) roofing sheets complete with accessories, fasteners, ridge pieces, flashing, sealing, and all incidental works as per drawings and the Engineer-in-Charge's instructions.

2. Material

- **Base Material:** Cold-rolled galvanized steel.
- **Coating:** Colour-coated (PPGI) with factory-applied polyester coating.
- **Thickness:** 0.45–0.50 mm (Base Metal Thickness).
- **Galvanizing:** Minimum Z120/Z180 coating (120–180 g/m²) or as specified.
- **Colour:** As approved by the Engineer-in-Charge.
- **Profile:** Trapezoidal or corrugated profile.
- **Yield Strength:** Minimum 240 MPa.

3. Dimensions

- **Effective Cover Width:** As per manufacturer's profile (typically 900–1050 mm).
- **Length:** Custom cut to suit roof dimensions to minimize end laps.

4. Accessories

- Matching ridge caps, barge flashings, gutters, valley gutters, apron flashings, and closure pieces.
- EPDM washers with self-drilling/self-tapping galvanized screws.
- Foam fillers and approved sealant where required.

5. Installation

- Roof sheets shall be fixed on steel purlins or structural members as shown on drawings.
- Side laps: Minimum one corrugation/rib.
- End laps: Minimum 150 mm (or as recommended based on roof slope).
- Fix with self-drilling screws and EPDM washers at every support.
- Provide ridge, flashing, and waterproof sealing at all joints.
- Ensure proper alignment, slope, and watertight installation.

6. Workmanship

- Sheets shall be free from dents, scratches, and coating damage.
- Damaged sheets shall not be used.
- Cut edges shall be treated as recommended by the manufacturer.
- Roof shall be true to line, level, and slope.

The measurement shall be in Smt. The rate includes all materials, labour, and everything required to execute this item

Item No. 137

Providing and laying 80 mm thick grass paver blocks of approved quality, manufactured from high-strength cement concrete, laid over prepared base/sub-base with proper alignment, joint filling, compaction and finishing complete as per specification and instructions of Engineer-in-Charge.

1. Scope

Providing and laying **80 mm thick precast concrete grass paver blocks** complete with sub-base preparation, bedding layer, filling of openings with topsoil and grass, jointing, compaction, and all incidental works as per drawings and the Engineer-in-Charge's instructions.

2. Material

- **Type:** Precast concrete grass paver blocks (open-cell type).
- **Thickness:** 80 mm.
- **Grade of Concrete:** Minimum **M40**.
- **Compressive Strength:** Minimum **40 MPa** at 28 days.
- **Water Absorption:** Maximum **6%** by weight.
- **Manufacturing:** Machine-pressed/vibro-compacted with uniform finish and dimensions.
- **Colour:** Grey or as approved by the Engineer-in-Charge.

3. Base Preparation

- Prepare and compact subgrade to the required level.
-

- Lay **150–200 mm thick granular sub-base** of well-graded crushed stone (GSB) compacted to at least **95% of Maximum Dry Density (MDD)**, where specified.
- Provide **30–50 mm thick bedding layer** of coarse sand or stone dust, screeded to line and level.

4. Laying

- Lay grass paver blocks in the approved pattern, maintaining alignment and level.
- Compact using a plate compactor with a protective rubber mat.
- Fill block openings with fertile topsoil.
- Plant suitable turf/grass and water adequately until establishment.
- Fill joints with sand where applicable.

5. Tolerances

- Surface level variation: Maximum **±5 mm** under a 3 m straightedge.
- Alignment and pattern shall be uniform.

6. Testing

- Visual inspection for cracks, chips, and dimensional accuracy.
- Compressive strength and water absorption tests as per applicable standards.
- Finished surface shall be stable and free from rocking blocks.

7. Applicable Standards

- **IS 15658** – Precast Concrete Blocks for Paving.
- **IS 456** – Plain and Reinforced Concrete – Code of Practice (where applicable).
- **IS 383** – Coarse and Fine Aggregates for Concrete.
- **IS 2386** – Methods of Test for Aggregates.

The measurement shall be in Smt. The rate includes all materials, labour, and everything required to execute this item.
