

**Name of work: - Construction of Supritendent Quarter at Children Home,
Himatnagar Dist. Sabarkantha**

TECHNICAL SPECIFICATIONS

ITEM WISE SPECIFICATION

Item No. 14 Providing TMT Bar FE 500D reinforcement for R.C.C. work including bending, binding and placing in position complete for All Floor

1.0.GENERAL

This work shall consist of furnishing and placing TMT Fe500D Conforming to IS 1786 2008 reinforcement, bars (intentioned) of the shape and dimensions shown on the drawings and conforming to these Specifications or as approved by the Engineer in charge.

2.0.MATERIAL

2.1.TMT Bars

Reinforcements shall be TMT Fe500D steel bars. They may be uncoated or coated 'with epoxy or with approved protective coatings.

2.2.TMT bars reinforcement for RCC work shall conform to IS 1786 FE-500D and shall be of tested quality. It shall also comply with relevant part of IS 456-1966

2.3.All reinforcement shall be clean and free from dirt, paint, grease or oil, oil scale or loose or thick rust at the time of placing

2.4.All steel shall be procured from original producers no re-rolled steel shall be incorporated in the work

2.5.Only new steel shall be delivered to the site every bar shall be inspected before placing to its position and defective brittle or burnt bar shall be discarded cracked ends of bars shall be discarded

3.0.Pitch

3.1.Distance between bars shall be as specified in drawings and as directed by the Engineer in Charge. all bars shall be placed at an accurate distance from each other and shall be bind tightly to maintain the desired pitch Suitable means shall be provided for holding bars securely in position

4.0.Binding wire

4.1.Mild steel binding wire shall be of 1.63 mm or 1.22 mm (16-to-18-gauge diameter and shall conform IS 280-1972

4.2.The use of black wire will be permitted for binding reinforcement bars. It shall be free from dirt, paint, grease or oil, oil scale or loose or thick rust and any other undesirable coating which may prevent adhesion of cement mortar at the time of binding

4.3.Only new binding wire shall be delivered to the site all binding wire shall be inspected before binding to its position and defective brittle, rusted, used wire, shall be discarded

5.0.PROTECTION OF REINFORCEMENT

5.1.Uncoated reinforcing steel shall be protected from rusting or chloride contamination. Reinforcements shall be free from rust, mortar, loose mill scale, grease, oil or paints. This may be ensured either by using reinforcement fresh from the factory or thoroughly cleaning all reinforcement to remove rust using any suitable method such as sand blasting, mechanical wire brushing, etc. as directed by the Engineer. Reinforcements shall be stored on bricks, racks or platforms and above the ground in a clean and dry condition and shall be suitably marked to facilitate inspection and identification.

5.2. Portions of uncoated reinforcing steel and dowels projecting from concrete shall be protected within one week after initial placing of concrete with a brush coat of neat cement mixed with water to a consistency, of thick paint. This coating shall be removed by lightly tapping with a hammer or other tool not more than one week before placing of the adjacent pour of concrete. Coated reinforcing steel shall be protected against damage to the coating. If the coating on the bars is damaged during transportation or handling and cannot be repaired, the same shall be rejected.

6.0. Workmanship

6.1. The work shall consist of furnishing and placing reinforcement to the shape and dimensions shown as on the drawings or as directed by The Engineer in charge.

6.2. Reinforcing steel shall conform accurate to the dimensions given in the bar bending schedules shown on relevant drawing

7.0. BENDING OF REINFORCEMENT

7.1. Bar bend g schedule shall be furnished by the Contractor and got approved by the Engineer before start of work.

7.2. Reinforcing steel shall conform to the dimensions and shapes given in the approved Bar bending Schedules.

7.3. Bars shall be bent cold to the specified shape and dimensions or directed by the Engineer using a proper bar bender operated by hand power to obtain the correct radius of bends and shape. Bars, shall not be bent or straightened in a manner that will damage parent material or the coating bars bent during transport or handling shall, be straightened before being used on work and shall not be heated to facilitate straightening.

8.0. PLACING OF REINFORCEMENT

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

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

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

In case of beam an slab construction, industrially produced polymer cover blocks of thickness equal to the specified cover shall be placed between the bars and formwork subject to satisfactory evidence that the polymer composition is not harmful to concrete and reinforcement.

over blocks made of concrete may be permitted by the Engineer, provided they have the same strength and specification as those of the member.

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

8.5. Layers of reinforcements shall be separated by spacer bars at approximately One meter intervals. The minimum diameter of spacer bars shall be 12 mm or: equal to maximum size of main

reinforcement or maximum size of coarse aggregate, whichever is greater. Horizontal reinforcement shall not be, allowed to sag between supports.

- 8.6.Necessary stays, blocks, metal chairs, spacers, metal hangers. supporting wires etc, or other subsidiary, reinforcement shall be provided to fix the reinforcements firmly in its correct position.
- 8.7.Use of pebbles, broken stone, metal pipe, brick, mortar or wooden blocks etc as devices for positioning reinforcement shall not be permitted.
- 8.8.Bars coated with epoxy or any other approved protective coating shall be placed on supports that do not damage the coating. Supports shall be installed in a manner such that planes of weakness are not created in hardened concrete. The coated reinforcing steel shall be held in place by use of plastic- or plastic-coated binding wires especially manufactured for the purpose.
- 8.9.Placing and fixing of reinforcement shall be inspected and approved by the Engineer before concrete is deposited.

9.0.Lapping

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

10.0. Welding

- 10.1. Splicing by welding of reinforcement will be permitted only if detailed on the drawing or approved by the Engineer. Weld shall develop an ultimate strength equal to or greater than that of the bars connected.
- 10.2. While welding may be permitted for TMT. reinforcing bars conforming to IS: 432, welding of deformed bars conforming to IS: 1786 shall in general be prohibited. Welding may be permitted in case of bars of other than S 240 grade including special. Welding grade of S 500 grade bars conforming to IS: 1786, for which necessary chemical analysis has been secured and the carbon equivalent (CE) calculated from the chemical composition using the formula: $CE = C + Mn + Cr + Mg + V + Ni + Cu$ 6 5 15 is 0.4 or less.
- 10.3. The method of welding shall conform to IS: 2751 and IS: 9417 and to any supplemental specifications to the satisfaction of the Engineer
- 10.4. Bars shall be bent cold to the specified shape and dimensions or as directed by Engineer in charge using the proper bender tool, operated by hand or power to attain proper radius of bends. Bars shall not be bend or straightened in a manner that will injure the material. Bars bent during transport or handling shall be straightened before being used in the work. Bars shall not be heated to facilitate bending.
- 10.5. Unless otherwise specified a 'U' type hook at the end of each bar shall invariably be provided to main reinforcement. The radius of the bane shall not be less then twice the diameter of the round bar and the length of the straight part of the bar beyond the end of the curve shall be at least four times of the diameter of the round bar. In case of bars which are not round and in case of deformed bars, the diameter shall be taken as the diameter of circle having an equivalent effective area the hooks shall be suitably encased to prevent any spiting of the concrete.

- 10.6. All reinforcement bars shall be accurately placed in exact position shown on the drawings and shall be securely held in position during placing of concrete by annealed binding wire not less than 1 mm in size and by using say blocks or metal chairs spacers, metal hangers, supporting wires or other approved devices at sufficiently close intervals, Bars shall not be allowed to sag between supports not displaced during concreting or any other operations of the work All devices used for positioning shall be of not corrodible material wooden and metal supports shall not extended to the surface of the concrete, except where shown in drawings. Placing bars on layers of freshly laid concrete as the work progresses for adjusting bar spacing shall not be allowed. Pieces of broken stone or brick and wooden blocs shall not be used Layers of bars shall be separated by spacer bars pre-cast mortar blocks or other approved devices. Reinforcement after bending placed in position shall be maintained in a clean condition until completely embedded in concrete, Special care shall be exercised to prevent any displacement of reinforcement in concrete already placed. To prevent reinforcement form corrosion, concrete cover shall be provided as indicated on drawings. All bars protruding from concrete and to which other bars are to be sliced and which are likely to be exposed for a period exceeding 10 days shall be protected by a thick coat of neat cement grout
- 10.7. Bars crossing each other where required shall be secured by binding wire (annealed) of size not less than 1 mm in such a manner that they do not slip over at the time of fixing and concreting.
- 10.8. As far possible bars of full length shall be used In case this is not possible, overlapping of bars shall be done as directed by the Engineer in charge When practicable overlapping bars shall not touch each other, but be kept apart by 25 mm Where no feasible overlapping bars shall be bound with annealed wires not less than 1 mm thick twisted tight The overlaps shall be staggered for different bars and located at points along the span where neither sheer not bending moments is maximum.
- 10.9. Whenever indicated on drawing or desired the Engineer in charge bars shall be jointed by coupling which shall have a cross section sufficient to transmit the full stresses of bars The end of the bars that are jointed by coupling shall be upset for sufficient length so that the effective cross section at the base of threads is not less than the normal cross section of the bar. Threads shall be standards threads Steel for coupling shall conform to IS 226.
- 10.10. When permitted or specified on the drawings joints of reinforcement bars shall butt-welded so as to transmit their full stresses Welded joints shall preferably be located at points when steel will not be subject to more than 75 percent of the maximum permissible stresses and welds so staggered that at any one section not more than 20 percent of the rods are welded Only electric are welding using a process which excludes air form the molten metal and conforms to any or other special provisions for the work shall be accepted Suitable means shall be provided for holding bars securely in position during welding It shall be ensured that no voids are left in welding and when welding is done in two or three stages previous surface shall be cleaned properly Ends of bars shall be cleaned of all loose scale rust stages paint and other foreign matter before welding Only competent welders shall be employed on the work. The M S electrodes used for welding shall conform IS 814 Welded pieces of reinforcement shall be tested. Specimen shall be taken form the actual site and their number shall frequency to test shall be as directed by the Engineer in charge

11.0. MODE OF MEASUREMENTS & PAYMENT

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

1.	6mm	0.22 Kg./Rmt.	8.	20mm	2.47 Kg./Rmt.
2.	8mm	0.39 Kg./Rmt.	9.	22mm	2.98 Kg./Rmt.
3.	10mm	0.62 Kg./Rmt.	10.	25mm	3.85 Kg./Rmt.
4.	12mm	0.89 Kg./Rmt.	11.	28mm	4.83 Kg./Rmt.
5.	14mm	1.21 Kg./Rmt.	12.	32mm	6.31 Kg./Rmt.
6.	16mm	1.58 Kg./Rmt.	13.	36mm	7.99 Kg./Rmt.
7.	18mm	2.00 Kg./Rmt.	14.	40mm	9.86 Kg./Rmt.

- 11.2. Excess consumption over 5% will be charged at penal rate.
- 11.3. Reinforcement shall be measured in length including overlaps, no steel shall be given for lap but work may be carried out as per detailed drawings. Where welding or coupling is resorted to, in place 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 on the same basis of as per table given above even though steel is supplied to the contractor by the department on actual weight. Length shall include hooks at the ends. Wastage and annealed steel wire for binding shall not be measured and the cost of these items shall be deemed to be included in the rate for reinforcement.
- 11.4. The rate for reinforcement includes cost of steel binding wires including lap, it's carting with all lead lifts, cutting, bending, placing in position, binding and fixing in position as shown on the drawings and as directed. It shall also include all devices for keeping reinforcement in approved position, cost of joining as per approved method and all wastage and spacer bars. No Payment shall be given for Lap.
- 11.5. The rate shall be for a unit of **One Kg.**

Item No. 17 Providing & Fixing Chicken mesh for joint between brick work & RCC work fixing with nail & GI washer as per director in charge

This item is for providing and fixing Chicken mesh jali at RCC / masonry joints. The chicken mesh Jali shall be got approved from Engineer in charge before use.

The jail shall be fixed by nail as per detailed drawing as directed by Engineer in charge.

Payment shall be made on **Sq.Mt.** basis of chicken mesh jali fixed.

The rate includes the cost of all kind of labour, materials, scaffolding etc.

Item No. 21 Applying two coats of putty & two coats of primer of approved brand and manufacture on new wall surface to give an even shade including thoroughly brushing the surface free from mortar dropping and other foreign matter and sand papered smooth.

(A) Putty

Material

Birla white ready mixed lapi, sand paper of standard quality and of required smoothness. Steel scrapping / Plate.

Workmanship

All loose piece and scales shall be removed by sand papering and surface shall be cleaned by old paint and of all greasery, dust, dirt etc. from wall surface. On clean surface of wall ready mixed Birla white lapi shall be applied with the help of steel plate in true line and level from both the direction i.e. vertical & horizontal. After dried the lapi, the surfaces shall be lifghtly sand papered to make the surface smooth for receiving the paint, taking care not to rub cut the lapi, coat, all loose particles shall be dusted off after rubbing. The furnished surfaces shall be even and uniform without patches, steel plate or sand paper marks.

Protective Measure.

The surface of door, windows, floors, articles of furniture etc. and such other parts of the building as are no to be applied lapi shall be protected from being aplashed upon. Such surfaces shall be cleaned of lapi aplashes if any.

Mode of Measurements and payments

Item includes removing nails, making good the holes cracks, patches with materials similar in composition to the paint to be applied.

The rate includes cost of all materials labour, scaffolding, protective measure etc. involved in all the operations described above. This shall also include conveyance, delivery, loading, unloading etc.

The rate shall be for a unit of **One Sqmt.**

Item No. 24 Finishing wall with weather proof exterior emulsion paint (two coats) with Damp Proof Coating (one coat) on wall surface to give a required shape even shade after thoroughly brushing the surface to remove all dirt, and remains of loose powdered materials.etc complete

1.0 Materials

1.1 The water shall conform to M-1. The Apex Ultima or Equivalent type paint shall conform to relevant I.S. specification.

2.0 Workmanship:

2.1 Scaffolding:

Wherever scaffolding is necessary it shall be erected in such a way that as far as possible on part of scaffolding shall rest against the surface to be white or colour washed. A property secured strong and well tied suspended platform (Zoola) may be used for white washing. Where ladders are used, pieces of old gunny bags shall be tied at top and bottom to prevent scratched to the floors and walls. For white washing of ceilings proper stage scaffolding shall be erected where necessary.

2.2 Preparation of surface:

- 2.2.1 The surface shall be thoroughly cleaned of all dust, dirt., mortar croppings and other foreign matter before white wash is to be applied.
- 2.2.2 The surface spoiled by smoke soot shall be scraped with steel wire brushes or steel scrapers or shall be rubbed with over-burnt surkhi or brick bats. The surface shall be then broomed to remove all dust, dirt and shall be washed with clean water.
- 2.2.3 Oil or grease spots shall be removed by suitable chemical and smooth surface shall be rubbed with wire brushes.

- 2.2.4 All unsound portion of the surface plaster shall be removed to full depth of plaster in rectangular patches and plastered again after raking tile masonry joints properly. Such portion shall be wetted and allowed to dry. They shall then be given one coat of white wash.
- 2.2.5 All unnecessary nails shall be removed, the holes cracks patches etc. shall be made good with materials similar in composition to the surface to be prepared.
- 2.2.6 The surface shall be thoroughly wetted with clean water before cement water proofing paint is applied.
- 2.3 Preparation of paint: Portland cement shall be prepared by adding paint powder to water and stirring to obtain a thick paste, which shall then be diluted to a brushable consistency. Generally, equal volumes of paint powder and water make a satisfactory paint. In all cases, the manufacturer's instructions shall be followed. The paint shall be mixed in such quantities as can be used up within an hour of mixing as otherwise the mixture will set and thicken, affecting flowing and finish. The lids of cement paint drums shall be kept tightly when not in use.
- 2.4 Application of APEX Ultima Paint
 - 2.4.1 No painting shall be done when the paint is likely to be exposed to a temperature of below 7° C within 48 hours after application.
 - 2.4.2 When weather conditions are such as to cause damage the work shall be carried out "in tile shadow" as far as possible. This helps the proper hardening of the paint film by keeping the surface moist for a longer period.
 - 2.4.3 To maintain the uniform mixture and to prevent segregation, tile paint shall be stirred frequently the bucket.
 - 2.4.4 For undercoated surfaces, the surfaces shall be treated with minimum two coats of APEX Ultima. Not less than 24 hours shall be allowed between two coats.
Next coat shall not be started until the preceding coat has become sufficiently hard to resist marking by the brush being used. In hot dry weather, the preceding coat shall be allowed between two coats. Next coat shall not be started until the preceding coat has become sufficiently hard to resist marking by the brush being used. In hot dry weather the preceding coat shall be slightly moistened before applying tile subsequent coat.
 - 2.4.5 The finished surface shall be even and uniform, in shade, without patches, brush marks, paint drops etc.
 - 2.4.6 The cement paint shall be applied with a brush with relatively short stiff hog or fiber bristles. The paint shall be brushed in uniform thickness and shall be free from excessive heavy brush marks. The laps shall be well brushed out.
 - 2.4.7 APEX Ultima shall not be applied on surfaces already treated with white wash colour wash, distemper dry or oil bound varnishes, paint etc. It shall not be applied on gypsum, wood and metal surfaces.
- 2.5 Curing: Painted surfaces shall be sprinkled with water two or three times a day. This shall be done between coats and for at least two days following the final coat. The curing shall be started as soon as the paint has hardened so as not to be damaged by the sprinkling of water say about 12 hours after the application.
- 2.6 Protective Measure : The surface of door, windows, floors, articles of furniture etc. and such other parts of the building as are not to be distempered shall be protected from being splashed upon. Such surfaces shall be cleaned of distemper splashes if any.

3.0 Mode of measurements & payment:

- 3.1 All the work shall be measured in the decimal system as under : (a)
Dimensions shall be measured to the nearest 0.01 M.

(b) Area in individual items shall be worked out to the nearest 0.01 Sq. M.

All the work shall be measured in sq. mt. Deductions for jambs, soffits, sills etc. for opening not exceeding 0.5 sq. mt. each in area for ends of joints, posts, beams, girders, steps etc. not exceeding 0.5 sq. mt. each in area and for opening exceeding 0.3 sq. mt. not exceeding 3.0 sq. mt. each in area deductions and additions shall be made as under :

- 3.2 No deductions shall be made for ends of joints beams, posts etc. and openings not exceeding 0.5 sq. mt. each. No addition shall be made for reveals, jambs, soffits, sills etc. of these openings nor for finish around ends of joints, beams, posts etc.
- 3.3 Deductions for openings exceeding 0.5 sq. mt. but not exceeding 3 sq. mt. each shall be made as follows and no addition shall be made for reveals, jambs, soffits etc. of these openings :
 - (a) When both the faces or walls are provided with finish, deduction shall be made for one face only.
 - (b) When each face of wall is provided with different finish deduction shall be made for that side of frame for door, windows etc. on which width of reveals is less than that of the other side, where width of reveals on both faces of wall are equal, deduction of 50% of area of opening on each face shall be made from total area of finish.
 - (c) When only one face of wall is treated and the other face is not treated, full deduction shall be made if the width of reveal on the treated side is less than that on the untreated side, but if the width of the reveal is equal or more than on the untreated side neither deductions nor additions be made for reveals, jambs, soffits, sills etc.
- 3.4 In case of area of opening exceeding 3 sq. mt. each, deduction shall be made for openings but jambs, soffits shall be measured.
- 3.5 No deduction shall be made for attachment such as casing, conducts, pipe, electric wiring and the like.
- 3.6 Corrugated surfaces shall be measured flat as fixed and not girth. The quantities so measured shall be increased by the following percentage and the resultant shall be included with the general areas.
 - (a) Corrugated steel sheets 14%
 - b) Corrugated A.C. Sheets 20%
 - c) Semi corrugated A.C. Sheets 10%
 - (d) Nainital pattern roof (Plain sheeting with rolls) 10%
 - e) Nainital pattern roof (with corrugated sheets) 25%
- 3.7 Cornices and other wall features, when they are not picked out in a different finish / colour shall be girthed and included in the general area.
- 3.8 The rate shall include the cost of all materials, labour, scaffoldings, protective measures etc. involved in all the operations described above.
- 3.9 The rate shall be for a unit of **one Sqmt.**

Item No. 26 Providing and fixing pre-cast Rubber Dye / steel Dye inter locking concrete block 60mm thick with grade of concrete M300 pneumatic compressed / vibrated mechanically and as per approved design Confirming to IS 15658 : 2006 including 35 mm Sand layer for levelling and filling the joint with sand in proper line and level as per guidelines of IRC : SP 63-2018 etc. Complete.

General

This work shall consist of providing and laying 60 mm thick coloured inter locking cement concrete block paving specification & samples over a base layer of 75 mm thick layer of sand of the

shape and dimensions shown on the drawings and conforming to these specifications or as approved by the Engineer in charge.

1.0 Material

Water shall conform to M-1. Cement mortar shall conform to M-11.

1.0 Cement Concrete Paver Block

Colored interlocking cement concrete paver block shall be of approved size brand and make as approved by Engineer in charge.

- 1.1 The size shape and design of Coloured interlocking cement concrete paver block shall generally be as per manufacturers product or as directed by the Engineer in charge and Architect.
- 1.2 The Colored interlocking cement concrete paver block shall satisfy the tests as regards traverse strength resistance to wear and water absorption.
- 1.3 The colour size shape and design of the Coloured interlocking cement concrete paver block shall be directed by Engineer or Architect.
- 1.4 The Coloured interlocking cement concrete paver block shall be of best quality as approved by the Engineer In charge. They shall be flat and true to shape. They shall be free from cracks, crazing spots, chipped edges and corners. The glazing shall be of uniform shade.

2.0 SAND

- 2.1 Sand shall be natural sand, clean well graded, hard strong durable and gritty particular free from immures amounts of dust, clay, kankar modules.
- 2.2 For masonry works sand shall confirm to the requirements of IS: 2116.
- 2.3 For plain and reinforced cement concrete (PCC and RCC) or pre stressed concrete (PSC) works fine aggregates shall consist of clean, hard strong and durable prices of crushed stone, crushed gravel or suitable combination of natural sand crushed stone or gravel, They shall not contain dust lumps soft or flaky materials mica or other deleterious materials in such quantities as to reduce the strength and durability of concrete, or to attack the embedded steel. Motorized sand washing machines should be used to remove impurities from sand. Fine aggregate having positive alkali-silica reaction shall not be used. All fine aggregates shall conform to IS L 383 and tests for conformity shall be carried out as per IS : 2386 (Part I to VIII) The contractor shall submit to the Engineer in charge the entire information indicated in Appendix A of IS: 383. The fineness modulus of fine aggregate shall neither be less than 2.00 nor greater than 3.5.
- 2.4 Sand fine aggregates for structural concrete shall conform to the following grading requirements as shown in the table below.
- 2.5 **Fine Sand:** The fineness module shall not exceed 1.0 the sieve analysis of fine sand be as under:

I.S. Sieve Designation	% by wt. passing		
	Zone I	Zone II	Zone III
10 mm	100	100	100
4.75 mm	90-100	90-100	90-100
2.36 mm	60-95	60-95	60-95
1.18 mm	30-70	30-70	30-70

600 MC	15-34	15-34	15-34
300 MC	5-20	5-20	5-20
150 MC	0-10	0-10	0-10

Coarse Sand: The fineness modules of coarse sand shall not be less than 2.5 and shall not exceed 3.0. The sieve analysis of coarse sand be as under:

I.S. Sieve Designation	% by wt. passing
	Zone I
4.75 mm	100
2.36 mm	90 to 100
1.18 mm	70 to 100
600 MC	30 to 100
300 MC	85 to 70
150 MC	00 to 50

3.0 WORKMANSHIP

- 3.1 The Coloured interlocking cement concrete paver block shall be 60 mm thick for cement concrete M-200 and laid on a layer of 75cm thick layer of coarse sand. The slope in the floors shall be provided in the sub grade. The base layer shall be properly watered, rammed and consolidated. Before laying the pavers blocks, it shall be moisture. Plinth masonry offset shall be depressed so as to allow the sub grade concrete to rest on it.
- 3.2 Coloured interlocking cement concrete paver block of approved quality shape and design and shall be laid evenly to level and slope as directed by Engineer in charge over a bed of a base layer consisting of 75mm thick sand layer.
- 3.3 Laying: The Coloured interlocking cement concrete paver block shall be laid in plain, diagonal or other pattern as directed. The cement concrete blocks shall be laid properly and set home by gentle taping.
- 3.4 End portion of pavement shall be finished with C.M. 1:3 as per detailed drawing etc. complete.

4.0 MODE OF MEASUREMENT AND PAYMENT

- 4.1 The unit rate Coloured interlocking cement concrete paver block flooring shall include the cost of all materials, tools and plant required for supplying and laying material like brick bats sand pavers blocks, laying of base layer in true level and slope as required applying & placing pavers blocks in position, compacting, finishing, curing.
- 4.2 The length and breadth shall be measured correct to a Square meter correct to 2 places of decimal. Length and breadth shall be measured to correct to a centimeter and between the finished the finished face of the skirting, dedo or wall plaster and no deduction shall be made nor extra paid for any opening in floors or areas up to 0.1 square meter.

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

Item No. 33 Providing and fixing Machine cut Bothside mirror polished kota stone in single piece (Max 150 cm long and width upto 45 cm with both side polished) for horizontal Shelves including making grooves & Fixing the same in Brick/ concrete wall finished with flush pointing, round open edge etc. complete

This work shall consist of Providing and fixing Machine cut Bothside mirror polished kota stone in single piece (Max 150 cm long and width upto 45 cm with both side polished) for horizontal Shelves including making grooves & Fixing the same in Brick/ concrete wall finished with flush pointing, round open edge etc. complete as directed by Engineer in Charge.

In addition to these, the Contractor shall also observe the instructions and any further additional instructions which may be given by the Engineer-in-charge and shall be responsible for damage to property and any accident which may occur to workmen or the public on account of any operations connected with the storage, handling. The Engineer-in-charge shall frequently check the Contractor's compliance with these precautions.

The unit rate for the item shall be for a unit of one **Sqmt.**

Item No. 34 Providing and laying water proofing treatment with china mosaic tiles flooring over avg 50 mm C.C. 1:2:4 bedding maintaining slope for plain and curve surface & 12 mm to 20 mm broken pieces not more than 2.5 cm of ceramic/ of glazed tiles to be laid over cement mortar 1:3 to plain or slope and to be tempered to bring mortar cream out upto surface using white cement including rounding off junctions and extending them upto 15 cm along the wall, clearing with water and oxalic acid etc. as directed.

1.0 Material

WATER

- 1.1 Water shall not be salty brackish and shall be clean reasonably clear and free objectionable quantities of silt and traces of oil & injurious alkalis salts organic matter and other deleterious material which will either weaken the mortar of concrete or cause efflorescence or attack the steel in R C C container for transport storage and huddling of water shall be clean, Water shall conform to the standard specified in IS 455 -1978
- 1.2 If required by the Engineer in charge it shall be tested by comparison with distilled water compression shall be made by means of standard cement tests for soundness time of setting and mortar strength as specified in IS 269-1976 Any indication of unsoundness change in time of setting by 30 minutes or more or decrease of more than 10 percent strength of mortar prepared with distilled water sample when compared with the result obtained with mortar prepared with distilled water shall be sufficient cause for rejection of water under test.
- 1.3 Water for curing mortar concrete or masonry should not be too acidic or too alkaline
- 1.4 It shall be free of elements which significantly affect the hydration reaction or otherwise interface with the hardening of mortar or concrete during curing or those which produce objectionable stains or other unsightly deposits on concrete or mortar surfaces
- 1.5 Hard and bitter water shall not be used for curing
- 1.6 Potable water will generally be found suitable for curing mortar or concrete

2.0 CEMENT

- 2.1 Cement shall be ordinary Portland slag cement as per IS 1624 -1974 or Portland slag cement as per IS 455-1976
- 2.2 Cement shall be stored above the ground level in perfectly dry and water tight sheds. Wherever bulk storage containers are used, their capacity should be sufficient to cater to the requirements at site and should be cleaned at least once every 3 to 4 months. The

aggregate shall be stored in such a way as to prevent admixture of foreign materials. Different size of fine or coarse aggregate shall be stored in separate stock-piles sufficiently away from the each other to prevent intermixing the materials.

3.0 SAND

3.1 Sand shall be natural sand, clean well graded, hard strong durable and gritty particular free from immures amounts of dust, clay, kankar modules, soft: or flaky particles shall alkali salts, organic matter, learn mica or other deleterious substance and shall be got approved from the Engineer-in-charge. The sand shall not contain more than 8 percent of slit as determined by field test. if necessary the sand.

Coarse Sand: The fineness modules of coarse sand shall not be less than 2.5 and shall not exceed

3.2 FINE SAND: The fineness module shall not exceed 1.0 the sieve analysis of fine sand be as under:

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

1.4. water proofing compound

Water proofing compound shall be of approved quality and make as approved by Engineer in charge

1.5. brick bats

Brick bat aggregates shall be broken form well burnt or slightly over burnt and dense bricks it shall be homogeneous in texture roughly cubical in shape clean and fee from dirt or any other foreign material brick bats shall be of 40 to 50 mm nominal size unless otherwise specified in the item the under burnt or over burnt bricks bats shall not be used

1.6. china mosaic tile pieces

china mosaic tiles pieces shall be of 50 mm to 90 mm nominal size. tile pieces shall be made form hard and good quality of tiles.

1.7. WHITE CEMENT

White cement shall be of approved make it shall confirm definition of I S 8042 –E- 1978 the sample of white cement shall be approved by Engineer in charge

WORKMAN SHIP

A. First of all surface of the entire terrace shall be cleaned by thoroughly brooming and then by wire brushes All the loose material dust and debris shall be removed thoroughly for the entire surface of the terrace All joints and cracks shall be racked off and cut in v trench which shall be filled by neat cement slurry admixed with water proofing compound The joints with parapet shall be racked up to 30 cm height and shall be applied by neat cement slurry admixed with water proofing compound Neat cement slurry shall be prepared and a water proofing compound of approved make shall be mixed with the slurry in proportion specified by the manufacturer of the compound and shall be laid throughout the surface of the terrace by the use of brushes mala etc Cement slurry shall be prepared by adding adequate quantity of water so as to spread it uniformly on the surface.

B. cement concrete 1:5:10 (using 50% of cement mortar 1:5 1part of cement and 5part of coarse sand by volume admixed with water proofing compound of approved make in specified proportion) of specified thickness shall be laid (specification of cc1:5:10 shall be followed for the execution of this layer) all over the surface of the terrace in true level and required slope including rounding of junctions of walls and slab

C. After two days of proper curing applying a second coat of cement slurry on entire surface of the terrace D. the entire surface shall be finished with 20 mm thick C M 1:4 and china mosaic tilling in

true level and slope as directed by Engineer in charge & finally finishing the surface with trowel with white cement slurry (specification of white glaze tiles flooring shall be followed for the execution of this item.)

E. finishing the surface with 20 mm thick C M 1:4 and china mosaic tilling & finally finishing the surface with trowel with white cement slurry

After two days proper curing the terrace shall be flooded for 15 days.

7.0 MODE OF MEASUREMENT & PAYMENT :

7.1. The unit rate flooring shall include the cost of all materials, tools and plant required for mixing, laying of base layer in true level and slope as required applying & placing stones in position, compacting, finishing, curing mirror polishing, providing treatment of 30 cm high all over the length of parapets and corners and sill of doors etc, and all other incidental expenses for producing flooring work to complete the structure or its components as shown on the drawings and according to these specifications. They shall also include the cost of making, fixing and removing of all scaffolding and forms required for the work. The rate of plastering shall include the cost of all labour, materials tools and plant scaffolding and all incidental expenses as described herein above.

7.2. The plaster work shall be measured for its length and width, limiting dimensions to those specified on plan or as directed. The rate shall be for a unit of one square meter.

7.3. The payment will be made on **Sqmt** basis of the finished work.

Item No. 35 Constructing Sandwich Platform of 18mm thick polished black or selected granite at top and 25 mm thick kota stone with 75cm height with necessary support using 20mm thick cement mortar 1:3 for sandwich and fitting at bottom & edges with waterproof rigid adhesive including making necessary grooves in walls with vertical support of double kota stone sandwich every 60cm centre to centre including all labour material of approved quality including full moulded round front edge fixed in wall for partition.

This work shall consist of Constructing Sandwich Platform of 18mm thick polished black or selected granite at top and 25 mm thick kota stone with 75cm height with necessary support using 20mm thick cement mortar 1:3 for sandwich and fitting at bottom & edges with waterproof rigid adhesive including making necessary grooves in walls with vertical support of double kota stone sandwich every 60cm centre to centre including all labour material of approved quality including full moulded round front edge fixed in wall for partition etc. complete as directed by Engineer in Charge.

In addition to these, the Contractor shall also observe the instructions and any further additional instructions which may be given by the Engineer-in-charge and shall be responsible for damage to property and any accident which may occur to workmen or the public on account of any operations connected with the storage, handling. The Engineer-in-charge shall frequently check the Contractor's compliance with these precautions.

The unit rate for the item shall be for a unit of one **Sqmt**.

Item No. 36 Providing and fixing flush door with Single shutters, solid core construction with frame of Anodized Aluminium section (weight not less than 1.1 kg/mt.) with cross board and finished with 1 mm thick laminate on both side of shutter, machine glued PVC beading on periphery including 30cm long Stainless Steel Pipe handle on both side SS AISI 304 grade, SS Stopper 20cm, SS Aldrop 30cm

both side, anodised aluminium butt hinges with necessary screws. (B) Non-decorative type and block board core anodised aluminium butt hinges in flush door shutters (2) 35 mm thick.

Materials:

The section of frame shall be as specified in the drawing and design. Plywood shall confirm to M-37 of General Technical Specification of building booklet. 35 mm. thick solid core both side decorative laminated water proof plywood for double shutter shall be of approved quality and shall be approved by the Engineer in charge. The aluminium frame shall heavy duty Anodised coating coated section shall confirm to M-31 of General Technical Specification of building booklet.

Workmanship:

The work shall be generally carried out as per the It No. 10.30 Page No.72 and It. No.10.12 Page No.69 of General Technical Specification of building booklet. Two pair of 600 mm long matt finish stainless steel Handle and S.S. aldop shall be provided as per the drawing and as per the instruction the Engineer in charge.

FOR FRAMES

The frame shall be prepared from Granite as specified in item of work and as directed by Engineer in Charge.

Shutters:

The Double shutter shall be flush door of specified thickness. The shutter shall be prelaminated using laminates of brand & pattern shall be as shown in the drawing or as directed.

The teak wood moulding shall be provided around shutter.

Fixtures & Fastenings:

All fixtures and fastening shall be anodized aluminium. Handles and latch locks shall be provided as per detailed drawing. The rate shall include all kind of fixtures and fastening. The size and number of hinges shall be as per table given in annexure-1. The hinges, bolts, and other items with moving parts shall be properly oiled by the contractor before handing over the building

Mode of measurement :

The rate is inclusive of all the cost of the material and the labour required for the satisfactory completion of the entire job.

Width shall be measured from out of the shutter to the outside of the frame at top. The clear gap between shutter and the floor shall not be more than 5 mm.

The rate shall be paid per one square meter of the completed item.

The payment shall be made on 1 **Sqmt** basis of finished work.

Item No. 37 Providing and fixing window having extruded aluminum Colour anodized section frame main outer size 63.50 x 38.10 x 1.95 mm, @ Wt 1.094 Kg / Rmt, horizontal two track member size 61.85 mm x 31.75 mm x 1.20mm @ wt.of 0.695 Kg/mt, vertical member of size 61.85 mm x 31.75mm x 1.30 mm @ wt.of 0.659 Kg/mt with sliding shutters of horizontal member size 40mm x 18mm x 1.29mm @ wt.of 0.456Kg/mt, vertical member of size 40mm x 18mm x 1.29mm @ wt.of 0.456Kg/mt, @ Wt. 0.457 Kg/mt with 5 mm thick transparent bronze colour tinted float glass with powder coated aluminum

fittings and fixtures and transparent silicon sealant glass fixing to frame as per details etc complete for window.

Alluminium alloy used in the windows section shall confirm to IS:733-1975 & IS 1285-1975. The section shall be heavy and specified as per drawing and design. The fabrication shall be done as directed.

The hinges shall be alluminium hinges & of large size. The handles of doors shall be of specified in the design, suitable brass door lock for the door operatable either from out side or inside shall be provided. In double shutter door, The first closing shutter shall have concealed alluminium alloy bolt at top and bottom.

The plain glass shall confirm to M-38 P.12 & shall be of 5 mm thickness.

The payment shall be made on **Sqmt** basis.

Item No. 38 Providing and fixing Standard extruded colour anodized alluminium section frame weight 1.094 kg/Rmt.with Adjactable Glass Louvers of 5 mm thick transparent glass colour tinted float glass with transparent silicon gasket with allu. Powder coated fittings & fixtures.

Alluminium alloy used in the doors section shall confirm to IS:733-1975 & IS 1285-1975. The section shall be heavy and specified as per drawing and design. The fabrication shall be done as directed.

The hinges shall be alluminium hinges & of large size. The handles of doors shall be of specified in the design, suitable brass door lock for the door operatable either from outside or inside shall be provided. In double shutter door, The first closing shutter shall have concealed alluminium alloy bolt at top and bottom.

The plain glass shall confirm to M-38 P.12 & shall be of 5 mm thickness.

The payment shall be made on **Sqmt** basis.

Item No. 39 Providing erecting and fixing double coated ISI water tank of required capacity each with all necessary fittings and connection etc. complete on terrace.

1.0 Materials:-

1.1 Polyethylene water storage tank shall be of as per ID marked and IS 12701, this materials should be light weight, non toxic all fitting materials shall be H.D.P.E. / Brass

1.2 The P.V.C. tank shall be of I.S.I. mark and approved quality and brand like infra or Sintex or equivalent. It shall be approved by Engineer in charge

1.3 The thickness of P.V.C. materials shall be as per Company's specification. The size of tank shall be decided by Engineer in charge

2.0 Workmanship :-

2.1 Water tank shall be installed on perfectly plained and smooth surface.

2.2 Outlet pipe shall be 7.5 cm high then bottom surface.

2.3 Diameter of overflow pipe shall be bigger then inlet pipe diameter.

2.4 Unions shall be used in inlet and outlet pipe.

2.5 For connection in water tank required vicer, and check-nuts shall be used.

2.6 Fitting shall be done by G.I. / P.V.C. pipes as per instruction of Engineer in charge in each tank.

All joints shall be leak proof.

3.0 Mode of Measurement and Payment :-

3.1 This shall be measured in one **liter** basis and rates are as per liter basis for the volumetric capacity of the water tank.

3.2 Rate shall be inclusive of placing, lifting, storing and making connection for inlet, outlet, overflow pipe, out pipe with all necessary plumbing work and material. For complete work

Item No. 58 Providing and fixing in position PVC cowl vent to pipes 160 mm dia.

General

This work shall consist of Providing and fixing in position PVC cowl vent of the shape and dimensions shown on the drawings and conforming to these Specifications or as approved by the Engineer in charge.

1. Material

1.0 Cowl vent

- 1.1 Cowl vent shall be of PVC and shall be sound and free from porosity or other defects which affect serviceability. The thickness of the base metal shall not be less than 6.5 mm. The surface shall be smooth and free from craze, chips and other flaws or any other kind of defects which affect serviceability. The size of Cowl vent shall be specified.
- 1.2 Cowl vent shall be of quality approved by the Engineer-in-charge and shall generally conform to the relevant Indian Standards.
- 1.3 The cover shall be PVC perforated cover shall be provided on the trap of appropriate size.
2. MODE OF MEASUREMENTS & PAYMENT
- 2.0 The rate for cowl vent includes cost of vent, its carting from to work site with all leads and lifts placing and fixing in position.
- 2.1 The rate shall be for a unit of One **Number**.

Item No. 67 Providing & laying weep hole in Abutments, and returns by using A.C. pipe of 100mm including laying in proper grede and jointing the completed as per detailed specification.

Weep holes of 100 mm internal diameter may be provided at 1.0 metre centre to centre in horizontal & vertical direction 100 mm diameter. P. V. C. pipe shall be provided for full width of abutment & return. The pipe shall be provided with slope of 1 vertical to 20 horizontal towards draining face. (slope 1 IN 20) Gigrating shall be provided on P. V. C. pipe on inner face of Abutment & Return.

The bottom row of weep holes may be provided just 15 centimetres above the ground level or low water level, whichever is higher.

Measurment for payment shall be per **Number** of weep holes provided.

Unit rate includes the cost of materials labour, tools, cutting, fixing to complete the work.

The rate shall be inclusive of royalties & all taxes & tool tax.

Item No. 68 Clearing and grubbing road land including uprooting rank vegetation grass bushes, shrubs, sapling and trees girth up to 300 mm removal of stumps of trees cut earlier and disposal of unserviceable materials (C) By mechanical means in area of light jungle

201. CLEARING AND GRUBBING

201.1. Scope

This work shall consist of cutting, removing and disposing of all materials such as trees, bushes, shrubs, stumps, roots, grass, weeds, top organic soil etc. to an average depth of 150mm in thickness, which in the opinion of the Engineer are unsuitable for incorporation in the works, from the area of road land containing road embankment, drains, cross-drainage structures and such other areas as may be specified on the drawings or by the Engineer. It shall include necessary excavation, backfilling of pits resulting from uprooting of trees and stumps to required compaction, handling, salvaging, and disposal of cleared materials with all lead and lift.

Clearing and grubbing shall be performed in advance of earthwork operations and in accordance with the requirements of these specifications.

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201.2. Preservation of Property/Amenities

Roadside trees, shrubs, any other plants, pole lines, fences, signs, monuments, buildings, pipelines, sewers and all highway facilities within or adjacent to the highway which are not to be disturbed shall be protected from injury or damage. The Contractor shall provide and install at his own cost, suitable safeguards approved by the Engineer for this purpose.

During clearing and grubbing, the Contractor shall take all adequate precautions against soil erosion, water pollution, etc., and where required, undertake additional works to that effect vide Clause 306 (as per Page No. 77 in MORTH specification booklet). Before start of operations, the Contractor shall submit to the Engineer for approval, his work plan including the procedure to be followed for disposal of waste materials

etc. and the schedules for carrying out temporary and permanent erosion control works as stipulated in Clause 306.3 (as per Page No. 78 in MORTH specification booklet).

201.3. Methods, Tools and Equipments

Only such methods, tools and equipment as are approved by the Engineer and which will not affect any property to be preserved shall be adopted for the work. If the area has thick vegetation/roots/trees, a crawler or pneumatic tyred dozer of adequate capacity may be used for clearance purposes. The dozer shall have ripper attachments for removal of tree stumps. All trees, stumps, etc., falling within excavation

and fill lines shall be cut to such depth below ground level that in no case these fall within 500 mm of the subgrade. Also, all vegetation such as roots, under-growth, grass and other deleterious matter unsuitable for incorporation in the embankment/subgrade shall be removed between fill lines to the satisfaction of the Engineer. All branches of trees extending above the roadway shall be trimmed as directed by the Engineer.

All excavations below the general ground level arising out of the removal of trees, stumps, etc., shall be filled with suitable material and compacted thoroughly so as to make the surface at these points conform to the surrounding area.

Ant-hills both above and below the ground, as are liable to collapse and obstruct free subsoil water flow shall be removed and their workings, which may extend to several metres shall be suitably treated.

201.4. Disposal of Materials

All materials arising from clearing and grubbing operations shall be taken over and shall be disposed of by the Contractor at suitable disposal sites with all lead and lift. The disposal shall be in accordance with local, State and Central regulations.

201.5. Measurements for Payment

Clearing and grubbing for road embankment, drains and cross-drainage structures shall be measured on area basis in terms of Hectares. Cutting of trees upto 300mm in girth and removal of their stumps, including removal of stumps upto 300mm in girth left over after trees have been cut by any other agency and trimming of branches of trees extending above the roadway and back filling to the required compaction shall be considered incidental to the clearing and grubbing operations. Clearing and grubbing of borrow areas shall be deemed to have been included in the rates quoted for the embankment construction item and no separate payment shall be made for the same.

Ground levels shall be taken prior to and after clearing and grubbing. Levels taken prior to clearing and grubbing shall be the base level and will be accordingly used for assessing the depth of clearing and grubbing and computation of quantity of any unsuitable material which is required to be removed. The levels taken subsequent to clearing and grubbing shall be the base level for computation of earthwork for embankment.

Cutting of trees, excluding removal of stumps and roots of trees of girth above 300 mm shall be measured in terms of number according to the girth sizes given below: -

Above 300 mm to 600 mm

i) Above 600 mm to 900 mm

ii) Above 900 mm to 1800 mm

v) Above 1800 mm

Removal of stumps and roots including back filling with suitable material to required compaction shall be a separate item and shall be measured in terms of number according to the sizes given below:-

Above 300 mm to 600 mm

i) Above 600 mm to 900 mm

ii) Above 900 mm to 1800 mm

v) Above 1800 mm

For this purpose of cutting of trees and removal of roots and stumps, the girth shall be measured at a height of 1 metre above ground or at the top of the stump if the height of the stump is less than one metre from the ground.

201.6. Rates

201.6.1. The Contract unit rates for the various items of clearing and grubbing shall be payment in full for carrying out the required operations including full compensation for all labour, materials, tools, equipment and incidentals necessary to complete the work. These will also include removal of stumps of trees less than 300mm girth excavation and back -filling to required density, where necessary and handling, giving credit towards salvage value disposing of the cleared materials with all lifts and leads. Clearing and grubbing done in excess of 150 mm by the Contractor shall be made good by the Contractor at his own cost as per Clause 301.3.3 to the satisfaction of the Engineer prior to taking up earthwork. Where clearing and grubbing is to be done to a level beyond 150 mm, due to site considerations, as directed by the Engineer, the extra quantity shall be measured and paid separately.

201.6.2. The Contract unit rate for cutting trees of girth above 300 mm shall include handling,giving credit towards salvage value disposing of the cleared materials with all lifts and leads.

201.6.3 The Contract unit rate for removal of stumps and roots of trees girth above300 mm shall include excavation and backfilling with suitable material to required compaction, handling,giving credit towards salvage value disposing of the cleared materials with all lifts and leads.

201.6.4 The Contract unit rate is deemed to include credit towards value of usable materials,salvage value of unusable material and off-set price of cut trees and stumps belonging to the forest Department. The off-set price of cut trees and stumps belonging to the Forest Department shall be deducted from the amount due to the Contractor and deposited with the State Forest Department. In case the cut trees and stumps are required to be deposited with the Forest Department the Contractor shall do so and no deduction towards the off -set price shall be effected. The offset price shall be as per guidelines I estimates of the state Forest Department.

201.6.5 Where a Contract does not include separate items of clearing and grubbing, the same shall be considered incidental to the earthwork items and the Contract unit prices for the same shall be considered as including clearing and grubbing operations.

The payment shall be made on **Hect.** basis.

Item No. 69 Earthwork in cutting including preparing the slope and camber and stacking or utilising the cutting stuff in bank as directed upto 200 Meters from the end of cutting with all lead and lift.(i) Hard murrum.

305 EMBANKMENT CONSTRUCTION

305.1 General:

305.1.1 Description:

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

305.2 Materials and General Requirements.

305.2.1 Physical requirements :

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

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

- (a) Materials from swamps, marshes and bogs;
- (b) Peat, log, stump and perishable material; and soil that classifies as OL,OI, OH or Pt in accordance with IS:1498;
- (c) Materials susceptible to spontaneous combustion;
- (d) Materials in a frozen condition;

- (e) Clay having liquid limit exceeding 50 and plasticity index exceeding 25; and
- (f) Materials with salts resulting in leaching in the embankment.

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

305.2.1.3 Any fill material with a soluble sulphate content exceeding 1.9 grams of sulphate (expressed as SO₃) per liter when tested in accordance with BS:1377 Part-3, but using a 2:1 water-soil ratio shall not be deposited within 500 mm or other distance described in the Contract), permanent works constructed out of concrete, cement bound materials or other cementations materials. aterials with a total sulphate content (expressed as SO₃) exceeding 0.5 per cent by mass, when tested in accordance with BS: 1377, Part 3 shall not be deposited within 500 mm or other distances described in the contract, of metallic items forming part of the Permanent Works.

305.2.1.4 The size of the coarse material in the mixture of earth shall ordinarily not exceed 75mm when being placed in the embankment and 50 mm when placed in the sub grade. However, the Engineer may at his discretion permit the use of material coarser than this also if he is satisfied that the same will not present any difficulty as regards the placement of fill material and its compaction to the requirements of these specifications. The maximum particle size shall not be more than two-thirds of the compacted layer thickness.

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

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

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

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

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

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

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

05.2.2 General Requirements:

305.2.2.1 The materials for embankment shall be obtained from approved sources with preference given to materials becoming available from nearby roadway excavation or any other excavation under the same Contract.

The work shall be so planned and executed that the best available materials are saved for the sub grade and the embankment portion just below the sub grade.

305.2.2.2 Borrow materials:

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

Borrow pits along the road shall be discouraged. If permitted by the Engineer, these shall not be dug continuously. Ridges of not less than 8 m width should be left at intervals not exceeding 300m. Small drains shall be cut through the ridges to facilitate drainage. The depth of the pits shall be so regulated that their bottom does not cut an imaginary line having a slope of 1 vertical to 4 horizontal projected from the edge of the final section of the bank, the maximum depth in any case being limited to 1.5 m.

Iso, no pit shall be dug within the offset width of a minimum of 10 m.

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

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

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

305.2.2.3 Fly-Ash

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

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

305.2.2.4 Compaction Requirements

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

TABLE 300-2. COMPACTION REQUIREMENTS FOR EMBANKMENT AND SUBGRADE.

Type of work/material	Relative compaction as percentage of max. laboratory dry density as per IS:2720 (Part 8)
1. Sub grade and earthen shoulders	Not less than 97%
2. Embankment	Not less than 95%
3. Expansive Clays	
a) Sub grade and 500mm. portion Just below the sub grade.	Not allowed
b) Remaining portion of embankment	Not less than 90-95%

The Contractor shall at least 7 working days before commencement of compaction submit the following to the Engineer for approval :

- (i) The values of maximum dry density and optimum content obtained in accordance with IS:2720 (Part 8), appropriate for each of the fill materials he intends to use.
- (ii) A graph of density plotted against moisture content from which each of the values in (i) above of maximum dry density and optimum moisture content were determined. The maximum dry density and optimum moisture content approved by the Engineer, it shall form the basis for compaction.

305.3 Construction Operations :

305.3.1 Setting Out

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

305.3.2 Dewatering

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

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

305.3.3 Stripping and Storing topsoil

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

305.3.4 Compacting ground supporting embankment/Sub grade:

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

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

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

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

305.3.5 Spreading material in layers and bringing to appropriate moisture content

305.3.5.1 The embankment and sub grade material shall be spread in layers of uniform thickness in the entire width with a motor grader. The compacted thickness of each layer shall not be more than 250mm when vibratory roller / vibratory soil compactor is used and not more than 200 mm when 80-100 kN static roller is used. The motor grader blade shall have hydraulic control suitable for initial adjustment and maintain the same so as to achieve the specific slope and grade. Successive layers shall not be placed until the layer under construction has been thoroughly compacted to the specified requirements as in Table 300-2 and got approved by the Engineer. Each compacted layer shall be finished parallel to the final cross-section of the embankment.

305.3.5.2 Moisture content of the material shall be checked at the site of placement prior to commencement of compaction; if found to be out of agreed limits, the same shall be made good. Where water is required to be added in such constructions, water shall be sprinkled from a water tanker fitted with sprinkler capable of applying water uniformly with a controllable rate of flow to variable widths of surface

but without any flooding. The water shall be added uniformly and thoroughly mixed in soil by balding, dicing or barrowing until a uniform moisture content is obtained throughout the depth of the layer. If the material delivered to the roadbed is too wet, it shall be dried, by aeration and exposure to the sun, till the moisture content is acceptable for compaction. Should circumstances arise, where owing to wet weather, the moisture content can not be reduced to the required amount by the above procedure, compaction work shall be suspended.

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

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

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

305.3.5.3 Embankment and other areas of fill shall, unless otherwise required in the Contract or permitted by the Engineer, be constructed evenly over their full width and their fullest possible extent and the Contractor shall control and direct construction plant and other vehicular traffic uniformly over them.

Damage by construction plant and other vehicular traffic shall be made good by the Contractor with material having the same characteristics and strength as the material had before it was damaged.

Embankments and other areas of unsupported fills shall not be constructed with steeper side slopes, or to greater widths than those shown in the Contract, except to permit adequate compaction at the edges before trimming back, or to obtain the final profile following any settlement of the fill and the underlying material.

Whenever fill is to be deposited against the face of a natural slope, or sloping earthworks face including embankments, cutting, another fills and excavations steeper than 1 vertical on 4 horizontal, such faces shall be benched as per Clause 305.4.1 immediately before placing the subsequent fill.

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

305.3.6 Compaction

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

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

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

Each layer of the material shall be thoroughly compacted to the densities specified in Table 300-2. Subsequent layers shall be placed only after the finished layer has been tested according to Clause 903.2.2 and accepted by the Engineer. The Engineer may permit measurement of field dry density by a nuclear moisture/density 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 embankments / 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 using appropriate mechanical means such as light weight vibratory roller, double drum walk behind roller, vibratory plate compactor, trench compactor or vibratory tamper to the density requirements and satisfaction of the Engineer.

305.3.7 Drainage

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

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

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

305.3.9 Finishing operations:

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

The topsoil, removed and conserved earlier (Clause 301.3.2 and 305.3.3) shall be spread over the fill slopes as per directions of the Engineer to facilitate the growth of vegetation. Slopes shall be roughened and moisture slightly prior to the application of the topsoil in order to provide satisfactory bond. The depth of the top soil shall be sufficient to sustain plant growth, the usual thickness being from 75 mm to 150 mm. Where directed, the slopes shall be turfed with sods in accordance with Clause 307. If seeding and mulching of slopes is prescribed, this shall be done to the requirement of Clause 308.

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

305.4 Construction of Embankment and subgrade under special conditions.

305.4.1 Earthwork for widening existing road embankment :

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

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

305.4.2 Earthwork for embankment and subgrade to be placed against sloping ground

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

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

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

305.4.3 Earthwork over existing road surface:-

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

- (i) If the existing road surface is of granular or bituminous type and lies within 1 m of the new formation levels, it shall be scarified to a depth of 50mm or as directed so as to provide ample bond between the old and new material ensuring that at least 500 mm portion below the top of new subgrade level is compacted to the desired density.
- (ii) If the existing road surface is of bituminous type or cement concrete type and lies within 1 m of the new formation level, the bituminous or cement concrete layer shall be removed completely.
- (iii) If the level difference between the existing road surface and the new formation level is more than 1 m. the existing surface shall be roughened after ensuring that the minimum thickness of 500mm of subgrade is available.

305.4.4 Embankment and subgrade around structures :-

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

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

The material used for backfill shall not be an organic soil or highly plastic clay having plasticity index and liquid limit more than 20 and 40 respectively when tested according to IS: 2720 (Part 5). Filling behind abutments and wing walls for all structures shall conform to the general guidelines given in IRC: 78. The fill material shall be deposited in horizontal layers in loose thickness and compacted thoroughly to the requirements of Table 300-2.

Where the provision of any filter medium is specified behind the abutment, the same shall be laid in layers simultaneously with the laying of fill material. The material used for filter shall conform to the requirements for filter medium spelt out in Clause 2504 unless otherwise specified in the Contract.

here it may be impracticable to use conventional rollers, the compaction shall be carried out by appropriate mechanical means such as small vibratory roller, plate compactor or power rammer. Care shall be taken to see that the compaction equipment does not hit or come too close to any structural member so as to cause any damage to them or excessive pressure against the structure.

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

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

305.4.6 Embankment construction under water and Water logged areas

305.4.6.1 Embankment construction under water

Where filling or backfilling is to be placed under water, only acceptable granular material or rock shall be used unless otherwise approved by the Engineer. Acceptable granular material shall be of GW, SW, GP, SP as per IS:1498 and consist of graded, hard durable particles with maximum particle size not exceeding 75mm. The material should be non-plastic having uniformity coefficient of not less than 10.

The material placed in open water shall be deposited by end tipping without compaction.

305.4.6.2 Embankment construction in waterlogged and Marshy Areas :

The work shall be done as per IRC:34.

05.4.7 Earthwork for high embankment :-

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

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

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

305.4.8 Settlement period

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

305.5 Plying of Traffic

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

305.6 Surface Finish and Quality Control of Work

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

305.7 Subgrade Strength

It shall be ensured prior to actual execution that the borrow area material to be used in the subgrade satisfies the requirements of design CBR.

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

305.8 Measurements for Payment

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

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

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

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

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

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

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

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

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

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

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

305.9 RATES:

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

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

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

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

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

305.9.5 The Contract unit rate for scarifying existing granular/bi-tuminous road surface shall be payment in full for carrying out the required operations including full compensation for all labour materials, tools, equipment and incidentals, necessary to complete the work. This will also comprise of handling, giving credit towards salvage value and disposal of the dismantled materials with all leads and lifts or as otherwise specified.

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

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

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

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

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

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

Measurement shall be taken and paid in **Cu.m.**

Item No. 70 Earthwork for embankment including breaking clods, dressing with all lead and lift (including watering and consolidation)(A) From Borrow pits within land width

305 EMBANKMENT CONSTRUCTION

305.1 General:

305.1.1 Description:

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

305.2 Materials and General Requirements.

305.2.1 Physical requirements :

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

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

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

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

305.2.1.3 Any fill material with a soluble sulphate content exceeding 1.9 grams of sulphate (expressed as SO₃) per liter when tested in accordance with BS:1377 Part-3, but using a 2:1 water-soil ratio shall not be deposited within 500 mm or other distance described in the Contract), permanent works constructed out of concrete, cement bound materials or other cementations materials. aterials with a total sulphate content (expressed as SO₃) exceeding 0.5 per cent by mass, when tested in accordance with BS: 1377, Part 3 shall not be deposited within 500 mm or other distances described in the contract, of metallic items forming part of the Permanent Works.

305.2.1.4 The size of the coarse material in the mixture of earth shall ordinarily not exceed 75mm when being placed in the embankment and 50 mm when placed in the sub grade. However, the Engineer may at his discretion permit the use of material coarser than this also if he is satisfied that the same will not present any difficulty as regards the placement of fill material and its compaction to the requirements of these specifications. The maximum particle size shall not be more than two-thirds of the compacted layer thickness.

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

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

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

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

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

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

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

05.2.2 General Requirements:

305.2.2.1 The materials for embankment shall be obtained from approved sources with preference given to materials becoming available from nearby roadway excavation or any other excavation under the same Contract.

The work shall be so planned and executed that the best available materials are saved for the sub grade and the embankment portion just below the sub grade.

305.2.2.2 Borrow materials:

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

Borrow pits along the road shall be discouraged. If permitted by the Engineer, these shall not be dug continuously. Ridges of not less than 8 m width should be left at intervals not exceeding 300m. Small drains shall be cut through the ridges to facilitate drainage. The depth of the pits shall be so regulated that their bottom does not cut an imaginary line having a slope of 1 vertical to 4 horizontal projected from the edge of the final section of the bank, the maximum depth in any case being limited to 1.5 m.

Iso, no pit shall be dug within the offset width of a minimum of 10 m.

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

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

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

305.2.2.3 Fly-Ash

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

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

305.2.2.4 Compaction Requirements

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

TABLE 300-2. COMPACTION REQUIREMENTS FOR EMBANKMENT AND SUBGRADE.

Type of work/material	Relative compaction as percentage of max. laboratory dry density as per IS:2720 (Part 8)
4. Sub grade and earthen shoulders	Not less than 97%
5. Embankment	Not less than 95%
6. Expansive Clays	
c) Sub grade and 500mm. portion Just below the sub grade.	Not allowed
d) Remaining portion of embankment	Not less than 90-95%

The Contractor shall at least 7 working days before commencement of compaction submit the following to the Engineer for approval :

- (iii) The values of maximum dry density and optimum content obtained in accordance with IS:2720 (Part 8), appropriate for each of the fill materials he intends to use.
- (iv) A graph of density plotted against moisture content from which each of the values in (i) above of maximum dry density and optimum moisture content were determined. The maximum dry density and optimum moisture content approved by the Engineer, it shall form the basis for compaction.

305.3 Construction Operations :

305.3.1 Setting Out

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

305.3.2 Dewatering

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

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

305.3.3 Stripping and Storing topsoil

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

305.3.4 Compacting ground supporting embankment/Sub grade:

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

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

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

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

305.3.5 Spreading material in layers and bringing to appropriate moisture content

305.3.5.1 The embankment and sub grade material shall be spread in layers of uniform thickness in the entire width with a motor grader. The compacted thickness of each layer shall not be more than 250mm when vibratory roller / vibratory soil compactor is used and not more than 200 mm when 80-100 kN static roller is used. The motor grader blade shall have hydraulic control suitable for initial adjustment and maintain the same so as to achieve the specific slope and grade. Successive layers shall not be placed until the layer under construction has been thoroughly compacted to the specified requirements as in Table 300-2 and got approved by the Engineer. Each compacted layer shall be finished parallel to the final cross-section of the embankment.

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

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

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

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

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

305.3.5.3 Embankment and other areas of fill shall, unless otherwise required in the Contract or permitted by the Engineer, be constructed evenly over their full width and their fullest possible extent and the Contractor shall control and direct construction plant and other vehicular traffic uniformly over them. Damage by construction plant and other vehicular traffic shall be made good by the Contractor with material having the same characteristics and strength as the material had before it was damaged. Embankments and other areas of unsupported fills shall not be constructed with steeper side slopes, or to greater widths than those shown in the Contract, except to permit adequate compaction at the edges before trimming back, or to obtain the final profile following any settlement of the fill and the underlying material.

Whenever fill is to be deposited against the face of a natural slope, or sloping earthworks face including embankments, cutting, another fills and excavations steeper than 1 vertical on 4 horizontal, such faces shall be benched as per Clause 305.4.1 immediately before placing the subsequent fill.

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

305.3.6 Compaction

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

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

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

Each layer of the material shall be thoroughly compacted to the densities specified in Table 300-2. Subsequent layers shall be placed only after the finished layer has been tested according to Clause 903.2.2 and accepted by the Engineer. The Engineer may permit measurement of field dry density by a nuclear moisture/density 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 embankments / 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 using appropriate mechanical means such as light weight vibratory roller, double drum walk behind roller, vibratory plate compactor, trench compactor or vibratory tamper to the density requirements and satisfaction of the Engineer.

305.3.7 Drainage

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

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

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

305.3.9 Finishing operations:

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

The topsoil, removed and conserved earlier (Clause 301.3.2 and 305.3.3) shall be spread over the fill slopes as per directions of the Engineer to facilitate the growth of vegetation. Slopes shall be roughened and moisture slightly prior to the application of the topsoil in order to provide satisfactory bond. The depth of the top soil shall be sufficient to sustain plant growth, the usual thickness being from 75 mm to 150 mm. Where directed, the slopes shall be turfed with sods in accordance with Clause 307. If seeding and mulching of slopes is prescribed, this shall be done to the requirement of Clause 308.

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

305.4 Construction of Embankment and subgrade under special conditions.

305.4.1 Earthwork for widening existing road embankment :

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

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

305.4.2 Earthwork for embankment and subgrade to be placed against sloping ground

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

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

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

305.4.3 Earthwork over existing road surface:-

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

- (iv) If the existing road surface is of granular or bituminous type and lies within 1 m of the new formation levels, it shall be scarified to a depth of 50mm or as directed so as to provide ample bond between the old and new material ensuring that at least 500 mm portion below the top of new subgrade level is compacted to the desired density.
- (v) If the existing road surface is of bituminous type or cement concrete type and lies within 1 m of the new formation level, the bituminous or cement concrete layer shall be removed completely.
- (vi) If the level difference between the existing road surface and the new formation level is more than 1 m. the existing surface shall be roughened after ensuring that the minimum thickness of 500mm of subgrade is available.

305.4.4 Embankment and subgrade around structures :-

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

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

The material used for backfill shall not be an organic soil or highly plastic clay having plasticity index and liquid limit more than 20 and 40 respectively when tested according to IS: 2720 (Part 5). Filling behind abutments and wing walls for all structures shall conform to the general guidelines given in IRC: 78. The fill material shall be deposited in horizontal layers in loose thickness and compacted thoroughly to the requirements of Table 300-2.

Where the provision of any filter medium is specified behind the abutment, the same shall be laid in layers simultaneously with the laying of fill material. The material used for filter shall conform to the requirements for filter medium spelt out in Clause 2504 unless otherwise specified in the Contract.

here it may be impracticable to use conventional rollers, the compaction shall be carried out by appropriate mechanical means such as small vibratory roller, plate compactor or power rammer. Care shall be taken to see that the compaction equipment does not hit or come too close to any structural member so as to cause any damage to them or excessive pressure against the structure.

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

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

305.4.6 Embankment construction under water and Water logged areas

305.4.6.1 Embankment construction under water

Where filling or backfilling is to be placed under water, only acceptable granular material or rock shall be used unless otherwise approved by the Engineer. Acceptable granular material shall be of GW, SW, GP, SP as per IS:1498 and consist of graded, hard durable particles with maximum particle size not exceeding 75mm. The material should be non-plastic having uniformity coefficient of not less than 10.

he material placed in open water shall be deposited by end tipping without compaction.

305.4.6.2 Embankment construction in waterlogged and Marshy Areas :

The work shall be done as per IRC:34.

05.4.7 Earthwork for high embankment :-

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

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

Where required, the contractor shall surcharge embankments or other areas of fill with approved material for the periods specified in the Contract. If settlement of surcharged fill results in any

surcharging fill results the Contractor shall bring the resultant level upto formation level with acceptable materials for use in fill.

305.4.8 Settlement period

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

305.5 Plying of Traffic

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

305.6 Surface Finish and Quality Control of Work

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

305.7 Subgrade Strength

It shall be ensured prior to actual execution that the borrow area material to be used in the subgrade satisfies the requirements of design CBR.

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

305.8 Measurements for Payment

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

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

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

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

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

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

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

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

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

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

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

305.9 RATES:

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

- (xv) Cost of arrangement of land as a source of supply of material of required quantity for construction unless provided other wise in the contract.
- (xvi) Setting out;
- (xvii) Compacting ground supporting embankment/subgrade except where removal and replacement of unsuitable material or loosening and recompacting is involved;

- (xviii) Scarifying or cutting continuous horizontal benches 300mm wide on side slopes of existing embankment and subgrade as applicable;
- (xix) Cost of watering or drying of material in borrow areas and/or embankment and subgrade during construction as required;
- (xx) Spreading in layers, bringing to appropriate moisture content and compacting to specification requirements;
- (xxi) Shaping and dressing top and slopes of the embankment and subgrade including rounding of corners;
- (xxii) Restricted working at sites of structures;
- (xxiii) Working on narrow width of embankment and subgrade,
- (xxiv) Excavation in all soils from borrow pits/designated borrow areas including clearing and grubbing and transporting the material to embankment and subgrade site with all lifts and leads unless otherwise provided for in the contract.
- (xxv) All labour, material, tools, equipment and incidentals necessary to complete the work to the Specifications;
- (xxvi) Dewatering, and
- (xxvii) Keeping the embankment/completed formation free of water as per Clause 311.
- (xxviii) Transporting unsuitable excavated material for disposal with all leads and lifts.

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

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

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

305.9.5 The Contract unit rate for scarifying existing granular/bituminous road surface shall be payment in full for carrying out the required operations including full compensation for all labour materials, tools, equipment and incidentals, necessary to complete the work. This will also comprise of handling, giving credit towards salvage value and disposal of the dismantled materials with all leads and lifts or as otherwise specified.

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

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

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

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

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

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

Measurement shall be taken and paid in **Cu.m.**

Item No. 71 Rolling and consolidation of soling including filling in depression which occur during the process, with power roler 8 tonne to 12 tonne.

1. For spreading materials in layers and bringing the appropriate moisture content, the embankment materials shall be spread uniformly over the entire width of the embankment in

layers not exceeding 250mm in loose thickness. Successive layers of embankment shall not be placed until the layer under construction has been thoroughly compacted to the requirements set down here under :-

Moisture content of the materials shall be checked at the source of supply and if found less than that specified for compaction, the same, shall be made good either at the source or after spreading the soil in loose thickness for compaction. In the latter case, water shall be sprinkled directly from a hoseline or from a truck mounted water tank, and flooding shall not be permitted under any circumstances.

If the materials delivered to the road bed is too wet it shall be dried, by evaporation and exposure to the sun. till the moisture content is brought down to acceptable standard for compaction Should circumstances arise. Where owing to wet weather, the moisture content cannot be reduced to the required level by the above procedure, work of compaction shall be suspended.

Moisture content of each layer of soil shall be checked in accordance with IST 2720 (Part-II) and unless otherwise mentioned shall be so adjusted, making due allowance for evaporation losses, that at the time of the compaction it is in the range of 1 percent to 2 percent below the optimum moisture content determined in accordance with ISI (Part-VII). Highly expansive clays shall however be compacted at 2 to 4 percent above the optimum moisture content

After adding the required amount of water, the soil shall be processed by means of harrows, rotary mixers or as otherwise approved until the layer is uniformly wet. Clods or hard lumps of earth shall be broken to have maximum size of 150mm when being placed in the lower layers of the embankment and a maximum size of 60mm when being placed in the top 0.5 meter portion of the embankment below the subgrade.

Hauling equipment shall be dispersed uniformly over entire surface of the previously constructed layer to minimize cutting of uneven compaction Where the embankment is to be constructed on low area ground that will not support the weight of trucks or other hauling equipment, the lower part of the fill should be constructed by dumping successive loads in a uniformly distributed layers of a thickness not greater than that necessary to support the hauling equipment while placing subsequent layers.

2. COMPACTION :

Only compacting equipment approved by the Engineer-in-charge shall be employed to compact the materials. The contractor shall demonstrate the efficiency of the plants he intends to use for carrying out compaction trials.

Each layer of the materials shall be thoroughly compacted to the densities specified in Table 1.2 Table.

1.2 Compaction requirements for embankment.

Sr.	Type of Work/materials	Field dry density as per centage of maximum laboratory dry density as per IS:2720 (Part-VII)
1.	Top 0.5 meter portion of embankment below subgrade level and shoulders.	Not less than 100.
2.	Other portion of embankment.	Not less than 95
3.	Highly expensive class 85 to 90	

Subsequent layers shall be placed only after finished layer has been tested according to M.O.S.T. specification clause 902 and accepted by the Engineer-in-charge.

When density measurements reveal any soft areas in the embankment further compaction shall be carried out as directed by the Engineer-in-charge. If insite of that the specified compaction

is not achieved, the materials in the soft areas shall be removed and replaced by approved materials and compacted to the density requirement to the satisfaction of the Engineer-in-charge.

3. Measurements for Payment :

Consolidation of earth embankment construction shall be measured by taking cross section at intervals in the original position before the work starts and after its completion and computing of the volume of earthwork in cubic meters by the method of average and areas. The measurement of fill material from borrow area shall be the difference between the net quantities of suitable materials brought from roadway and drainage excavation. For this purpose it shall be assumed that one cubic meter of suitable materials brought to site from roadway and drainage excavation from one cubic meter of compacted fill and all bulking or shrinkage shall be ignored Stripping including storing and reapplication of top soil shall be measured as volume in cubic meter.

4. The contract unit rate includes cost of mechanical roller required for consolidation including ail labour, equipments fuel, hire charges, tolls, and incidentals necessary.
he rate will be made on **Sq.meter** basis of the finished work.

Item No. 72 Box cutting the road surface to proper slope and camber for making a base for road work including removing the excavated stuff and depositing on the road side slope as directed upto 50Mt.lead.

The sub grade / sub base / base to receive the water bound macadam course shall be prepared to the specified grade and camber and made of dust and other extraneous materials. Any nets of soft places shall be corrected in on approved manner and rolled until firm.

Cutting shall be paid on cross section area as established by the longitudinal level and cross sections for this purpose. The work shall be started after the initial longitudinal section of the ground and cross sections are taken and recorded.

The final surface shall confirm to proper profile, camber and super elevation etc. as directed by the Engineer. The earthwork shall be paid on sectional measurements, cross sectional etc. taken.

No allowance or payments shall be made for materials excavated prior to the taking of level by the Engineer. The rate is inclusive of cutting in all soil and murrum including removal of all shrubs, jungle cutting, cutting stuff in slopes, side drain bank etc. complete.

This item also includes the clearing the sides and demarking the line as per requirement and cutting out the existing tress on the road side, not extra payment will be paid for.

At the time of preparing final bill, the road formation in embankment and cutting shall have be perfect condition true to grade, camber and side slope duly dressed and damages due to rain cuts etc. during entire working period shall have to be done by the contractor.

The work taken in length shall be completed in all respects viz. width, grades, camber, side drains, side slopes etc. and measurements for incomplete work shall not be taken otherwise.

1.0 Mode of Measurement & Payment :

The unit rate box cutting shall include the cost of all materials, tools and plant required for excavation in all type of soils in grade and camber, line and levels and finishing as per direction of the Engineer-in-charge, excavation and all other incidental expenses for producing item of box cutting of specified breadth and depth and grade to complete the item or its components as shown on the drawings and according to these specifications.

The box cutting shall be measured for its cross section area and compacting volumes in cubic metres by the method of average areas.

The rate will be made on **Cubic Meter** basis of the finished work.

Item No. 73 Construction of B.I.T.C. granular sub base by providing granular material of Grading II, spreading in uniform layers with motor grader on prepared surface , mixing by mix in place method

with front end loader at OMC , and compacting with vibratory roller to achieve the desired density ,complete as per Clause 401.

401 GRANULAR SUB-BASE

401.1 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 sub-base hereinafter) as necessary according to lines, grades and cross-sections shown on the drawings or as directed by the Engineer.

402 Materials

402.2.1 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 gradings given in Table 400-1 and physical requirements given in Table 400-2. Gradings III and IV shall preferably be used in lower sub-base. Gradings 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 Materials

IS Sieve	Percent by Weight Passing the IS Sieve					
Designation	Grading I	Grading II	Grading III	Grading IV	Grading V	Grading VI
75.0 mm	100	-	-	-	1100	-
53.0 mm	80-100	100	100	100	80-100	100
26.5 mm	55-90	70-100	55-75	50-80	55-90	75-100
9.50 mm	35-65	50-80	-	-	35-65	55-75
4.75 mm	25-55	40-65	10-30	15-35	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	<5	-	0-3

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

Aggregate Impact Value (AIV)	IS:2386 (Part 4) 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

401.2 Construction Operations

401.2.1 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. 74 Providing, laying, spreading and compacting stone aggregates of specific sizes to water bound macadam (Grade-II) (B.T. Metal of size 45 to 63 mm) specification including spreading in uniform thickness, hand packing, rolling with 3 wheeled steel/ vibratory roller in stages to proper grade and camber, applying and brooming requisite type of screening/ binding Materials to fill up the interstices of coarse aggregate, watering and compacting to the required density.

404 WATER BOUND MACADAM SUB-BASE/BASE

404.1 Scope

This work shall consist of clean crushed aggregates mechanically interlocked by rolling and bonding together with screening, binding material where necessary and water laid on a properly prepared subgrade/sub-base/base or existing pavement, as the case may be and finished in accordance with the requirements of these Specifications and in close conformity with the lines, grades, cross-sections and thickness as per approved plans or as directed by the Engineer.

404.2 Materials

404.2.1 Coarse Aggregates

Coarse aggregates shall be either crushed or broken stone, crushed slag, overburnt (Jhama) brick aggregates or any other naturally occurring aggregates such as kankar and laterite of suitable quality.

Materials other than crushed or broken stone and crushed slag shall be used in sub-base courses only.

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 400-8. The type and size range of the aggregate shall be specified in the Contract or shall be as specified by the Engineer. 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 400-8 : Physical Requirements of Coarse Aggregates for Water Bound Macadam for Sub-base/Base Courses

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

Aggregates which get softened in presence of water shall be tested for Impact value under wet conditions in accordance with IS:5640.

The requirement of flakiness index and elongation index shall be enforced only in the case of crushed broken stone and crushed slag.

In case water bound macadam is used for sub-base, the requirements in respect of Los Angeles Value and Aggregate Impact Value shall be relaxed to 50 percent and 40 percent maximum respectively.

404.2.2 Crushed or Broken Stone

The crushed or broken stone shall be hard, durable and free from excess flat, elongated, soft and disintegrated particles, dirt and other deleterious material.

404.2.3 Crushed Slag

Crushed slag shall be made from air-cooled blast furnace slag. It shall be of angular shape, reasonably uniform in quality and density and generally free from thin, elongated and soft pieces, dirt or other deleterious materials. The weight of crushed slag shall not be less than 11.2 kN per m³ and the percentage of glossy material shall not be more than 20. It should also comply with the following requirements:

- (i) Chemical stability : To comply with requirements of appendix of Bs:1047
- (ii) Sulphur content : Maximum 2 percent
- (iii) Water absorbion : Maximum 10 percent

404.2.4 Overburnt (Jhama) Brick Aggregates

Jhama brick aggregates shall be made from overburnt bricks or brick bats and be free from dust and other objectionable and deleterious materials. This shall be used only for road stretch when traffic is low.

404.2.5 Grading Requirement of Coarse Aggregates

The coarse aggregates shall conform to one of the Gradings given in Table 400-9 as specified.

404.2.6 Screenings

Screenings to fill voids in the coarse aggregate shall generally consist of the same material as the coarse aggregate. However, where permitted, predominantly non-plastic material such as moorum or gravel (other than rounded river borne material) may be used for this purpose provided liquid limit and plasticity index of such material are below 20 and 6 respectively and fraction passing 75 micron sieve does not exceed 10 percent.

Table 400-9 : Grading Requirements of Coarse Aggregates

Grading No.	Size Range	I.S. Sieve Designation	% by weight passing
1)	63 mm to 45 mm	75 mm	100
		63 mm	90 - 100
		53 mm	25 - 75
		45 mm	0 - 15
		22.4 mm	0 - 5
2)	53 mm to 22.4 mm	63 mm	100
		53 mm	90 - 100
		45 mm	65 - 90
		22.4 mm	0 - 10
		11.2 mm	0 - 5

Note : The compacted thickness for a layer shall be 75 mm.

Screenings shall conform to the grading set forth in Table 400-10. The quantity of screenings required for various grades of stone aggregates are given in Table 400-11. The Table also gives the quantities of materials (loose) required for 10 m² for sub-base/base compacted thickness of 75 mm.

The use of screenings shall be omitted in the case of soft aggregates such as brick metal, kankar, laterites, etc. as they are likely to get crushed to a certain extent under rollers.

404.2.7 Binding Material

Binding material to be used for water bound macadam as a filler material meant for preventing ravelling shall comprise of a suitable material approved by the Engineer having a Plasticity Index (PI) value of less than 6 as determined in accordance with IS:2720 (Part-5).

The quantity of binding material where it is to be used, will depend on the type of screenings. Generally, the quantity required for 75 mm compacted thickness of water bound macadam will be 0.06–0.09 m³ per 10 m².

Table 400-10 : Grading For Screenings

Grading No.	Size of Screenings	I.S. Sieve Designation	% by weight passing by the Sieve
A	13.2 mm	13.2 mm	100
		11.2 mm	90 - 100
		5.6 mm	15 - 35
		180 micron	0 - 10
B	11.2 mm	13.2 mm	100
		11.2 mm	80 - 100
		5.6 mm	50 - 70
		180 micron	5 - 25

Table 400-11 : Approximate Quantities of Coarse Aggregates and Screenings Required for 75 mm Compacted Thickness of Water Bound Macadam (WBM) Sub-Base/Base Course for 10 m² Area

Classification	Size Range	Compacted Thickness	Loose Qty.	Screenings	
				Stone Screening	Crushable Type Such as Moorum or Gravel

				Grading Classification & Size	For WBM Sub-base/ ase Course (Loose Quantity)	Grading Classification & Size	Loose Qty.
Grading 1	63 mm to 45 mm	75 mm	0.91 to 1.07 m ³	Type A 13.2 mm	0.12 to 0.15 m ³	Not uniform	0.22 to 0.24 m ³
-do-	-do-	-do-	-do-	Type B 11.2 mm	0.20 to 0.22 m ³	-do-	-do-
Grading 2	53 mm to 22.4 mm	75 mm	-do-	-do-	0.18 to 0.21 m ³	-do-	-do-

The above mentioned quantities should be taken as a guide only, for estimation of quantities for construction etc.

Application of binding materials may not be necessary when the screenings used are of crushable type such as moorum or gravel.

404.3 Construction Operations

404.3.1 Preparation of Base

The surface of the sub-grade/sub-base/base to receive the water bound macadam course shall be prepared to the specified grade and camber and cleaned of dust, dirt and other extraneous material.

any ruts or soft yielding places shall be corrected in an approved manner and rolled until firm surface is obtained.

Where the WBM is to be laid on an existing metalled road, damaged area including depressions and potholes shall be repaired and made good with the suitable material. The existing surface shall be scarified and re-shaped to the required grade and camber before spreading the coarse aggregate for WBM.

As far as possible, laying water bound macadam course over existing bituminous layer may be avoided since it will cause problems of internal drainage of the pavement at the interface of two courses. It is desirable to completely pick out the existing thin bituminous wearing course where water bound macadam is proposed to be laid over it.

404.3.2 Inverted Choke/Sub-surface Drainage Layer

If water bound macadam is to be laid directly over the sub-grade, without any other intervening pavement course, a 25 mm course of screenings (Grading B) or coarse sand shall be spread on the prepared sub-grade before application of the aggregates is taken up. In case of a fine sand or silty or clayey sub-grade, it is advisable to lay 100 mm insulating layer of screening or coarse sand on top of fine grained soil, the gradation of which will depend upon whether it is intended to act as a drainage layer as well. As a preferred alternative to inverted choke, appropriate geosynthetics performing functions of separation and drainage may be used over the prepared sub-grade as directed by the Engineer. Section 700 shall be applicable for use of geosynthetics.

404.3.3 Lateral Confinement of Aggregates

For construction of WBM, arrangement shall be made for the lateral confinement of aggregates. This shall be done by building adjoining shoulders along with WBM layers. The practice of constructing WBM in a trench section excavated in the finished formation must be completely avoided.

Where the WBM course is to be constructed in narrow widths for widening of an existing pavement, the existing shoulders should be excavated to their full depth and width up to the sub-grade level except where widening specifications envisages laying of a stabilised sub-base using in-situ operations in which case the same should be removed only up to the sub-base level.

404.3.4 Spreading Coarse Aggregates

The coarse aggregates shall be spread uniformly and evenly upon the prepared sub-grade/ sub-base in the required quantities from the stockpiles to proper profile by using templates placed across the road about 6 m apart, in such quantities that the thickness of each compacted layer is not more than 75 mm.

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 base be permitted. Wherever possible, approved mechanical devices such as aggregate spreader shall be used to spread the aggregates uniformly so as to minimize the need for manual rectification afterwards.

No segregation of coarse aggregates shall be allowed and the coarse aggregates, as spread shall be of uniform gradation with no pockets of fine material.

The surface of the aggregates spread shall be carefully checked with templates and all high or low spots remedied by removing or adding aggregates as may be required. The surface shall be checked frequently with a straight edge while spreading and rolling so as to ensure a finished surface as per approved drawings. The coarse aggregates shall not normally be spread more than 3 days in advance of the subsequent construction operations.

404.3.5 Rolling

Immediately following the spreading of the coarse aggregates, rolling shall be started with three wheeled power rollers of 80 to 100 kN capacity or tandem or vibratory rollers of 80 to 100 kN static weight. The type of roller to be used shall be approved by the Engineer based on trial run.

Except on superelevated portions and carriageway with unidirectional cross-fall, where the rolling shall proceed from inner edge to the outer, rolling shall begin from the edges gradually progressing towards the center. First the edge/edges shall be compacted with roller running forward and backward.

The roller shall then move inward parallel to the center line of the road, in successive passes uniformly overlapping preceding tracks by at least one-half width.

Rolling shall be carried out on courses where coarse aggregates of crushed/ broken stone are used, till the road metal is partially compacted. This will be followed by application of screenings and binding material where required in Clauses 404.3.6 and 404.3.7.

However, where screenings are not to be applied as in the case of aggregates like brick metal, laterite and Kankar for sub-base construction, the compaction shall be continued until the aggregates are thoroughly keyed. Rolling shall be continued and light sprinkling of water shall be done till the surface is well compacted.. Rolling shall not be done when the sub- grade is soft or yielding or when it causes a wave-like motion in the sub-grade or sub-base course.

The rolled surface shall be checked transversely with templates and longitudinally with 3 m straight edge. Any irregularities, exceeding 12 mm, shall be corrected by loosening the surface, adding or removing necessary amount of aggregates and re-rolling until the entire surface conforms to the desired camber and grade. In no case shall the use of screenings be permitted to make up depressions.

Material, which gets crushed excessively during compaction or becomes segregated, shall be removed and replaced with suitable aggregates.

404.3.6 Application of Screenings

After the coarse aggregates have been rolled to Clause 404.3.5, screenings to completely fill the interstices shall be applied gradually over the surface. These shall not be damp or wet at the time of application. Dry rolling shall be done while the screenings are being spread so that vibrations of the roller cause them to settle into the voids of the coarse aggregates. The screenings shall not be dumped in piles but be spread uniformly in successive thin layers either by the spreading motions of hand shovels or by mechanical spreaders, or directly from tipper with suitable grit spreading arrangement.

Tipper operating for spreading the screenings shall be equipped with pneumatic tyres and operated so as not to disturb the coarse aggregates.

The screenings shall be applied at a slow and uniform rate (in three or more applications) so as to ensure filling of all voids. This shall be accompanied by dry rolling and brooming with mechanical brooms, hand brooms or both. In no case shall the screenings be applied so fast and thick as to form cakes or ridges on the surface in such a manner as would prevent filling of voids or prevent the direct bearing of the roller on the coarse aggregates. These operations shall continue until no more screenings can be forced into voids of the coarse aggregates. The spreading, rolling, and brooming of screenings shall be carried out in only such lengths of the road which could be completed within one day's operation.

404.3.7 Sprinkling of Water and Grouting

After application of screenings, the surface shall be copiously sprinkled with water, swept and rolled.

and brooms shall be used to sweep the wet screenings into voids and to distribute them evenly. The sprinkling, sweeping and rolling operation shall be continued, with additional screenings applied as necessary until the coarse aggregates have been thoroughly keyed, well-bonded and firmly set in its full depth and a grout has been formed of screenings. Care shall be taken to see that the sub-base or sub-grade does not get damaged due to the addition of excessive quantities of water during construction.

In case of lime treated soil sub-base, construction of water bound macadam on top of it shall be taken up after curing as per Clause 402.3.9 and as directed by the Engineer.

Application of binding material : After the application of screenings in accordance with Clauses 404.3.6 and 404.3.7, the binding material where it is required to be used (Clause 404.2.7) shall be applied successively in two or more thin layers at a slow and uniform rate. After each application, the surface shall be copiously sprinkled with water, the resulting slurry swept in with hand brooms, or mechanical brooms to fill the voids properly, and rolled during which water shall be applied to the wheels of the rollers if necessary to wash down the binding material sticking to them. These operations shall continue until the resulting slurry after filling of voids, forms a wave ahead of the wheels of the moving roller.

404.3.8 Setting and Drying

After the final compaction of water bound macadam course, the pavement shall be allowed to dry overnight. Next morning hungry spots shall be filled with screenings or binding material as directed, lightly sprinkled with water if necessary and rolled. No traffic shall be allowed on the road until the macadam has set. The Engineer shall have the discretion to stop hauling traffic from using the completed water bound macadam course, if in his opinion it would cause excessive damage to the surface.

The compacted water bound macadam course shall be allowed to completely dry and set before the next pavement course is laid over it.

404.4 Surface Finish and Quality Control of Work

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

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

404.4.3 The water bound macadam work shall not be carried out when the atmospheric temperature is less than 10°C in the shade.

404.4.4 Reconstruction of Defective Macadam

The finished surface of water bound macadam shall conform to the tolerances of surface regularity as prescribed in Clause 902. However, where the surface irregularity of the course exceeds the tolerances or where the course is otherwise defective due to sub-grade soil mixing with the aggregates, the course to its full thickness shall be scarified over the affected area, reshaped with added material or removed and replaced with fresh material as applicable and re-compacted. The area treated shall not be less than 10 sq.m. In no case shall depressions be filled up with screenings or binding material.

404.5 Arrangements for Traffic

During the period of construction, the arrangements for traffic shall be done as per Clause 112.

404.6 Measurements for Payment

Water bound macadam shall be measured as finished work in position in **cubic metres**.

404.7 Rate

The Contract unit rate for water bound macadam sub-base/base course shall be payable in full for carrying out the required operations including full compensation for all components listed in Clause 401.7

(i) to (v), including arrangement of water used in the work as approved by the Engineer.

Item No. 75 Compaction and finishing of cement concrete road by trimix process providing extra labour charges for the trimix vaccum dewatering service process on cement concrete road surface by using vaccum dewatering pump floater surface vibrator including making rough finish to surface as per in including levelling the complete.

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

dewatering pump floater surface vibrator including making rough finish to surface as per in including levelling the complete.complete as directed by Engineer in Charge.

In addition to these, the Contractor shall also observe the instructions and any further additional instructions which may be given by the Engineer-in-charge and shall be responsible for damage to property and any accident which may occur to workmen or the public on account of any operations connected with the storage, handling. The Engineer-in-charge shall frequently check the Contractor's compliance with these precautions.

The unit rate for the item shall be for a unit of one **Sqmt.**

Item No. 76 Supplying of yellow or Goradu soil with all lead and lift including spreading watering dressing and rolling with hand roller etc complete selected soil

The Work consists Supplying of yellow or Goradu soil with all lead and lift including spreading watering dressing and rolling with hand roller etc complete Selected soil as per instruction of Engineer-in-charge.

The Payment shall be on **Cu.Mt.** basis.

Item No. 77 Supplying of well rotted FYM manure with all lead and lift including spreading mixing dressing and rolling with hand roller etc. complete

Providing the farm yard manure shall be well decomposed and free from rubbish, unwanted stuff, excessive quantity of manure will be judged by the official authorized by this office. The interior material will be totally rejected or reduces rate will be paid at the discretion of the Director, parks & Garden, GujaratState, Gandhinager.

Mode of Measurement and Payment :-

The Payment shall be on **Cu.Mt.** basis.

Item No. 78 Scarifying the surface of soil including spreading of DAP fertilizer mixing with soil properly leveling ground dressing of the plot

The Work consists Scarifying the surface of Soil including spreading of DAP fertilizer mixing with Soil properly levelling gand dressing of the plot as per instruction of Engineer-in-charge.

The Payment shall be on **Sq.Mt.** basis.

Item No. 79 Supplying and planting Dibbling semi carpet lawn at distance of about 15 cm x 15 cm after proper anti termite treatment and rolling the same by hand roller and watering etc complete

1.0 MATERIALS

Plant of various category like Neem, Gumore etc. shall be provided as per requirement of department . The fertilizer shall be of approved quality and watering.

2.0 WORKMANSHIP

The size of pits is 45 x 45 x 45 mm carried out as per instruction of department. Black cotton soil shall be spread in to the pits plantation of tree shall be done in the centre of pits.

Necessary fertilizer shall be spread in the pits. Finally black cotton soil is spreads as required surrounding to plant up to 15 cm down from original ground for store of water surrounding plants. Care should be taken to plants during the execution of work and shall be prevents from cow, buffalo, got etc. by providing MS jail guard and agency should be responsible for it.

3.0 MODE OF MEASUREMENT AND PAYMENTS

3.1 The rate inclusive of any cost of all materials and labours for complete items. The rate also include cost of organic fertilizer, the providing plants of trees paid separately.

3.2 The rate shall be for a unit of One **Sqmt.**

Item No. 80 Bowling and developing flowering plants grown in nursery having approximate height 4 to 5 t or Height as per Landscape Plan with natural growth and natural colour planted in a lump of

soil packed in polyethylene bag or earthen pot including organic & chemical fertilizer pesticides, fungicides, hormones & maintaining the plants up to three months as Jasud

The Work Consists Bowling and developing flowering plants grown in nursery having approximate height 4 to 5 t or Height as per Landscape Plan with natural growth and natural colour planted in a lump of soil packed in polyethylene bag or earthen pot including organic & chemical fertilizer pesticides, fungicides, hormones & maintaining the plants up to three months as Jasud as per instruction of Engineer-in-charge.

2.0 WORKMANSHIP

The Plant of various specified category from approved Nursury shall be supplied and placing on site without any harm to plants and stacked in protected place so as not approached by any animals and also proper watering shall be done to stacked plants and agency should be responsible for it.

3.0 MODE OF MEASUREMENT AND PAYMENTS

3.1 The rate inclusive of any cost of all materials and labours and conveyance charge and water charge for complete items.

3.2 The rate shall be for a unit of One **Number**.

Item No. 81 Bowling and developing flowering plants grown in nursery having approximate height 4 to 5 t or Height as per Landscape Plan with natural growth and natural colour planted in a lump of soil packed in polyethylene bag or earthen pot including organic & chemical fertilizer pesticides, fungicides, hormones & maintaining the plants up to three months as Croton

The Work Consists Bowling and developing flowering plants grown in nursery having approximate height 4 to 5 t or Height as per Landscape Plan with natural growth and natural colour planted in a lump of soil packed in polyethylene bag or earthen pot including organic & chemical fertilizer pesticides, fungicides, hormones & maintaining the plants up to three months as Croton as per instruction of Engineer-in-charge.

2.0 WORKMANSHIP

The Plant of various specified category from approved Nursury shall be supplied and placing on site without any harm to plants and stacked in protected place so as not approached by any animals and also proper watering shall be done to stacked plants and agency should be responsible for it.

3.0 MODE OF MEASUREMENT AND PAYMENTS

3.1 The rate inclusive of any cost of all materials and labours and conveyance charge and water charge for complete items.

3.2 The rate shall be for a unit of One **Number**.

Item No. 82 Bowling and developing flowering plants grown in nursery having approximate height 4 to 5 t or Height as per Landscape Plan with natural growth and natural colour planted in a lump of soil packed in polyethylene bag or earthen pot including organic & chemical fertilizer pesticides, fungicides, hormones & maintaining the plants up to three months as Deserted Golden Durenta Varigated

The Work Consists Bowling and developing flowering plants grown in nursery having approximate height 4 to 5 t or Height as per Landscape Plan with natural growth and natural colour planted in a lump of soil packed in polyethylene bag or earthen pot including organic & chemical fertilizer pesticides, fungicides, hormones & maintaining the plants up to three months as Deserted Golden Durenta Varigated as per instruction of Engineer-in-charge.

2.0 WORKMANSHIP

The Plant of various specified category from approved Nursury shall be supplied and placing on site without any harm to plants and stacked in protected place so as not approached by any animals and also proper watering shall be done to stacked plants and agency should be responsible for it.

3.0 MODE OF MEASUREMENT AND PAYMENTS

3.1 The rate inclusive of any cost of all materials and labours and conveyance charge and water charge for complete items.

3.2 The rate shall be for a unit of One **Number**.

Item No. 83 Bowling and developing flowering plants grown in nursery having approximate height 4 to 5 t or Height as per Landscape Plan with natural growth and natural colour planted in a lump of soil packed in polyethylene bag or earthen pot including organic & chemical fertilizer pesticides, fungicides, hormones & maintaining the plants up to three months as Deserted Pendulla Asopalav

The Work Consists Bowling and developing flowering plants grown in nursery having approximate height 4 to 5 t or Height as per Landscape Plan with natural growth and natural colour planted in a lump of soil packed in polyethylene bag or earthen pot including organic & chemical fertilizer pesticides, fungicides, hormones & maintaining the plants up to three months as Deserted Pendulla Asopalav as per instruction of Engineer-in-charge.

2.0 WORKMANSHIP

The Plant of various specified category from approved Nursury shall be supplied and placing on site without any harm to plants and stacked in protected place so as not approached by any animals and also proper watering shall be done to stacked plants and agency should be responsible for it.

3.0 MODE OF MEASUREMENT AND PAYMENTS

3.1 The rate inclusive of any cost of all materials and labours and conveyance charge and water charge for complete items.

3.2 The rate shall be for a unit of One **Number**.

Item No. 84 Bowling and developing flowering plants grown in nursery having approximate height 4 to 5 t or Height as per Landscape Plan with natural growth and natural colour planted in a lump of soil packed in polyethylene bag or earthen pot including organic & chemical fertilizer pesticides, fungicides, hormones & maintaining the plants up to three months as Deserted Potted Plants

The Work Consists Bowling and developing flowering plants grown in nursery having approximate height 4 to 5 t or Height as per Landscape Plan with natural growth and natural colour planted in a lump of soil packed in polyethylene bag or earthen pot including organic & chemical fertilizer pesticides, fungicides, hormones & maintaining the plants up to three months as Deserted Potted Plants as per instruction of Engineer-in-charge.

2.0 WORKMANSHIP

The Plant of various specified category from approved Nursury shall be supplied and placing on site without any harm to plants and stacked in protected place so as not approached by any animals and also proper watering shall be done to stacked plants and agency should be responsible for it.

3.0 MODE OF MEASUREMENT AND PAYMENTS

3.1 The rate inclusive of any cost of all materials and labours and conveyance charge and water charge for complete items.

3.2 The rate shall be for a unit of One **Number**.

Item No. 85 Labour charges for planting various plants after proper anti-termite treatment in pits including placing properly and filling the pits with required prepared mix soil and watering and dispoorting etc. complete

The Work Consists Labour charges for planting various plants after proper anti termite treatment in pits including placing property and filling the pit with required prepared mix soil and wetering and dispoorting etc complete. as per Engineer-in-charge.

MODE OF MEASUREMENT AND PAYMENTS

The rate inclusive of any cost of all materials and labours and conveyance charge and water charge for complete items.

The rate shall be for a unit of One **Number**.

Item No. 86 Maintance of the garden for 60 days after Complition of 3 month stipulated period is completed for plantation of lawn and plants including applying second round of proper anti-termite treatment

The Work Consists Maintance of the garden for 60 days after Complition of 3 month stipulated period is complted for plantation of lawn and plants including applying second round of proper antitermite treatment as per Engineer-in-charge.

MODE OF MEASUREMENT AND PAYMENTS

The rate inclusive of any cost of all materials and labours and conveyance charge and water charge for complete items.

The rate shall be for a unit of One **Job.** basis of work done.

Item No. 87 Rubber Hose Pipe 15 mm dia of approved brand and make

The Work consists Rubber Hose pope 15 mm dia of approved brand and make as per instruction of Engineer-in-charge.

The Payment shall be on **Rmt.** basis.

Item No. 89 Drilling of pilot bore hole of size 250/300 mm diameter at above site by mud finish direct rotary rig etc. complete

The drilling agency has to collect and furnish the following information.

1 Sample of drill cutting from different strata shall be collected at suitable intervals preferably at every 2 meters depth drilled or at close intervals, if a change in the strata is met with the opinion of the Geo-hydrologist of Public Health Mechanical Circle shall binding to the contractor.

2 The sample should be stored preferably in sufficient quantity and should be washed properly. As the drilling is in progress and accurate drilling time log shall be kept indicating the time take for drilling every two meters. This log will be enable interpretation regarding the nature of formation)Hard, Soft,Unconsolidated etc.) which has bearing on the water yielding capacity of the formation. The payment shall be made on Rmt. basis of work done.

If further drilling can not be done upto specified depth due to encountering the hard formation, blue sticky clay or shell, the drilling will be stopped as per instruction of Hydrologist and payment will be made for work carried out by the contractor.

In case cement sealing is proposed below the total depth of housing that the upper reaming should be continued upto the upper limit of cement sealing.

The lowering of pipe at required depth 3 meter more reaming should be carried out beyond the full depth of pipe assembly to ensure the safe lowering against any cutting remained in the bore holes. No payment shall be made for this 3 meter extra drilling.

The pipes assembly (as per the size of tubewell) suggested by Hydrologist should be lowered as per instruction of Engineer in charge.

The required suggested size of housing, casing, strainer pipes etc. shall be brought by contractor. The pipe shall be lowered in a vertical position necessary steel bended pipes should be welded at each end of the pipes. The necessary welding rods required to weld the pipe should be brought by contractor.

No extra payment for welding rods shall be given for welding of each pipe and other. Pipe assembly should be welded in such a fashion that no air gaps should be left and there is no chance of water leakage from outside of pipe assembly through welded joint.

IF the bore is required to be drilled, more that specified depth the contractor shall be bound to carryout such additional work including drilling, providing and lowering casing and strainer pipes etc. as may be necessary. The relevant specifications regarding drilling, lowering, jointing welding pipes and strata samples etc. shall also be completed in case of such additional works. The rates of such additional works would be paid as per Tender Rates / S.O.R. of Department with less / more % of quoted by the Contractor .

The gravel packing around housing casing and strainer pipe shall have to to carried out by the contractor at his own cost.

Before gravel packing is treated, it should be ensured that the thickness of mud plaster is reduced to minimum and perfect back washing should be carried out.

The tube well should be gravel packed with at-least minimum calculated quantity. The gravel packing operation shall be continued till filter is construction around the slotted pipe or screen so as to ensure that no sand flowed in tube well under normal operational condition of the tube well. After gravel packing, mud mortar remains at bottom should be cleaned by fresh water.

Record of quantity of gravel in the bore should be kept by contractor and should be supplied along with strata chart.

Extra quantity of gravel should be used, if required during development of the bore. Clay packing (if required) done by the contractor by providing sticky clay desired by the Engineer in charge during or after developing the bore with air compressor etc at free of cost.

Vertically Test:

All the pipes shall be installed in such fashioned that pipes assembly has minimum possible deviation from vertical plumb. The vertically test will be permitted as under :-

1 The deviation upto 10cms per 30 meters will be permitted in the plan and done direction only and no deduction in payment will be made.

2 If the deviation is beyond 10cms above, the bore will be accepted with 10% deduction from the payment of drilling charges. Provide submersible pump suitable to above size only and should be lower at required depth and run satisfactory.

3 If the submersible pump of required capacity and size could not be lowered and do not run satisfactorily, the tube well will be rejected ad no payment shall be made.

The vertically test will be carried out as per standard practice as per G.W.S.S.b and directed by Engineer in charge.

The rate for drilling work is inclusive all kind of tools, plants, materials required to carried

But the above operation. The payment shall be made on **Rmt.** basis of work done.

Item No. 90 Supply of 200 mm diameter V-wire screen pipe of slot size 1.0 mm nominal hole etc. complete.

Supply of 200 mm diameter V-wire screen pipe of slot size 1.0 mm nominal hole etc. complete.

Instruction by Engineer-in Charge.

The payment shall be made on **Rmt** basis of work done

Item No. 91 Providing & Laying Rain Water Junction Chamber of Clear Internal Size 0.60 x 0.60 x 0.75m with excavation of size 1.36 x 1.36m & 0.15m thick M200 Bed Concrete Including brick masonry 0.23 thick wall in C.M. 1:6 of 0.75m height with 15mm thick Cement Plaster inside & outside (1:4), 1.06 x 1.06 RCC M200 top slab of thickness 0.15m with TMT steel and 455mm x 610mm cast iron manhole cover with frame weight not less than 35 kg as per directed by Engineer-in-charge.

This work shall consist of Providing & Laying Rain Water Junction Chamber of Clear Internal Size 0.60 x 0.60 x 0.75m with excavation of size 1.36 x 1.36m & 0.15m thick M200 Bed Concrete Including brick masonry 0.23 thick wall in C.M. 1:6 of 0.75m height with 15mm thick Cement Plaster inside & outside (1:4), 1.06 x 1.06 RCC M200 top slab of thickness 0.15m with TMT steel and 455mm x 610mm cast iron manhole cover with frame weight not less than 35 kg as per directed by Engineer-in-charge etc. Complete as directed by Engineer in Charge.

In addition to these, the Contractor shall also observe the instructions and any further additional instructions which may be given by the Engineer-in-charge and shall be responsible for damage to property and any accident which may occur to workmen or the public on account of any operations connected with the storage, handling. The Engineer-in- charge shall frequently check the Contractor's compliance with these precautions.

The unit rate for the item shall be for a unit of one **Number.**

Item No. 92 Providing & Laying Filter chamber of brickwork 0.23 thick in C.M. 1:6 of clear internal size 2.04m x 1.20m x 1.20m and excavation dimension of 2.80m x 1.96m x 1.35m including C.C. M200 Bed Concrete 0.15m thick and RCC M200 Top slab of thickness 0.15m with TMT steel, Including 15mm (1:4) thick cement plaster inside & outside with Cement slurry & top cover with frame of

minimum weight of 35kg, including filling filter material of 200mm thick each layer of 25-40mm, 10-20mm of BT metal and sand as per directed by engineer-in-charge

This work shall consist of Providing & Laying Filter chamber of brickwork 0.23 thick in C.M. 1:6 of clear internal size 2.04m x 1.20m x 1.20m and excavation dimension of 2.80m x 1.96m x 1.35m including C.C. M200 Bed Concrete 0.15m thick and RCC M200 Top slab of thickness 0.15m with TMT steel, Including 15mm (1:4) thick cement plaster inside & outside with Cement slurry & top cover with frame of minimum weight of 35kg, including filling filter material of 200mm thick each layer of 25-40mm, 10-20mm of BT metal and sand as per directed by engineer-in-charge etc. Complete as directed by Engineer in Charge.

In addition to these, the Contractor shall also observe the instructions and any further additional instructions which may be given by the Engineer-in-charge and shall be responsible for damage to property and any accident which may occur to workmen or the public on account of any operations connected with the storage, handling. The Engineer-in-charge shall frequently check the Contractor's compliance with these precautions.

The unit rate for the item shall be for a unit of one **Number**.

Item No. 93 Providing & Laying Water Harvesting Pit of clear size 2.00 mt x 2.00 mt x 4.00 mt. For water logging with excavation in any strata upto four meter depth, Brick work 0.23 thick in C.M. 1:6 of clear internal size 2.00m x 2.00m x 1.20m with 15mm thick C.M. 1:4 plaster, filling the pit with B.T. metal 40mm in 0.60 mt. depth with 25-40mm kaptchi, 0.30 mt. depth and 2mt. depth with coarse sand in layers including making P.V.C. line for water inlet etc. as directed with 250mm dia bore 15mt. depth and 150mm dia PVC pipe of 10 Kg.f/cm² casing with gravel packing or as directed.

This work shall consist of Providing & Laying Water Harvesting Pit of clear size 2.00 mt x 2.00 mt x 4.00 mt. For water logging with excavation in any strata upto four meter depth, Brick work 0.23 thick in C.M. 1:6 of clear internal size 2.00m x 2.00m x 1.20m with 15mm thick C.M. 1:4 plaster, filling the pit with B.T. metal 40mm in 0.60 mt. depth with 25-40mm kaptchi, 0.30 mt. depth and 2mt. depth with coarse sand in layers including making P.V.C. line for water inlet etc. as directed with 250mm dia bore 15mt. depth and 150mm dia PVC pipe of 10 Kg.f/cm² casing with gravel packing or as directed. etc. Complete as directed by Engineer in Charge.

In addition to these, the Contractor shall also observe the instructions and any further additional instructions which may be given by the Engineer-in-charge and shall be responsible for damage to property and any accident which may occur to workmen or the public on account of any operations connected with the storage, handling. The Engineer-in-charge shall frequently check the Contractor's compliance with these precautions.

The unit rate for the item shall be for a unit of one **Number**.

Item No. 94 II) Fire Extinguisher and Exit Signages Supply, installation, testing and commissioning of Carbon Dioxide (CO₂) type Fire Extinguisher of 4.5 kg confirm to IS:15683, with ISI marked / TAC approved fitted with required accessories including wall suspension brackets.

This work shall consist of Fire Extinguisher and Exit Signages Supply, installation, testing and commissioning of Carbon Dioxide (CO₂) type Fire Extinguisher of 4.5 kg confirm to IS:15683, with ISI marked / TAC approved fitted with required accessories including wall suspension brackets etc. Complete as directed by Engineer in Charge.

In addition to these, the Contractor shall also observe the instructions and any further additional instructions which may be given by the Engineer-in-charge and shall be responsible for damage to property and any accident which may occur to workmen or the public on account of any operations connected with the storage, handling. The Engineer-in-charge shall frequently check the Contractor's compliance with these precautions.

The unit rate for the item shall be for a unit of one **Number**.

Item No. 95 Supply, Installation, Testing & Commissioning of ABC type 6kg confirm IS:15683, with ISI marked / TAC approved fitted with required accessories including wall suspension brackets.

This work shall consist of Supply, Installation, Testing & Commissioning of ABC type 6kg confirm IS:15683, with ISI marked / TAC approved fitted with required accessories including wall suspension brackets etc. Complete as directed by Engineer in Charge.

In addition to these, the Contractor shall also observe the instructions and any further additional instructions which may be given by the Engineer-in-charge and shall be responsible for damage to property and any accident which may occur to workmen or the public on account of any operations connected with the storage, handling. The Engineer-in-charge shall frequently check the Contractor's compliance with these precautions.

The unit rate for the item shall be for a unit of one **Number**.

Item No. 105 Providing and Constructing sock pit of 3.46 mt. dia outside and 4 mt depth with honey combed masonry 6.50 mt. from bottom and 0.60 mt. brick masonry in C.M. 1:6 top with RCC slab cover of M200 vent pipe 1.8mt. Long 75mm dia & C.I. cover and cowel vent etc. comp

This work shall consist of Providing and Constructing sock pit of 3.46 mt. dia outside and 4 mt depth with honey combed masonry 6.50 mt. from bottom and 0.60 mt. brick masonry in C.M. 1:6 top with RCC slab cover of M200 vent pipe 1.8mt. Long 75mm dia & C.I. cover and cowel vent etc. Complete as directed by Engineer in Charge.

In addition to these, the Contractor shall also observe the instructions and any further additional instructions which may be given by the Engineer-in-charge and shall be responsible for damage to property and any accident which may occur to workmen or the public on account of any operations connected with the storage, handling. The Engineer-in-charge shall frequently check the Contractor's compliance with these precautions.

The unit rate for the item shall be for a unit of **one Number**.

Item No. 106 to 170 Electric Items

PROCEDURE TO BE FOLLOWED FOR EXECUTION OF ELECTRICAL WORKS

The Certificate copy of the agreement shall be sent by the Executive Engineer, R. & B. Division, **Himmatnagar** for the Executive Engineer, **Himmatnagar** Elect. (R&B) Division, **Himmatnagar**.

The Civil works as per Part-I of Quantities shall be supervised, Measured, billed passed and paid by the Executive Engineer, R. & B. Division, **Himmatnagar**.

The Electrical works as per Part-II of Quantities shall be supervised, measured billed for and passed by Executive Engineer, **Himmatnagar** Elect. (R&B) Division, **Himmatnagar**.

The payment of bill of Electrical work duly passed by the Executive Engineer, **Himmatnagar** Elect. (R&B) Division, **Himmatnagar** shall be made by Executive Engineer, R. & B. Division, **Himmatnagar**.

So far as the Electrical works is concern, the decision and in Instruction given by the Executive Engineer, Himmatnagar Elect. (R&B) Division, Himmatnagar shall be binding to the contractor and he shall be liable to set in accordance with the instruction issued for the quality & workmen ship etc.

Quality of works and part rate / reduce rate etc. for Electrical works shall be decided by the Executive Engineer, Himmatnagar Elect. (R&B) Division, Himmatnagar and shall be binding to the contractor.

The Contractor shall be observing the prevailing Rules and procedure for the Electrical work before during and after execution of Electrical works. As directed by the Executive Engineer, Himmatnagar Elect. (R&B) Division, Himmatnagar.

Electrical work shall be carried out & completed simultaneously with civil work.

Before execution of Extra / Excess Electrical works as per part-II of Quantities approval from competent authority should be obtained.

Signature of Contractor

Deputy Executive Engineer,
R&B Sub Division
Himmatnagar

Executive Engineer,
R&B Division
Himmatnagar