

GENERAL TECHNICAL SPECIFICATIONS

FOR ROAD /BRIDGE WORKS

Name of Work-

કામનું નામ

Construction of Hume pipe Drain on SH to Manpur Methan Road (VR) Between
Km.0/800 to 1/000 Ta.Dhrangadhra, Dist.; Surendranagar. (Under MMGSY-
Normal-2025-26)

GENERAL TECHNICAL SPECIFICATIONS

1.0 General :

All Measurements shall be made in metric system. Different items of work shall be measured in accordance with the procedures set forth in relevant sections read in conjunction with General Conditions of contract. The same shall not however apply in the case of lump-sum items. All measurements and computations ; unless other wise indicated, shall be carried nearest to be following limits :

- (i) Length and breadth.....10mm
- (ii) Height, depth or thickness of earthwork,
Sub-base, bases surfacing, and structural members.....5mm
- (iii) areas..... 0.01 Sq.Metre.
- (iii) Cubic contents.....0.01 Cubic Metre.

In recording dimensions of work the sequence of length, width and height or depth or thickness shall be followed.

2.0. Measurement of lead for Materials :

Where lead is specified in the contract for construction materials, the same shall be measured as described hereunder.

Lead shall be measured over the shortest practicable route and not the one actually taken and the decision of the Engineer-in-charge in this regards shall be taken as final. Distance up to and including 100 Metres shall be measured in units of 50 Metres, exceeding 100 metres but exceeding 1 Km. in units of 100 Metres, and exceeding 1 Km. in units of 500 Metres. The half and greater than half of the units shall be reckoned as one and less than half of the units ignored. In this regard, the source of the materials shall be divided into suitable blocks and for each block the distance from the centre of the block to the centre of placing pertaining to that block shall be taken as the lead distance.

3.0 Surface Regularity of sub grade and Pavement courses :

The surface regularity of completed sub-base courses and wearing surface in the longitudinal and transverse direction shall be within the tolerances indicated in Table below. The longitudinal profile shall be checked with a 3 Metre long straight edge, at the middle of each traffic lane along a line parallel to the centre line of the road. The transverse profile shall be checked with a set for three camber boards at intervals of 10 Metres.

PERMITTED TOLERANCES OF SUB REGULARITY FOR PAVEMENT COURSE.

Sr.	Type of construction	Longitudinal Profile with 3 Metre straight edge.					Cross Profile
		Maximum permissible undulation in mm	Maximum number of undulation permitted in any 300 m. length exceeding in				Maximum permissible variation from specified profile camber themplate mm
1	2	3	4	5	6	7	8
1	Earth sub grade	36	30	-	-	-	15
2	Granular/lime Cement stabilized sub base.	23	-	30	-	-	12
3	Water Bound Macadam with nominal size metal (20-50)mm	18	-	-	30	-	8
4	Semi Dense carpet @ @	15	-	-	-	20	6

Notes:

1. These are for machine laid surfaces. If laid manually, due to unavoidable reason, tolerance up to 50 percent above these values in the columns may be permitted. However, this relaxation does not apply to the values of maximum undulation for longitudinal and cross profiles mentioned in columns 3 and 8 in the table.

2. Surface evenness requirements in respect of both the longitudinal and profiles should be simultaneously satisfied.

3. **Rectification** : Where the surface irregularity of sub grade and the various pavement courses fall outside the specified tolerances, the contractor shall be liable to rectify these in the manner described below and to the satisfaction of the Engineer- in-Charge at this own cost.

(I) **Sub grade**; Where the surface is high, it shall be trimmed and suitably compacted. Where the surface is low, the deficiency shall be corrected by adding fresh material. The degree of compaction and the type of material to be used shall conform to the specified requirements.

(ii) **Granular/Sub Base**: Same as at (i) above except that the degree of compaction and the type of material to be used shall conform to the specified requirements.

(iii) **Lime/Cement stabilized soil sub-Base**: For lime/ cement treated materials where the surface is high, the same shall be suitably trimmed while taking care that the material below is not disturbed due to this operation. However where the surface is low, the same shall be corrected as described here in below.

For cement treated material, when the time elapsed between detection of irregularity and the time of mixing of the material, is less than 2 hours, the surface shall be scarified to a depth of 50mm, supplemented with freshly mixed material as necessary and recomposed to the relevant specification. When this time is more than 2 hours, the full depth of the layer shall be removed from the pavement and replaced with fresh material, to specification. In either case, the area treated shall not be less than 5 Metres wide. This also applies to lime treated material except that the time criterion shall be 3 hours instead of 2 hours.

(iv) **Water Bound Macadam Base**. : Where the surface is high or low, that top 75mm shall be scarified, reshaped with added material as necessary and re compacted. The area treated at a place shall not be less than 5 Metres long and 2 Metres wide.

(v) **Bituminous Construction** : For bituminous construction other than wearing course, where the surface is low, the deficiency shall be corrected by adding fresh material and re compaction to specifications, Where this surface is high, the full depth of the layer shall be removed and replaced with fresh material and compacted to specifications. For wearing course, where the surface is high or low, the full depth of the layer shall be removed and replaced with fresh material and compacted to specifications in all cases where the removal and replacement of a bituminous layer is involved, the area treated shall not be less than 5 Metre long and not less than 1 lane wide.

4.0 Quality Control Test during Construction. :

The materials supplied and the works carried out by the Contractor shall conform to the enclosed relevant specifications. For ensuring the requisite quality of construction, the materials and works shall be subjected to quality control test as described hereinafter, by the Engineer-in-charge. The testing frequencies set forth are the desirable minimum and the Engineer-in-charge shall have the full authority to carry out test as frequently as he may deem necessary to satisfy that the materials at work comply with the appropriated specification. Test procedures for the various quality control tests are indicated in the respective sections of the specification or for certain tests within this section. Where no specific testing procedure is mentioned, the test shall be carried out as per prevalent accepted engineering practice to the directions of the Engineer-in-charge.

5.0 Tests of Earthwork for Embankment Construction :**5.1 Borrow Materials:**

- (a) Sand content (IS: 2720 Part IV)
Two test per 8000 Cubic Metres of soil.
- (b) Plasticity Test (IS: 2720 Part-V)
Each type to be tested. Two tests per 8000 Cubic Metres of soil.
- (c) Density test (IS: 2720 part-VII)
Each soil type to be tested. Two test per 8000 Cubic Metres of Soil.
- (d) Moisture Content Test (IS: 2720 Part-II)
One test for every 250 Cubic Metres of soil.

5.2 Compaction Control :

Control shall be exercised by taking at least one measurement of density for each 1000 square Metres of compacted area, or closer as required to yield the maximum number of test results for evaluating day's work on statistical basis. The determination of density shall be accordance with IS: 2720 (Part XXVIII). Test locations shall be chosen only through random sampling techniques. Control shall be not being based on the result of any one test but on the mean value of set of 5-10 density determinations. The number of tests in one set of measurements shall be 5 as long as it is felt that sufficient control over borrow material and the method of compaction is being exercised. If considerable variations are observed between individual density results, the minimum number of tests in one set of measurement shall be increase to 10. The acceptance of work shall be subject to the condition that the mean dry density equals or exceeds the specified density and the standard deviation for any set of result is below 0.08 gm/cc. However for earthwork in shoulders and in top 500 mm portion of the embankment below the sub grade, at least one density measurement shall be taken for every 500 square Metres of the compacted area provided further that the number of the test in each set of measurement shall be at least 10. In other respects, the control shall be similar to that described earlier.

6. Following materials shall conform to the Indian Standards shown against them;

- | | | |
|-----|-----------------------------------|----------|
| (1) | Cement | IS: 269 |
| (2) | Sand for masonry | IS: 2116 |
| (3) | Sand for concrete | IS: 383 |
| (4) | Course aggregate. | IS: 383 |
| (5) | Mild Steel. | IS: 432 |
| (6) | High yield strength deformed bars | |
| | (a) Hot Rolled. | IS: 1139 |
| | (b) Cold Twisted. | IS: 1786 |

7. Barrel thickness of pipes of different class shall be under:

Sir No	Internal DiaMetre of pipes in MM	Barrel thickness (in mm)		
		NP1	NP2	NP3
1	80	25	25	-
2	100	25	25	-
3	150	25	25	-
4	250	25	25	-
5	300	30	30	-
6	350	32	32	75
7	400	32	32	75
8	450	35	35	75
9	500	-	35	75
10	600	-	40	80
11	700	-	40	80
12	800	-	45	90
13	900	-	50	100
14	1000	-	55	100
15	1100	-	60	115
16	1200	-	65	115

Item No.1

Earthwork for embankment including breaking clods, dressing with all lead and lift (Excluding watering and consolidation (A) From borrow area with all lead and lift. (Selected soil to be used for Earthwork shall be From BORROW AREA only having CBR not less than 6.00)

1. The land width on which the earth work is to be done shall be cleared of all trees having a girth of 30cm and loss, loose stones, vegetation, bushes, stumps and all other objectionable materials. All the materials cleared will be the property of Government. Useful material shall be arranged in convenient stack the road boundary or as directed at places within 50 Metres lead, and handed over to the department in convenient section. Unsuitable material shall be burnt or other wise disposed off by the contractor at own cost without causing any nuisance inconvenience or damage to the works property or people in the neighborhood. In all cases the materials shall be disposed off in a neat manner.

2. After cleaning the site, the alignment of the road shall be properly set out true to line, curves, slopes grade sand sections as shown on then plan or directed by the Engineer-in-charge. The contractor shall provide all labors and materials such as lime, string, pegs, nails, bamboos, stones, mortar, concrete etc. Required for setting out, establishing. Bench Marks and giving profiles. The contractor shall be responsible for maintaining the B.M.S. profiles alignment and other marks long they are required for the work in the opinion of the Engineer-in-charge. If the contractor defaults in this respect they may be restored by the department at the cost of the contractor.

3. When an existing embankment is to be widened, continuous, horizontal benches, each at least 0.3 Metre wide shall be cut into the existing slope for ensuring adequate bond with the fresh embankment materials to be added. The material obtained from the cutting of benches can be utilized in the widening of the embankment. The dumping of material from trucks for widening operation shall be avoided except in difficult circumstances when the extra width is too narrow to permit the movement of any other type of hauling equipment.

4. The soil to be used for embankment shall be free from trees, stumps, root, rubbish or any other objectionable materials. Only materials considered suitable by the Engineer-in-charge shall be used for the construction and that considered unsuitable shall be disposed off as directed by him. The selection of materials to be used in the construction of embankment shall be made after soil survey and investigations are carried out by the Department. The embankment shall consist of earth available from road-side borrow pits on either side with all lead and lifts. And within land width in the manner specified in Para 11. Below. The road, if any required for the purpose of haulage of earth by men, animals or vehicles will be constructed. (If not existing) and maintained by the contractor at his own cost.

5. Department is extended all necessary co-operations in helping contractor to get borrow from near by Government or Panchayat land, if available. However department is not responsible if not such area is made available to the contractor and in the case, contractor will have to make his own arrangement to get borrow area for borrowing earth of the quantity even by making temporary arrangement with the private land owners.

6. The Embankment shall be constructed in uniform layer not exceeding 250mm in loose thickness. The soil shall be spread uniformly over the entire width of the embankment unless otherwise directed by the Engineer-in-charge. All clods of hard lumps of earth shall be broken to have maximum size of 15 cm. When being placed in the embankment a maximum of size 5 cm when being placed in the top 45 cm. of embankment. The work of next layer shall be allowed only after the first layer has been thoroughly compacted.

7. Where an embankment is to be placed on sloping ground shall be balanced in the step of trenches of broken up in such a manner that the new material shall have perfect bond with the existing surface. Where the embankment is to be placed over an existing road surface, the surface shall be scarified to minimum depth of a 5 cm. so as to provide ample bond between the old and new material. However when the embankment is to be placed over and old concrete pavement and lies within 1 Metre of new sub grade level,

the pavement shall be broken up in pieces not to exceed 0.1 m and may be Metre of new sub grade left under the new embankment. If the existing road surface is of granular or bituminous type and lies within 1 mt. of the new sub grade level, the same shall be scarified to a depth of minimum 50mm. so as to provide ample bond between the old and the new material.

8. To avoid interference with contraction of abutment, wing walls or return walls of culvert/bridge structures, the contractor shall at point to be determined by the Engineer-in-charge, 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 interference of damage to the bridge work, unless directed otherwise the filling around culverts, bridge and other structures upto a distance of twice the height of the embankment from the back of the embankment 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-in-charge but in any case not until the concrete or masonry has been in position for 14 days, the embankment shall be brought up simultaneously in equal layer 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-in-charge. Where the provision of any filter medium is specified behind the abutment, the same shall be laid in layers with the laying of fill material. The material used for the filter shall conform to the requirements for filler medium and will be paid extra in the relevant item.

9. The embankment shall be finished in conformity with the alignment, level, cross section and dimensions shown on the plans or as directed by the Engineer-in-charge. Where the alignment of the road is in a curve, the top of the embankment shall be formed with the super elevation and the increased width shown on the drawing or as the Engineer-in-charge may direct. Finishing operation shall include the work of shaping and dressing the shoulder, road bed and the slopes to conform to the cross section.

10. The earthwork measurement shall be paid on cross sectional measurements and computing the volumes of earth work in cubic metres by average area method. The contractor shall sign day to day leveling work and also original cross sections, longitudinal section etc. in token of his acceptance. The working section both longitudinal and cross of the ground shall be taken by the Engineer-in-charge before the actual work has started. The contractor or his authorized representative shall attend day to day leveling work and sign with date the field book daily, in token of his acceptance, if there is any disagreement, the contractor shall inform of it in writing to the officer concerned with specific reference to the sections before starting further work. Once the work is started, no cognizance of any complaint will be taken merely not signing to level book shall not be deemed as disagreement. The Executive Engineer shall also verify leveling work to the extent of 5% before commencement of earth work and on finalization. The contractor shall maintaining the embankment by filling in ruts, rain cuts, depression due to shrinkage etc. to proper formation and grade till this item is finally measured and accepted by the Department. The measurements shall be the on compacted earth work. Deduction of 15% for shrinkage shall be made from gross measured quantity if measured before first monsoon and 10% if measured after one or more monsoon have been passed over the earth embankment. However the contractor shall have to bear loss of deformation etc. If any due to all settlements as well as other type of deformation etc. if any, that might have taken place at the time of taking measured of the item.

11. If usable approved material is available within the land width of road, the same shall be permitted for used in the road embankment subject to the following conditions:-

- (i) The borrow pits will be so excavated as to form a road side longitudinal gutter to drain the water, interrupted by such gutter.
- (ii) The width of the drain shall be restricted to 1.5mts. only the depth will be restricted to such grade so as to drain the water efficiently. All balance quantity of earth shall be brought from distant borrow areas only.
- (iii) If there is top layer of black cotton or other objectionable soils, the same shall be removed and disposed off elsewhere and usable material found at the lower level will only be used in the earthen embankment, if the contractor choose to utilize this material.

- (iv) the drain should be aligned along the boundry of the land width of the road. Not pit, other than this drain shall be dug within 5 metres of the toe to the final section of the road embankment.
- (v) No borrow pits shall be allowed in the length in which earth obtained for cutting from cutting is specified to be used in embankment.

12 The rate of earthwork includes cleaning jungles, dog belling fixing profiles, erecting necessary pillars or stones for bench mark for leveling purpose, excavating earth from borrow pits, bracking clods, conveying and spreading earth in layers with all lead and lift, finishing the entire embankment and incidentals necessary to complete the work to the specifications. The cutting stuff of cutting in ordinary soil, soft murrum, soft rock, hard murrum and hard rock shall utilised in embankment costruction under this item within the lead specified in the particulars item. No Payment shall be made under this item for the cutting stuff used in embankment but labour for cutting will be paid as per specifications in the particulars item, and only balance quantity of earthwork from borrow areas will be pain in this item.

Item No.2

WBM Grading-2

Providing, laying, spreading and compacting stone agg. Of 63mm to 45mm size to water bound macadam specification including spreading in uniform thickness, hand packing, rolling with smooth wheel roller 80-100 KN in stage to proper grade and camber, applying and brooming, stone screening/binding material to fill-up the interstices of coarse agg., watering and compacting to the required density grading-2 as per Technical Specification Clasue.405 By manual means.

405. WATER BOUND MACADAM SUB-BASE/BASE/SURFACING

405.1. Scope

405.1.1. 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.

405.2. Materials

405.2.1. 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 obtained from rocks, such as, Phyllites, Shales or Slates, etc. shall not be permitted in WBM construction. 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 per cent 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 400.7. 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 per cent, the Soundness test shall be carried out on the material delivered to site as per IS:2386 (Part 5).

TABLE 400.7: PHYSICAL REQUIREMENTS OF COURSE AGGREGATES FOR WATER BOUND MACADAM FOR SUB-BASE/BASE/SURFACING COURSES

Test	Sub-base	Base	Surfacing
Aggregate Impact Test (IS:2386 Part 4 or IS:5640)	Less than 50	Less than 40	Less than 30
Flakiness Index Test (IS:2386	Less than 30	Less than 25	Less than 20

Part 1)			
Soundness Test (IS:2386 Part 1)			
- Loss with Sodium Sulphate	Less than 12%	Less than 12%	Less than 12%
- Loss with Magnesium Sulphate	Less than 18%	Less than 18%	Less than 18%

405.2.2. Aggregates, like, brick bats, kankar, laterite, etc. which get softened in presence of water shall be tested for Aggregate Impact Value under wet conditions in accordance with IS:5640.

405.2.3. The requirement of flakiness Index shall be enforced only in the case of crushed or broken stone and crushed slag.

405.2.4. 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.

405.2.5. Crushed slag: Crushed slag shall be made from air-cooled blast furnace slag. It shall be angular shape, reasonably uniform in quality and density and generally free from thin, elongated and soft pieces, dirt or other deleterious materials.

405.2.6 Overburnt (Jhama) brick aggregates: Jhama brick aggregates shall be made from over burnt bricks or brick ballast and be free from dust and other objectionable and deleterious materials.

405.2.7. Grading requirement of coarse aggregates: The coarse aggregates shall conform to one of the Gradings given in Table 400.8 as specified, provided, however, the use of Grading No.1 shall be restricted to sub-base courses only.

TABLE 400.8 : GRADING REQUIREMENTS OF COARSE AGGREGATES

Grading No.	Size Range	IS Sieve Designation	Per cent by weight passing
(1)	90 mm to 45 mm	125 mm	100
		90 mm	90-100
		63 mm	25-60
		45 mm	0-15
		22.4 mm	0-5
(2)	63 mm to 45 mm	90 mm	100
		63 mm	90-100
		53 mm	25-75
		45 mm	0-15
		22.4 mm	0-5
(3)	53 mm to 22.4 mm	63 mm	100
		53 mm	95-100
		45 mm	65-90

		22.4 mm	0-10
		11.2 mm	0-5

Note: The compacted thickness for a layer with Grading 1 shall be 100 mm while for layer with other Gradings, i.e., 2 & 3, it shall be 75 mm.

405.2.8 Screenings: Screenings to fill voids in the coarse aggregate shall generally consist of the same material as the coarse aggregate. However, where economic considerations so warrant, predominantly non-plastic material (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 per cent. The Screenings shall not contain any of the undesirable constituents listed in Clause 301.2.3 which would render it unsuitable as a fill material.

Screenings shall conform to the grading set forth in Table 400.9. The consolidated details of quantity of screenings required for various grades of stone aggregates are given in Table 400.10. The Table also gives the quantities of materials (loose) required for 10 m² for sub-base compacted thickness of 100/75 mm.

TABLE : 400.9 : GRADING FOR SCREENING

Grading Classification	Size of Screenings	IS Sieve Designation	Percent by Weight Passing the IS Sieve
A	13.2 mm	13.2 mm	100
		11.2 mm	95-100
		5.6 mm	15-35
		180 micron	0-10
B	11.2 mm	11.2 mm	100
		5.6 mm	90-100
		180 micron	15-35

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

405.2.9 Binding material: Binding material to be used for water bound macadam as a filler material meant for preventing raveling, shall comprise of a suitable material approved by the Engineer having a Plasticity Index (PI) value of less than 6 for sub-base/base course and 4 to 10 for surfacing course 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 m³/10m² and 0.08-0.10 m³/10 m² for 100 mm compacted thickness.

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.

TABLE 400.10: APPROXIMATE QUANTITIES OF COARSE AGGREGATES AND SCREENINGS REQUIRED FOR 100/75 mm COMPACTED THICKNESS OF WATER BOUND MACADAM (WBM) SUB-BASE/ BASE/ SURFACING COURSE FOR 10 M² AREA.

Classification	Size Range	Compacted thickness	Loose Quantity	Stone Screenings		Crushable Screenings such as moorum or	
				Grading Classification & Size	For WBM Sub-base/ Base Course (Loose Quantity) m ³	Properties	Loose Quantity
Grading 1	90 to 45	100	1.21 to 1.43	Type A 13.2	0.27 to 0.30	LL<20, PI<6 percent passing 0.075 mm 10	0.30 to 0.32
Grading 2	63 to 45	75	0.91 to 1.07	Type A 13.2	0.12 to 0.15	-do-	0.22 to 0.24
Grading 2	63 to 45	75	0.91 to 1.07	Type B 11.2	0.20 to 0.22	-do-	-do-
Grading 3	53 to 22.4	75	0.91 to 1.07	Type B 11.2	0.18 to 0.21	-do-	-do-

405.3. Construction Operations

405.3.1. Preparation of base: The surface of the subgrade/sub-base/base to receive the water bound macadam course shall be prepared to the specified lines and crossfall (camber) and made free of dust and other extraneous material. Any ruts or soft yielding places shall be corrected in an approved manner and rolled until firm surface is obtained if necessary by sprinkling water. Any sub-base/base/surface irregularities, where predominant, shall be made good by providing appropriate type of profile corrective course (leveling course).

Laying water bound macadam course over an existing bituminous layer shall 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.

405.3.2. Inverted choke: Where the WBM layer is to be laid over the subgrade and the subgrade soil is fine-grained, it is advisable to lay 100 mm intervening layer of screening or coarse sand on top of the fine-grained soil.

405.3.3. Provision of lateral confinement of aggregates: While constructing water bound macadam, arrangement shall be made for the lateral confinement of the aggregate. This shall be done by laying materials in adjoining shoulders along with that of water bound macadam layer and following the sequence of operations described in Clause 407.4.1.

405.3.4. Spreading coarse aggregates: The coarse aggregates shall be spread uniformly and evenly upon the prepared subgrade/sub-base/base to proper profile by using templates placed across the road about 6 mm apart, in such quantities that the thickness of each compacted layer is not more than 100 mm for Grading 1 and 75 mm for Grading 2 and 3, as specified in Clause 405.2.5. Aggregates placed at locations which are inaccessible to the spreading equipment, may be spread in one or more layers by any approved means so as to achieve the specified results.

The spreading shall be done from stockpiles along the side of the roadway or directly from vehicles. No segregation of large or fine aggregates shall be allowed and the coarse aggregate 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.

405.3.5. Rolling: Immediately following the spreading of the coarse aggregate, 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 where the rolling shall proceed from inner edge to the outer, rolling shall begin from the edges gradually progressing towards the centre. First the edge/edges shall be compacted with roller running forward and backward. The roller shall then move inward parallel to the centre line of the road, in successive passes uniformly lapping preceding tracks by at least one half width.

Rolling shall be discontinued when the aggregates are partially compacted with sufficient void space in them to permit application of screenings. However, where screenings are not to be applied, as in the case of crushed aggregates, like, brick metal, laterite and kanker, compaction shall be continued until the aggregates are thoroughly keyed. During rolling slight sprinkling of water may be done, if necessary. Rolling shall not be done when the subgrade is soft or yielding or when it causes a wave-like motion in the subgrade or sub-base course.

The rolled surface shall be checked transversely and longitudinally, with templates and any irregularities corrected by loosening the surface, adding or removing necessary amount of aggregates and re-rolling until the entire surface conforms to desired crossfall (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.

It shall be ensured that shoulders are built up simultaneously along with water bound macadam courses, in accordance with the procedure given in Clause 407.4.1.

405.3.6. Application of screenings: After the coarse aggregate has been rolled to Clause 405.3.4, 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 aggregate. 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 so driven as not to disturb the coarse aggregate.

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 aggregate. These operations shall continue until no more screenings can be forced into the voids of the coarse aggregate.

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.

405.3.7. Sprinkling of water and grouting: After the screenings have been applied, the surface shall be copiously sprinkled with water, swept and rolled. Hand 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 aggregate has 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 base or subgrade 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 can cause excessive water to flow down to the lime treated sub-base before it has picked up enough strength (is still "green") and thus cause damage to the sub-base layer. The laying of water bound macadam layer in such cases shall be done after the sub-base attains adequate strength, as directed by the Engineer.

405.3.8. Application of binding material: After the application of screenings in accordance with Clauses 405.3.5 and 405.3.6 the binding material where it is required to be used (Clause 405.2.7) 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.

405.3.9. 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 should be allowed to completely dry and set before the next pavement course is laid over it.

405.4. Surface Finish and Quality Control of Work

405.4.1. The surface finish of construction shall conform to the requirements of Clause 1802.

405.4.2. Control on the quality of material and works shall be exercised by the Engineer in accordance with Section 1800.

405.4.3. The water bound macadam work shall not be carried out when the atmospheric temperature is less than 0° C in the shade.

405.4.4. Reconstruction of defective macadam: The finished surface of water bound macadam shall conform to the tolerance of surface regularity as prescribed in Clause 1802. However, where the surface irregularity of the course exceeds the tolerances or where the course is otherwise defective due to subgrade 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 recompacted. In no case shall depressions be filled up with screenings or binding material.

405.5. Arrangement for Traffic

During the period of construction, the arrangement of traffic shall be done as per Clause 111.

405.6. Measurements for Payment

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

405.7. 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 401.9 (i) to (v) including arrangements of water used in the work as approved by the Engineer.

Item No.3

Rolling and Watering of earthwork in layers with vibratory roller including filling in depression which occur during the process as directed.

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

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 hose line 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 150 mm when being placed in the lower layers of the embankment and a maximum size of 60mm when being placed in the top 0.5 Metre portion of the embankment to ensure even compaction.

Hauling equipment shall be dispersed uniformly over entire surface of the previously constructed layer to minimise cutting of uneven compaction.

Where the embankment is to be constructed on low area ground that will not support the weight of truck or other hauling equipment, the lower part of the fill should be constructed by dumping successive loads in a uniform distributed layers of a thickness not greater than that necessary to support the hauling equipment while placing subsequent layers.

2. COMPACTION : Only compaction 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.No.	Type of Work/ Materials	Field dry density as percentage of maximum Laboratory dry density as per IS:2720 (Part - VII)
1.	Top 0.5 Metre 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 inside of that 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. Measurement for Payment : Consolidation of earth embankment construction shall be measured by taking cross section at interval in the original position before the work starts and after its completion and computing of the volume of earthwork in cubic Metres 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 Metre of suitable materials brought to site from roadway and drainage excavation forms one cubic Metre 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 Metre.

4. The contract unit rate include cost of mechanical roller required for consolidation including all labour, equipments fuel, hire charges, tolls and incidental necessary.

Item No. 4

Excavation for foundation upto 1.5m depth including sorting out and stacking of useful materials and disposing of the excavated stuff upto all lead. Dense or hard soil.

1. Excavation for structures shall consist of the removal of material for the construction of foundations for culverts, retaining walls, cut of walls pipe culverts and other similar structures, in accordance with the requirements of these specification and the lines and dimensions shown on the drawing or as indicated by the Engineer in charge. The work shall include all necessary sheet piling, shoring, bracing, draining and pumping and the removal of all logs, stumps, grubs and other deleterious matter and obstructions necessary for placing the foundations, trimming bottoms of excavations, backfilling and clearing up the site and the disposal of all surplus material.

2. After the site has been cleared the limits of excavation shall be set out true to lines, curves and slopes.

3. Excavation shall be taken to the width of the lowest step of the footing. The contractor at his own expense shall put up necessary shoring, strutting and planking or cut slopes to a safer angle or both with due regard to the safety of persons and works and to the satisfaction of the engineer in charge.

4. The depth to which the excavation is to be carried out shall be as shown, on the drawings, unless the type of material encountered is such as to require changes, in which case the depth shall be as ordered by the Engineer in charge.

5. Where water is met with in excavation due to stream flow, seepage springs, rain or other reasons, the contractor shall take adequate measures such as bailing, pumping, constructing, diversion channels, drainage channels and other necessary work to keep the foundation trenches dry when so required and to protect green concrete/masonry against damage by erosion or sudden rising of water level. The method to be accepted in the regard and other details thereof shall be left to the choice of the contractor but subject of approval of the Engineer in charge. Approval of the Engineer in charge shall, however, not relieve the contractor of the responsibility for the adequacy of dewatering and protection arrangements and for the quality and safety of the work.

6. Pumping from the interior of any foundation enclosures shall be done in such manner as to preclude the possibility of the movement of water through any fresh concrete. No pumping shall be permitted during the placing of concrete or for any period of at least 24 hours thereafter, unless it is done from a suitable sump separated from the concrete work by a water tight wall or other similar means.

7. The bottom of the foundation shall be leveled both longitudinally and transversely or stepped as directed by the Engineer in charge. Before footing is laid, the surface shall be slightly watered and rammed. In the event of excavation having been made deeper than that shown on the drawings or as otherwise ordered by the Engineer in charge, the extra depth shall be made up with concrete or masonry of the foundation grade at the cost of the contractor. Ordinary filling shall not be used for the purpose of bringing the foundation to level. If there are any slips or blows in the excavation these shall be removed by the contractor at his own cost.

8. Near towns, villages and all frequented places, trenches and foundation pits shall be securely fenced, provided with proper caution signs and marked with red lights at night to avoid accidents. The contractor shall be required to take adequate protective measures to see that the excavation operation does not affect or damage adjoining structures.

9. Backfilling shall be done with approved material after concrete or masonry is full set and carried out in such a way as not to cause under thrust on any part of the structure. All space between foundation masonry or concrete and the sides of excavation shall be refilled to the original surface, making due allowance for settlement in 250 mm loose layers. Which shall be watered and compacted.

10. All the excavated materials shall be the property of the Government where the excavated material is directed to be used in the construction of embankment, it shall be directly deposited at the required locations.

11. All useful materials, not intended for use in the work, shall be stacked neatly on Government land as directed by the Engineer in charge within 50 metres lead. Unsuitable and surplus materials not intended for use in any part of the road shall be disposed off as directed by the Engineer in charge.

12. Excavation for structures shall be measured in cubic metres for each class of material encountered, limited to the dimensions shown on the drawings or as directed by the Engineer in charge. Excavation over increased width, cutting of slopes, shoring, shattering and planking shall be deemed as convenience for the contractor in executing the work and shall not be measured and paid for separately.

13. The contract unit rate for the items for excavation for structures shall be paid in full for carrying out the required operations including:

(1) Setting out

(2) Construction of necessary shoring and bracing and their subsequent removal:

(3) Removal of all logs, stumps, grubs and other deleterious matter and obstructions for placing the foundations including trimming of bottoms of excavation:

- (4) Foundation sealing dewatering including pumping.
- (5) Backfilling clearing up the site and disposal of all surplus material within all lifts and leads upto 100 metres :
- (6) All labour, material, tools, equipment, safeguards and incidentals necessary to completed the work to the specification .

14. Excavation shall be for ordinary soil such as vegetable or organic soil, turt slit, and loam , clay mud, plat, black cotton soil, soft shale or soft murrum a mixture of these and similar material which yields other ordinary application of pick and shovel rake of other ordinary digging equipment. Removal of gravel or any other nodular material having diametre in any one direction not exceeding 75 mm occurring in such strata shall bedeeded to be covered under this category. The classification of excation shall be decided by the Engineer in charge and his decision shall be final and binding on the contractor,

(B) -DO- in dense or hard soil

Specifications shall be same except that the work swhall be carried out in strata like dense or hard soil. The work shall be carred out in workmanship like manner.

Useful material available from excavation should be stacked properly and reused as directed and rmaining Metreials should be disposed as directed. **Rate should be paid on cubic Metre basis.**

Item No. 5

Excavation for foundation upto 1.5m depth including sorting out and stacking of useful materials and disposing of the excavated stuff upto all lead. Hard Murrum

1. Excavation for structures shall consist of the removeal of material for the construction of foundations for culverts, rataining walls, cut of walls pipe culverts and other similar structures, in accordance with the requirements of these specification and the lines and dimensions shown on the drawing or as indicated by the Engineer in charge. The work shall include all necessary sheeting shorting. ba\racng draining an pumping and the removal of all logs stumps ,grubs and other deleterious matter and obstructions necessary for placing the foundations, trimming bottoms of excavations backfilling and clearing up the site and the disposal of all surplus material.

2. After the site has been cleared the limits of excavation shall be set out true to lines, curves and slopes.

3. Excavation shall be taken to the width of the lowest step of th footing. The contractor at his own expense shall put up necessary shoring, trutting and planking or cut slopes to a safer angle or both with due-regard to the safety of persons and works and to the satisfaction of the enginner in charge.

4. The depth to which the excave on is to be carried out shall be as shown, on the drawings. unles the type of material encounted is such as to require changes. in which case the depth shall be as ordered by the Engineer in charge.

5. Where waters is met with in excavation due to stream flowm seepage springs , raing or ther reasons, the contractor shall take adequate measures such as bailing pumping , constructing , diversion channels drainage channels and other necessary work to keep the foundation trenches dry when so required and to protect green concrete/masory against damage by erosion or sudden rising of wate level. The method to be accepted in the regard and other details there of shall be left to the choice of the contractor but subject of approval of the engineer in charge. Approval of the Engineer in charge shall, however not relieve the contractor of the responsibility for the adequacy of dewatering and protection arragements and for the quality an safety of the work.

6. Pumping from the interior of any foundation enclosures shall be done in such manner as to preclude the prossibility of the movement of water through anyfresh concrete. No pumping shall be permitted durring the placing of concrete or for any period of at least 24 hours thereafter, unless it is done from a sitable sump separated from the concrete work by a water tight wall or other similar means.

7. The bottom of the foundation shall be leveled both longitudinally and transversely or stepped as directed by the Engineer in charge. Before footing is laid, the surface shall be slightly watered and rammed. In the event of excavation having been made deeper than that shown on the drawings or as otherwise ordered by the Engineer in charge, the extra depth shall be made up with concrete or masonry of the foundation grade at the cost of the contractor, Ordinary filling shall not be used for the purpose of bringing the foundation to level. If there are any slips or blows in the excavation these shall be removed by the contractor at his own cost.

8. Near towns, villages and all frequented places, trenches and foundation pits shall be securely fenced, provided with proper caution signs and marked with red lights at night to avoid accidents. The contractor shall be required to take adequate protective measures to see that the excavation operation does not affect or damage adjoining structures.

9. Backfilling shall be done with approved material after concrete or masonry is full set and carried out in such a way as not to cause under thrust on any part of the structure. All space between foundation masonry or concrete and the sides of excavation shall be refilled to the original surface, making due allowance for settlement in 250 mm loose layers. Which shall be watered and compacted.

10. All the excavated materials shall be the property of the Government where the excavated material is directed to be used in the construction of embankment, it shall be directly deposited at the required locations.

11. All useful materials, not intended for use in the bank, shall be stacked neatly on Government land as directed by the Engineer in charge within 50 metres lead. Unsuitable and surplus materials not intended for use in any part of the road shall be disposed off as directed by the Engineer in charge.

12. Excavation for structures shall be measured in cubic metres for each class of material encountered, limited to the dimensions shown on the drawings or as directed by the Engineer in charge. Excavation over increased width, cutting of slopes, shoring, shattering and planking shall be deemed as convenience for the contractor in executing the work and shall not be measured and paid for separately.

13. The contract unit rate for the items for excavation for structures shall be paid in full for carrying out the required operations including.

(1) Setting out

(2) Construction of necessary shoring and bracing and their subsequent removal :

(3) Removal of all logs, stumps, grubs and other deleterious matter and obstructions for piling the foundations including trimming of bottoms of excavation :

(4) Foundation sealing dewatering including pumping.

(5) Backfilling clearing up the site and disposal of all surplus material within all lifts and leads up to 100 metres :

(6) All labour, material, tools, equipment, safeguards and incidentals necessary to complete the work to the specification.

14. Excavation shall be in hard soil such as stiff heavy clay, hard shale or compact murrum requiring grouting tool or pick or both and shovel close applied and gravel and rubble stone having maximum diameter in any one direction between 75 and 300 mm and soft conglomerate. The classification of excavation shall be decided by the engineer in charge and his decision shall be final and binding on the Contractor.

Payment shall be made on Cum basis

Item No. 6

Providing and casting in situ ordinary cement concrete M-150 mix and providing necessary pin headers including shuttering, scaffolding, laying vibrating, curing and finishing complete Without V-Grooves For all Height.

And Item No. 7

Providing and filling in foundation with ordinary cement concrete M-10/M-100 mix and providing necessary vertical pin headers incl. Formwork, vibrating, ramming and curing complete.

And

Item No. 8

Providing and casting in situ ordinary cement concrete M-200 mix and providing necessary pin headers including shuttering, scaffolding, laying vibrating, curing and finishing complete Without V-Grooves For all Hieght..

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

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

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

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

TABLE

Grade of Concrete	Mix By Volume	Total quantity of dry aggregates by volume per 50 Kg. of cement, to be taken as sum of the individual volumes of fine and coarse aggregates max.,	Proportion of fine aggregate to coarse aggregate	Quantity of water per 50 kg. of cement max.
1	2	3	4	5
Ordinary M.100	Litres 1:3:6	300	General 1:2 for fine aggregate to coarse aggregate by volume but subject to a upper limit of 1:1.1/2 & 2 lower limit of 1:3	Litres 34
M.150	1:2:4	220		32
M.200	1:1 1/2:3	160		30
M.250	1:1:2	100		27

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

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

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

5. Following shall be the maximum nominal size of coarse aggregate, for the different items of work:

Sr. No.	Item of Construction	Maximum nominal size of coarse aggregate
(i)	R.C.C. well curb, R.C.C. well steining and R.C.C. Piles	40mm
(ii)	R.C.C. well steining	63mm

(iii)	Well cap or pile cap; solid type piers, abutment and wing-walls, and their pier caps	40mm
(iv)	R.C.C. Works in cross girders deck slab, wearing coars, kewrb, light posts, blast walls, approach slab etc. and hollow type piers, abutments, wing-walls and their pier caps.	20mm
(v)	R.C.C. bearings	20mm
(vi)	For any other item of construction not covered by item (i) to (v)	As specified on the drawing or as desired by the Engineer- in-charge in case it is not specified on drawing.

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

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

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

8. Cement shall be stored above the ground level in perfectly and water tight shed. 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.

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

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

11. When hand mixing is permitted by the Engineer-in-charge for small jobs or for certain other reasons. It shll be done on a smooth watertight platform large enough to allow efficient tuning over of the ingredients of concrete before and after adding water. Mixing platform shall be so arranged that no foreign materials shall get mixed with concrete nor does the mixing water flow out. Cement in required number of bags shall be placed in a uniform layer on top of the measured quantity of fine and coarse aggregate, which shall also the spread in alayer of uniform thickness on the mixing platform. Dry coarse and fine aggregate and cement shall then be mixed thoroughly by turning over to get a mixture of uniform colour. Enough water shall then be added gradually through a rose can and the mass turned over till a mix of required consistency is obtained. IN hand mixing quantity of cement shall be increased by 10 per cent above that specified.

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

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

14. If concreting is not started within 24 hours of the approval given, it shall have to be obtained again from the Engineer-in-charge. Concreting being given, it shall proceed continuously over the area between construction joints. Fresh concrete shall not be placed against concrete which has been in position for more than 30 minutes unless a proper construction joint is formed. Concrete shall be compacted in its final position within 30 minutes of its discharge from the mixer unless carried in properly design agitators, operating continuously, when this time shall be with 2 hours of the addition of cement to the mix and within 30 minutes of its discharge from the agitator. Except where otherwise agreed to be the Engineer-in-charge, concrete shall be deposited in horizontal layers to a compacted depth of not more than 0.45 metre when internal vibrators are used and not exceeding 0.30 metre in all other cases.

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

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

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

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

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

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

19. Forms shall be mortar-tight and shall be made sufficiently rigid by the use of ties and bracings to prevent any displacement or sagging between supports. They shall be strong enough to withstand all pressure, ramming and vibration, without deflection from the prescribed line occurring during and after placing the concrete. Screw jacks or hard wood wedges where required shall be provided to make up any settlement in the form work either before or during the placing of concrete. Suitable camber shall be provided in horizontal members of structure, specially in long spans to counteract the effects of any fixed as to provide such camber. Forms shall be so constructed as to be removable in sections in the desired

sequence, without damaging the surface of concrete or disturbing other sections. Unless otherwise specified or directed, chambers or fillets of sizes 25mm x 25mm shall be provided at all angles of formwork to avoid sharp corners.

20. The inside surface of shuttering shall, except in the case of permanent form work or where otherwise agreed to by the Engineer-in-charge, be coated with an approved materials to present adhesion of concrete to the for work. Releases agents shall be applied strictly in accordance with the manufacturer's instructions and shall not be allowed to come into contact with any reinforcement or prestressing tendons and anchorages. Different release agents shall not be used in form work for concrete which will be visible in the finished works.

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

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

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

24. In the case of reinforced concrete work workability shall be such that the concrete surrounds and properly grips all reinforcement. The degree of consistency, which shall depend upon the nature of work and

methods of vibration of concrete shall be determined by regular slump tests. Following slump shall be adopted for different types of works.

Type of work		Where vibrators are used	Slumps Where vibrators are not used
(i)	Mass concrete in R.C. C. foundations, footings and retaining walls	10mm to 25mm	80mm
(ii)	Beams, slabs and columns simply reinforced	25mm to 40mm	100mm to 120mm
(iii)	Thin R.C.C. section or section with congested steel	40mm to 50mm	125mm to 150mm

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

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

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

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

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

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

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

Item No. 9

Providing and laying in Position FE -500/500D TMT bar reinforcement including cutting, bending, hooking and tying complete as per detailed drawings for the following (A) Piers (B) Abutments © R.C.C. Returns /Walls / Caps / Copings etc.

And

Item No. 10

Providing and placing in position FE-500/500D TMT bar reinforcement including cutting, bending, hooking, and tying complete as per detailed drawing (A) Solid Slab/ App. Slab / Wearing coat.

2.00 Materials :- T.M.T. shall conform to IS : 1789-FE 500/500D Mild steel binding wires shall conform to the specification.

2.1 The work shall consist of furnishing and placing reinforcement of the shape and dimensions shown on the drawing or as directed by the Engineer-in-charge.

2.2 Steel shall be clean and free from loose rust mill scale at the time of fixing in position and subsequent concreting.

2.3 Reinforcing steel shall conform accurately to the dimensions given iron bar bending schedules shown on relevant drawing. Bar shall be bent cold to the specified shape and dimensions or as directed by the Engineer-in-charge using a proper bar bender, operated by hand or power to attain proper radius of bends. Bars shall not be bent or straightened in manner that will injure the material. Bars bend during transporting or handling shall be straightened before use on work ; they shall not be invariably be provided. The radius of the bend shall not less than twice the diameter of the round bar and length of the straight part of the beyond the end of the curve shall be at least four times the diameter of the round bar. In the case which are not round and in the case of deformed bars, the diameter shall be taken as the diameter of a circle having a equivalent effective area. The work shall be suitably encased to prevent any splitting of the concrete.

2.4 All reinforcement bars shall be accurately placed in exact on the drawings, and shall be securely held in position during placing of concrete by annealed binding wire not less than 1mm, in size and confirming to IS : 280 and by using stay blocks or metal chairs, spacer, metal hangers, supporting wires or other approved device at sufficiently close intervals. Bars will not be allowed to sag between supports or displaced during concreting or any of their operations over the work. All devices used for positioning shall be non-corrodible material. Wooden and metal supports will not extend to the surface of concrete except where shown on the drawings. Placing bars on layers of freshly laid concrete as the work progress or adjusting bar will not be allowed. Pieces of broken stone or brick and wooden blocks shall not be used. Layers of bars shall be separated by spacer bars, precast mortar block, or other approved device. Reinforcement after being placed in position shall be maintained in clean condition until completely embedded in concrete. Special care shall be exercised to prevent any displacement of reinforcement in concrete already placed. To protect reinforcement from corrosion, concrete cover shall be provided as indicated on the drawing. All bars protruding from concrete and to which other bars are to be spliced and which are likely to be exposed for an indefinite period shall be protected by a thick coat of neat cement grout.

2.5. 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 each other at the time of fixing and concreting.

2.6. As far as possible, bars of full length shall be used. In case this is not possible, overlapping of bars shall be done as directed by the engineer-in-charge. When practicable, overlapping bar shall not touch each other, but be kept apart by 25mm or 1.25 times the maximum size of the coarse aggregate whichever is greater, by concrete between them, Where not feasible, overlapping bars shall be bound with annealed steel wire, not less than 2mm thickness twisted right. The overlaps shall be staggered for different bars and located at points, along the span where neither shear nor bending movement is maximum.

2.7. Whenever indicated on the drawings or desired by the Engineer-in-charge, bar shall be joined by couplings which shall have a cross-section sufficient to transmit the full strength of bars. The end of the bars that are joined by coupling shall be upset for a sufficient length so that the effective cross-section at the base of threads shall be standard thread strength. Steel for coupling shall conform to IS : 226.

2.8. When permitted or specified on the drawings joints of reinforcement bars shall be but welded so as to transmit their full strength. Welded joints shall preferably be located at points where steel will not be subject to more than 75 per cent of the maximum permissible stresses and so staggered that at any one section not more than 20 per cent of the rods are welded. Only electric arc welding shall be used using a process which excluded air from the molten metal and conforms to any or all these special provisions for the work will be accepted. Suitable means shall be provided for holding the bars securely in position during welding. It must be ensured that no voids are left in welding and when welding is done in 2 or 3 stages, previous surface shall be cleaned properly. Ends of the bars shall be cleaned of all loose scale, rust grease, paint and other foreign matter before welding. Only competent welders shall be employed on the work. The M.S. electrodes used for

welding shall conform to IS : 814 welded pieces of reinforcement shall be tested. Specimen shall be taken from the actual site and their number and frequency to test shall be as directed by the Engineer-in-charge.

MEASUREMENTS FOR PAYMENT

Reinforcement shall be measured in length including hooks, if any, separately for different diameters as actually used in work, excluding overlaps. From the length so measured, the weight of reinforcement shall be calculated in tonnes on the basis of IS: 1732. Wastage, overlaps, couplings, welded joints, spacer bars, chairs, stays, hangers and annealed steel wire or other methods for binding and placing shall not be measured and cost of these items shall be deemed to be included in the rates for reinforcement.

RATE

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

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

Mode of Measurement and Payment

The rate shall be for a unit of One M.T

Item No. 11

Supplying and fixing reinforced concrete heavy duty non pressure pipes with collars for culverts carrying heavy traffic as per IS 458-1991 specification including setting and joining the pipes in C.M. 1:2 watering and laying (to level or slope) of I.S. Class NP-3 of following internal diameter with all lead and lift. (i) 1200mm Dia.

1. The work shall consist to furnishing and installing reinforced cement concrete pipe of the type dia metre and length required at the location shown on the drawings or as ordered by the Engineer in charge.

2. Reinforced concrete pipe shall be NP3 type conforming to the requirements of IS : 458 and shall be of dia as specified in the item each consignment of cement concrete pipes shall be inspected. If necessary and approved by the engineer in charge, either at the place of manufacture or at the site before their incorporation in the works.

NP3 , NP3 , NP1 pipes are used for RCC pipes where testing of pipes will not be feasible the contractors will have to produce a certificate from the manufacturers on company's letter head the given hereinafter form.

Production of such certificate will not however relieve the contractor from this responsibility of supplying pipes of required standard and will have to bear the loss or damage caused to the work in account of defects found subsequently during the execution It will also be necessary to purchase these pipes from manufacturer having standard equipments for carrying out various test as per IS : 458 at his factory.

FORM OF CERTIFICATE FOR NP3, NP2, NP1 PIPES

We..... manufacture of RCC pipes produce RCC pipes as per the requirement of IS : 458 and also carry out the required test at our place. We have acquired equipments for carrying out test and are prepared to carry out test at our factory sites.

We have experience of manufacturing of pipes of years The pipes supplied by us to M/s Satisfy the requirement of IS " 458.

Date

Place

Manufacturer's sign.

3. No pipe shall be placed in position until the foundations have been approved by the engineer in charge. Where two or more pipes are to be laid adjacent to each other they shall be separated by a distance equal to at least half the diameter of the pipe subject to minimum of 450mm. The laying of pipes on the prepared foundation shall start from the outlet and proceed toward the inlet and be completed to the specified lines and grades. The pipes shall be fitted and matched so that when laid in works they form a culvert with a smooth uniform invert. Any pipe found defective or damaged during laying shall be removed at the cost of contractor.

4. The pipes shall be jointed either by collar joint or by flush joint in the former case the collars shall be of RCC 150 to 200 mm wide and having the same strength as the pipes to be jointed. Caulking space shall be slightly wet mix of cement and sand in the ratio of 1:2 rammed with caulking irons. Before caulking the collar shall be so placed that its centre coincides with that of pipe and an even annular space is left between the collar and the pipes. Flush joint may be shaped to form a self centering joint with a joint space 13 cm wide. The jointing space shall be filled with cement mortar, 1 cement 2. sand, mixed sufficiently dry to remain in position when forced with a trowel or rammer. Care shall be taken to fill all voids and excess mortar shall be removed. All joints shall be made with care so that their interior surface is smooth and consistent with the interior surface of the pipes. After finishing, the joint shall be kept covered and damp for at least four days.

5. RCC pipe shall be measured along their centre between their inlet and outlet ends in linear metres.

6. The rate for the pipes shall include the cost of pipe including loading unloading handling storing laying in position and joining complete.

7. Payment shall be made on Running Metre basis.

Item No. 12

Dismantling the existing structure including removing and stacking the dismantled materials as and where directed. Rubble masonry/ U.C.R. Masonry.

And

Item No. 13

Dismantling G.I. Pipes G.S.W. Pipes and R.C.C. NP2 pipes with fitting and clamps including stacking the materials with all lead and lift (for any of pipe)

202. DISMANTLING CULVERTS, SMALL BRIDGES, PAVEMENTS AND OTHER STRUCTURES

202.1. Scope

This work shall consist of removing, as hereinafter set forth, existing culverts, bridges, pavement, kerbs and other structures, like, railings, fences, utility services, manholes, catch basins, inlets etc., which are in place but interfere with the new construction or are not suitable to remain in place. It shall include salvaging and disposing of the resulting materials and backfilling the resulting trenches and pits.

Existing culverts, bridges, pavement and other structures which are within the road land and which are designated for removal, shall be removed upto the limits and extent specified in the drawings or as directed by the Engineer.

Dismantling and removal operations shall be carried out preferably with locally available tools and equipments and in such a manner as to leave undisturbed adjacent pavement, structures and any other work to be left in place. Use of specialized tools and equipments by the agency shall be incidental to this item.

All operations necessary for the removal of any existing structure which endanger new construction shall be completed prior to the start of new work.

202.2. Dismantling Culverts and Small Bridges

The structures shall be dismantled carefully and the resulting materials so removed as not to cause any damage to the serviceable materials to be salvaged, the part of the structure to be retained and any other properties or structures or utilities nearby.

Unless otherwise specified, the superstructure portion of culverts/bridges shall be entirely removed and other parts removed below the ground level or as necessary depending upon the interference they cause to the new construction. Removal of overlying or adjacent material, if required in connection with the dismantling of the structures, shall be incidental to this item.

Where existing culverts/bridges are to be widened / strengthened or otherwise incorporated in the new work, only such part or parts of the existing structure shall be removed as are necessary for execution of work shown in drawings to provide a proper connection to the new work. The connecting edges shall be cut, chipped and trimmed to the required lines and grade without weakening or damaging any part of the structure to be retained. Due care should be taken to ensure that reinforcing bars which are to be left in place so as to project into the new work as dowels or ties are not damaged during removal of concrete and protected against rusting or corrosion.

Pipe culverts shall be carefully removed in such a manner as to avoid damage to the pipes.

Steel structures shall be carefully dismantled in such a manner as to avoid damage to members thereof, if the structure is to be removed in a condition suitable for re-erection as specified in the drawings or directed by the Engineer. All members shall be match marked with white lead paint by the Contractor before dismantling. All loose parts like pins, nuts, loose plates, etc. shall be securely wired to adjacent members or packed in boxes with proper markings for the ease of identification at the time of re-erection of the structure at later stage.

Timber structures shall be removed in such a manner as to avoid damage to such timber or lumber as is designated by the Engineer to be salvaged after joint inspection by the Engineer and the Contractor or their authorized representatives.

202.3. Dismantling Pavement and Other Structures

In removing pavements, kerbs, gutters, and other structures, like, railings, fences, manholes, catch basins, inlets, etc. where portions of the existing construction are to be left in the finished work, the same shall be removed to an existing joint or cut and chipped to a true line with a face perpendicular to the surface of the existing structure. Sufficient removal shall be made to provide for proper grades and connections with the new work as directed by the Engineer.

Concrete pavements, base courses in carriageway and shoulders, etc. designated for removal shall be broken to pieces and stock piled at designated locations or as directed by the Engineer, if the material is to be used later or otherwise, the Contractor shall arrange for disposal as stipulated in Clause 202.5.

202.4. Backfilling

Holes and depressions caused by dismantling operations shall be backfilled with excavated or other approved materials and compacted to required density conforming to these specifications, or as directed by the Engineer.

202.5 Disposal of Materials

All materials, obtained by dismantling, shall be the property of Government. Unless otherwise specified, materials having any salvage value shall be placed in neat stacks of like materials within the right-of-way, as directed by the Engineer with all lifts and upto a lead of 1000 m.

Pipe of culverts which are removed shall be cleaned and neatly piled on the right-of-way at spots designated by the Engineer with all lifts and lead upto 1000 m.

Structural steel removed from old structures shall, unless otherwise specified be stored in a neat and presentable manner in blocks at locations suitable for loading.

Timber or lumber salvaged from old structures shall have all nails and bolts removed therefrom and shall be stored in neat piles in locations suitable for loading in the right-of-way.

All materials obtained from dismantling operations which cannot be used or auctioned shall be disposed off as directed by the Engineer with all lifts and upto a lead of 1000 m.

202.6. Acceptance

Acceptance of dismantling and removal of salvaged material shall be based on visual inspection of the work and backfilling and compaction shall comply the tests specified for such work in these Specifications.

202.7. Measurements for Payment

The work of dismantling structures shall be paid for in units indicated below by taking measurements before and after, as applicable:

(i)	Dismantling brick/stone masonry/concrete (Plain and reinforced)	cu.m.
(ii)	Dismantling flexible and cement concrete pavement	cu.m.
(iii)	Dismantling steel structures	tonne
(iv)	Dismantling pipes, guard rails, kerbs, gutters and fencing	Linear m
(v)	Utility services	Nos./linear m

202.8. Rate

The Contract unit rates for the various items of dismantling including utility services shall be paid in full for carrying out the required operations including all labour, materials tools, equipment, safeguards and incidental expenditure for the satisfactory completion of the work. These rates will also include excavation and backfilling where necessary to the required compaction and for handling, salvaging, piling and disposing of the dismantled materials within all lifts and upto a lead of 1000 m.

CONTRACTOR'S SIGNATURE

EXECUTIVE ENGINEER

Deputy Executive Engineer
Panchayat R&B Sub Dn
Dhrangadhara

Executive Engineer
Panchayat R&B Division
Surendranagar.

- : SCHEDULE FOR TESTING OF MATERIALS :-

For ensuring quality control and workmanship Various tests prescribed below for materials shall be taken at periodical intervals as stipulated below. The materials shall be got tested at Government recognized Laboratory (R&B) or field Laboratory of GERI (R&B) for which 1% of the estimated amount put to tender shall be recovered from the contractor from the RA bills and final bills and the testing charges shall be paid to the GERI by the Government . However if the charges increase over 1% no excess recovery shall be made from the contractor as per resolution of B & C department dated 10th May 1985 vide TNC/ 1085/ (4)/ S

Sr. No.	Material /Item	Approx. Qty.		Description of tests.	Frequency of test	No. of reqd. tests
1	Cement	49.10	MT	Fineness, Compressive Strength, Consistency setting time, Chemical Analysis	1 Test/up to 50 2 Test/50 to 100 MT 3 Test/100 to 200 MT 4 Test/200 to 300 MT 5 Test/300 to 500 MT 6 Test/500 to 800 MT 7 Test/800 to 1300 MT	1
2	Earthwork	84	Cum	PI/ LL/ OMC / MDD / CBR Sieve Analysis	1 test / 3000 cum	1
3	13.20 MM Agg. (WBM-1-2)	2	Cum	Elongation, Gradation, Flakiness ,Water absorption, Impact, Abrasion etc	1 test/up to 100cum 3 Test /101 to 500cum 5Test/501 to 1500cum 7Test/1501 to 5000cum	1
4	63mm to 45mm Agg. (WBM-2)	18	Cum	Elongation, Gradation, Flakiness ,Water absorption, Impact, Abrasion etc	1 test/up to 100cum 3 Test /101 to 500cum 5Test/501 to 1500cum 7Test/1501 to 5000cum	1
5	Stone dust (WMB Gr.1-2) (BM,MSS)	1	Cum	PI Value	1 test/up to 100cum 3 Test /101 to 500cum 5Test/501 to 1500cum 7Test/1501 to 5000cum	1
6	Coarse Sand	76	Cum	Silt content Gradation	1test /Work	1
7	Crushed stone agg.40mm	14	Cum	Elongation, Gradation, Flakiness ,Water absorption, Impact, Abrasion etc	1 test/up to 100cum 3 Test /101 to 500cum 5Test/501 to 1500cum 7Test/1501 to 5000cum	1
8	Crushed stone agg. 10mm	42	Cum	Elongation, Gradation, Flakiness ,Water absorption, Impact, Abrasion etc	1 test/up to 100cum 3 Test /101 to 500cum 5Test/501 to 1500cum 7Test/1501 to 5000cum	1

9	Crushed stone agg. 20mm	90	Cum	Elongation, Gradation, Flakiness ,Water absorption, Impact, Abrasion etc	1 test/upto 100cum 3 Test /101 to 500cum 5Test/501 to 1500cum 7Test/1501 to 5000cum	1
10	NP3 Pipes 1200mm. dia.	23	Rmt	-	Manu. certificate	Manu. certificate
11	C.C. cube M-100	22	Cum	Comp. strength	4 test / 20 to 50 cum + 1 test/50cum	3
12	C.C. cube M-150	133	Cum	Comp. strength	4 test / 20 to 50 cum + 1 test/50cum	6
13	CC Cube M-200	15	Cum	Comp. strength	4 test / 20 to 50 cum + 1 test/50cum	3
14	TMT Bar reinforcement	0.94	MT	Tensile strength Yeild stress Elongation	1 test / forEach dia.	1
15	Water	-	-	Chemical Test	1 test / source	1

The Number of tests will be as per Manual of quality control or latest Govt. G.R./Circular and it will be considered final

The contractor shall have to pay 1% of the estimated cost put to tender towards all testing of materials and the same shall be deducted from their bills for the works.

Testing charges of GERI shall be borne by Govt. No refund be made nor extra charges over 1% shall be recoverable from the contractor.

If directed by the Engineer in charge, the materials intended to be used for the work but not included in the above schedule shall also be got tested at Government recognized Laboratory or field Laboratory.

The Numbers of tests will be as per manual of quality control or latest Govt. G.R./Circular will be final.

Signature of Contractor

Executive Engineer
Panchayat (R&B) Division
Surendranagar

Deputy Executive Engineer
Panchayat R&B Sub Dn
Dhrangadhara