

PANCHAYAT (R & B) DIVISION

RAJPIPLA.



NAME OF WORK:- Constructing Mathasar Maski Faliya Road. (V.R. / N.P.) Taluka:- Dediapada, District: Narmada. (K.M. 0/0 to 2/00)

DETAILED SPECIFICATIONS.

GENERAL TECHNICAL SPECIFICATION 1. General:

All measurements shall be made in the metric system. Different items of work shall be measured in accordance with the procedures set forth in the relevant specifications read **in** conjunction with Genral Conditons of Contract. The same shall not. however, apply in the case of lump-sum item. All measurements and computations, unless otherwise, indicated, shall be carried nearest to the following limites

(i)	Length and breath	10 mm
(ii)	height, depth or thickness of earthwork, sub-base, base surfacings and structural members	05 mm
(iii)	areas.	0.01 Sq.Mtrs.
(iv)	cubic contentcs	0.01 Cubic Mtr

2 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 regard shall be taken as final. Distance upto and including 100 meters shall be measured in units of 50 metres, exceeding 100 metres but not 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 material 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 Surface, Regularity

The surface regularity of completed wearing surfaces in the longitudinal and transverse directions shall be within the tolerances indicated in Table below. The longitudinal profile shall be checked with a 3 metre long strainght edge, at the middle of each traffic lane along a line p6ralelled to the centre of the road, The transverse profile shall be checked with a set of three cambe boards at intervals of ten metres

PERMITTED TOLERANCES OF SURFACE REGULARITY FOR PAVEMENT COURSES

Sr. No.	Type of Construction	Longitudinal Maximum Permissible in MM.	Profile with 3 meter straight edge	Cross Profile
			Maximum Nos. Of Undulations permitted length exceeding 3mm	Maxi. Permissible variation from specified camber template mm
	Bitumenous wearing coat	15	20	6

Notes.

- 1 @ These are for machine laid surfaces. If laid manually, tolerance; upto 50,-percent above these values in this column may be permitted. However this relaxation does not apply to the value of maximum undulation for longitudinal and cross profiles mentioned in columns 3 and 8 on the table
- 2 Surface evenness requirements in respect of both the longitudinal and cross profiles should be simultaneously satisfied

3.1 Rectification

Where the surface irregularity 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 his own cost.

3.2 Bituminous constructions

For bituminous constructions, for wearing course, where the surface is high or low, the full depth of the layer shall be removed and replaced with fresh materials and compacted to specifications, In all cases where the removal & replacement of a bituminous layer is involved, the area treated shall not be less than 5 metres long and less than 1 lane

4.0 Quality control tests 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 tests, as described here in after, by the Engineer-in-charge . Test procedures for the various quality control test are indicated in the respective sections of the Specifications or for certain tests within this section. Where no specific testing procedure is mentioned, the test shall be carried out as per the prevalent accepted Engineering practice to the directions of the Engineer-in-charge.

5.0 Following materials shall conform to the Indian Standards shown "Against Them".

[1]	Cement	IS: 269
	Sand of Masonary	IS : 2116
	Sand for Concrete	IS: 383,
	Coarse aggregate	IS: 383
	Mild Steel	IS: 432
	High yiled strength deformed bars-	
	(a) Hot Rolled	IS :1139
	(B) Cold Twisted	IS :1786
	Cast Steel	IS :1030
	Cast Iron	IS : 210
	Structural Steel-	
	(a) Mild Steel	IS : 226
	(b) H. T. Steel	IS : 961
	(c) Fusion welding quality steel	IS :2062
	(d) Rivet steel	IS : 1148 OR
		IS :1149 As applicable
	H.T. Steel	IS :1785
	Greese	IS :1002
	Electrodesformetalorweldingof N.J.	IS : 814

**ITEM No Clearing & Grubbing road land including uprooting rank vegetation, grass
[1] brushes, shrubs, spalling and trees girth up in 300 mm removal of
stumps of trees cut earlier & disposal of unservicable material (A) By
manual means in area of heavy jungle.**

- I. Before starting the work. the site shown on plans shall be cleared of all obstructions, loose stones and materials. rubbish of all kinds as well as all trees and brush wooden except those marked for preservation. the roots being entirely grubbed up. No trees are to be cut down before obtaining the instruction from Engineer-in-charge
- II All holes or hollows, where originally or produced by digging up roots shall be carefully filled up with earth, well rammed and leveled up neatly as directed
- III After completion of the work, but before its acceptance, the site shall be cleared of all scaffolding surplus materials and rubbish etc. as per contract no extra payment shall be made for site
- IV After completion of the work shall be for the complete job and shall be paid at the lump sum rate tendered for the work on completion of the entire work
- V. The Payment of Work done Shall be made on **Hectare** Basis.

**ITEM No Earthwork in Embankment inclu. breaking clods drssing with all lead &
[2] lift from Borrow area with all Lead & Lift.**

- 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 meters 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-inc-charge. The contractor shall provide all labours 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 responsive for maintaining the B.M.S. profiles alignments and other marks as long as they are required for the work in the opining of the Engineer-in-charge. If the contractor defaults in this respect they be restored by the department at the cost of the contractor.

- 3 When existing embankment is to be widened, continuous, horizontal benches, each at least 0.3 metre wide, shall be cut into existing slope for ensuring adequate bond with the fresh embankment. of the embankment. The dumping of material from trucks for widening operations shall be avoided except in difficult circumstances when the extra width is too narrow to permit the movement to any other type 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
- 5 Location, shape and size of borrow pits shall be as indicated by the Engineer-in charge. Its shall not be dug continuously. Ridges of not less than 8 metres width should be left at interval not exceeding 300 metres. Small drain shall be cut through the ridges of facilities drainage. The other edge of borrow pits shall be so regulated that the bottom does not cut an imaginary line having a slope 1 vertical to 4 horizontal projected from the edge of final section of the bank, the maximum depth in any case being limited to 1.5 meter. Also no pits shall be dug within 5 metres of the toe of the final section of the road embankment
- 5.1 No borrow pits shall be allowed at the following sites along the road
 - i Upto 30 metres on either side of C.D. works.
 - ii Upto 15 metres on either side of cart track crossing for which approaches are to be constructed.
- 5.2 If there is top layer of black cotton or there object able soils, the same shall be removed and deposed off elsewhere and usable material found at lower level will only be used in earthen embankment.
- 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 the consolidation including watering and rolling of earth work shall be carried out by the Department. The operation of laying the successive layer of earth shall be broken to have maximum size 15cm. when being in the embankment and a maximum of size 5 cm. when bedding placed in the 45cm. of the embankment. The work of next layer shall be allowed only after the first layer below it 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 an old concrete pavement and lies within 1 meter of new sub grade level the pavement shall be broken up in places not be exceed 0.1 m. and may be left under the new embankment. If the existing road surface is of granulate 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 construction 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 up to a distance of twice the height of the embankment. The fill material shall not be placed against any abutment or wing wall unless permission has been given for 14 days, the embankment shall be brought up simultaneously in equal layers on each side of the structure to avoid displacement and unequal pressure. The sequence of work in this regard shall be got approved from the Engineer-in-charge. Where the provision of any filter medium is specified behind the abutment, the same shall be laid in layers simultaneously with the laying of fill material. The material used for the filter shall conform to the requirement 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 meters by average area method. The contractor shall sign day to day leveling work and also original cross section, 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 is 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 the acceptance. If there is any disagreement the contractor shall inform of it in writing to the officer concerned with specific reference to the section before starting further work. Once the work is started, no cognizance of any complaint will be taken. Merely not signing of level book shall not be deemed as disagreement. The executive Engineer shall also verify leveling work to the extent 5% before commencement of earth work and on finalization. The contractor shall maintain the embankment by filling in rain cuts, depression due to shrinkage etc. to proper formation and grade till this is finally

measured and accepted by the Department. The measurements shall be taken on compacted earthworks. If the compaction as stipulated in Para above is not done by the department in that case shrinkage from such earth work quantity shall be deducted as per norms i.e 10 per cent after monsoon and 15% before monsoon. However the contractor shall have taken place at the time of taking the final measurements of this item.

- 11 The Rate of earthwork includes,, clearing jungles, dog belling, fixing profiles, erecting necessary pillars for stones for bench marks for leveling purpose, excavating earth from borrow area, breaking clods, conveying and spreading earth in layers with all lead and lift, finishing the entire embankment and incidental 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 be utilized in embankment construction 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 the embankment but labor for cutting will be paid as per specification in the particulars item, and only balance quantity of earthwork brought from borrow area will be paid in this item.
- 12 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
- 13 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 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.

- 14 After adding the required amount of water, the soil shall be processed by mean 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 meter portion of the minimize cutting of uneven compaction. Hauling equipment shall be diapered uniformly over entire surface of the previously constructed layer to minimize cutting of uneven compaction.
- 15 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 till should be constructed by dumping successive loads in a informally distributed layers of a thickness not greater than that necessary to support the hauling equipment while placing subsequent layers

ITEM No [3] Earthwork in cutting in all sorts of soil & soft murrum incl. conveying & spreading the stuff, in Spoil bank, Maintaining Minimum distance of five Mt. between top edge of Cutting and Toe of Spoil bank.

- 1 The land width required for the roadway gutter side slopes and catch water gutters shall be cleared of all trees having a girth of 30 cms. and less loose stones. vegetation bushes stumps and all other objectionable materials. The roots of trees and stumps shall be removed to a depth of 30 cms below the grade information and slopes and excavation filled up with excavated materials and compacted. All the materials cleared will be the property of Government. Useful materials shall be arranged in convenient stacks along the road boundary or a directed as places within 50 mts. lead, and handed over to the department in convenient sections. Unsuitable material shall be burnt or otherwise disposed off by the contractor at his own cost without causing any nuisance, inconvenience or damage to the work, property or people in the neighborhood. If the contractor and royalty etc. If any paid by him without claiming compensations. In all cases, the materials shall be disposed of in a neat manner.
- 2 After clearing the site, the alignment of the road shall be properly set out true to lines, curves slope, grades and section as shown on the plans or directed by the Engineer in charge. The contractor shall provide all labour and establishing bench marks and giving profiles. The contractor shall be responsible for maintaining the B.Ms profiles alignments and other stakes and marks as long

as then are required for the work in the opinion of the Engineer, If the contractor defaults in this respect even after the direction by the Engineer within the

- 3 Profiles of the section including the road side gutters to be excavated shall be laid at suitable intervals of 10m to 50 m or other intervals as directed by Engineer to conform to the curved or straight alignment, sections grades and used shall be set up with the toe line marked on each side. The road way section shall first be excavated with vertical side for each lift and the sides slopes for that lift shall be excavated in steps. These steps shall be smoothened to the required slope when the excavation reaches the road formation. The contractor shall on no account excavate beyond the slopes or below the specified grade unless so directed by the Engineer in writing. If excavation is done below the specified level or out side the section, it shall not be paid for and the contractor shall be required to fill up at his own cost such

extra excavation in the road portion, with approved materials of the embankment grade in layers, watered and fully compacted to attain maximum density laid down for the embankment in its relevant item. The Engineer may require measurement ridges and dead man to be left at specified intervals or places & kept intact till order to be removed for the purpose to check measurements. The excavation shall be finished neatly smoothly and evenly to the correct lines, curves, grades. If loose shall be scarified, watered and compacted to the same density as the embankment,

The section side slopes and catch water gutter shall be maintained by the contractor at his own cost in such a way that the formation and gutters will be drained by providing for necessary diversions etc. and not damaged due to obstruction of any drainage. Necessary passages shall be provided for leading away seepage, spring, surface flow or rainwater safely without damaging the work. If any damage occurs due to default of the contractor in this respect he shall make good the damage at his own cost. If it is necessary in the execution of the work to interrupt existing surface drainage, irrigation channels, sewers or under drainage, temporary arrangements shall be provided till such time as is necessary. The contractor at his own cost shall make the existing work or work in hand caused as a result of his operations or negligence shall be made good by the contractor at his own cost. Road side gutters shall be excavated to the specified sections and shall be measured along with the main cutting in cubic meters.

- 4 If slides occur in the cutting they shall be removed as ordered by the Engineer. If finished slopes slide into the roadways before the final acceptance of the work. Such slides shall be removed by the contractor and shall be paid for at the contract rate for the class of excavation involved provided the slides are not due to any negligence of the contractor. The classification of the material in slides shall conform to its conditions at the time of removal and payment made accordingly regardless of its prior condition. Care shall be taken to see that excavation is arranged in a safe way so that there will be no risk to the workmen by slides, falling materials, boulders and collapsing sides etc.
- 5 If there is traffic nearby or if there are towns and villages in the neighborhood. barricades and or traffic, signals shall be provided day or night on both sides giving sufficient warning. If necessary, signalers shall be stationed at each end to regulate traffic where it is heavy. Measures shall be taken to see that the excavation does not affect or damage adjoining structures or property. If there is damage to property, injury to workers, the members of the public, animals etc., due to the negligence of the contractor, he will be responsible & liable to all the consequences including compensation.
- 6 All the excavated materials shall be property of Govt. When the useful excavated material is to be used in embankment within a lead of 200metre or an all lift, it shall be directly deposited at the required location in specified layers. No handling or conveyance charges shall be paid if the material is temporarily deposited elsewhere and the drainage in any way. If no Govt. land is available but the excavated useful stuff is to be stacked temporarily before use under the same agreement, the contractor shall make his own arrangements for the stacking of this material not required for use on embankment or unsuitable materials may be used on his own to uniformly widen embankment to flatten slopes and to fill low places in the road land. if so permitted by the Engineer. Material not required for any use whatsoever may be disposed of by the contractor at his own cost in manner approved by the Engineer. The excavated material shall not be deposited within 3 m. from the top edge of slope or toe of the bank. The lead shall be measured from the junction point of cutting and embankment up to 200 mt. on either side.

- 7 If the contractor does not wish to utilise the quantity of cutting within the specified lead for any reason, then he may do the embankment work with the earth from other sources (except borrow pits in the length of the road where cutting stuff is to be utilized) but in that case the full or part quantity on acceptable quality stuff for which payment is made or to be made will be deducted from the net quantity of the earth work in the embankment arrived at, within the chainage measured as above.
- 8 The contract rate shall be a unit of one cubic metre for the work mentioned in the wording of the item of excavation acceptably completed. limited to the dimensions shown on the plans or as directed by the Engineer. Excavation shall be measured in its original positions by taking cross sections before the work starts and after it is entirely completed. The quality shall be worked by the average end area method. When the classification of the strata changes, the contractor shall bring this to notice of the Engineer. who will then verify and if necessary take levels for the changed strata for purpose of measurement.

(b) In spoil Bank : Specification shall be as per Item 2(a) except that the excavated stuff shall be deposited in spoil Bank instead of using same in road embankment.

ITEM No [4] Rolling and Consolidation of Earth Work in Layers with Power Roller including filling in depression which occur during the process with all lead & lift.

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 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	2	3
(i)	Top 0.5 meter portion of	Not less than 100
(ii)	below subgrade level and	Not less than 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

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 meters** by the method of average material brought from road way and drainage excavation. For this purpose it shall be assumed that one cubic

meter of suitable materials brought to site from roadway and drainage excavation forms one cubic meter of compacted fill and all bulking or shrinkage shall be ignored. Stripping including storing and reapplication of top soil shall be measured as volume in cubic meter.

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

ITEM No [5] Construction of granular sub-base by providing well graded material for grade-I (B.T. stone agg. 53mm to 9.50 mm 50%, 9.50mm to 2.36mm 20%, 2.36 below 36%) including spreading in uniform layers with motor grader on prepared surface, mixing by mix in place method with rotavator at OMC, and compacting with smooth wheel roller to achieve the desired density, complete as per Technical Specification Clause 401. For Grading 1 Material.

Scope:

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

Materials:

The material to be used for the work shall be natural sand, murrum, gravel, crushed stone or combination thereof depending upon the grading required. Materials like crushed slag, crushed concrete, brick metal and kankar may be allowed only with the specific approval of the Engineer. The materials shall be free from organic or other deleterious constituents and conform to one of the three gradings given in Table 400-1.

While the gradings in Table 400-1 are in respect of **close graded granular** sub-base materials, one each for maximum particle size of 75 mm, 53mm and 26.5 mm, the corresponding gradings for the close graded materials for each of the three maximum particle sizes are given at Table 400-2. The grading to be adopted for a project shall be as specified in the Contract.

Physical Requirements :-

The materials shall have a 10 percent lines value of 50 kN or more (for sample in soaked condition) when tested in compliance with BS:812 (Part 111). The water absorption value of the close aggregate shall be determined as per IS: 2386 (Part 3), if this value is greater than 2 per cent, the soundness test shall be carried out on the material delivered to site as per IS: 383. For Grading II and III materials, the CBR shall be determined at the density and moisture content likely to be developed in equilibrium conditions which shall be taken as being the density relating to a uniform air voids content of 5 percent

I.S.Sieve Designation	Percentage by Weight Passing the Sieve		
	Grading I	Grading II	Grading III
75.0 mm	100	..	..
53.0 mm	80-100	100	..
26.5 mm	55-90	70-100	100
9.5 mm	33-65	50-80	65-95
4.75 mm	25-55	40-65	50-80
2.36 mm	20-40	30-50	40-65
0.425 mm	25-Oct	15-25	20-35
0.075 mm	3-10	3-10	3-10
CBR Value	30	25	20
(Minimum)			

Note:-The material passing 425 micron (0.425 mm) sieve for all the three grading when tested according to IS: 2720(Part 5) shall have liquid limit and plasticity index not more than 25 and 6 percent respectively

Strength of Sub Base

It shall be ensured prior to actual execution that the material to be used in the sub-base satisfies the requirements of CBR and other physical requirements when compacted and finished

When directed by the Engineer, this shall be verified by performing CBR tests in the laboratory as required on specimens remolded at field dry density and moisture content and any other tests for the "Quality" of materials, as may be necessary

Construction Operations :

Preparation of subgrade:-

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

Spreading and compacting:

The sub-base material of grading specified in the Contract shall be spread on the prepared subgrade with the help of a motor grader of adequate capacity, its blade having hydraulic controls suitable for initial adjustment and for maintaining the required slope and grade during the operation or other means as approved by the Engineer

When the sub-base material consists of combination of materials mentioned in Clause 401.2.1, mixing shall be done mechanically by the mix-in-place method. Manual mixing shall be permitted only where the width of laying is not adequate for mechanical operations as in small sized jobs. The equipment used for mix-in-place construction shall be a rotavator or similar approved equipment capable of mixing the material to the desired degree. If so desired by the Engineer, trial runs with the equipment shall be carried out to establish its suitability for the work.

Moisture content of the loose material shall be checked in accordance with IS:2720 (Part 2) and suitably adjusted by sprinkling additional water from a truck mounted or trailer mounted water tank and suitable for applying water uniformly and at controlled quantities to variable widths of surface or other means approved by the Engineer so that, at the time of compaction, it is from 1 per cent above to 2 per cent below the optimum moisture content corresponding to IS: 2720 (Part 8). While adding water, due allowance shall be made for evaporation losses. After water has been added, the material shall be processed by mechanical or other approved means like disc harrows, rotavators until the layer is uniformly wet.

Immediately thereafter, rolling shall start. If the thickness of the compacted layer does not exceed 100 mm, a smooth wheeled roller of 80 to 100 kN weight may be used. For a compacted single layer upto 225 mm the compaction shall be done with the help of a vibratory roller of minimum 80 to 100 kN static weight with plain drum or pad foot-drum or heavy pneumatic tyred roller of minimum 200 to 300 kN weight having a minimum tyre pressure of 0.7 MN/m² or equivalent capacity roller capable of achieving the required compaction. Rolling shall commence at the lower edge and proceed towards the upper edge longitudinally for portions having unidirectional crossfall and super elevation and shall commence at the edges and progress towards the center for portions having cross fall on both sides.

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

Rolling shall be continued till the density achieved is at least 98 percent of the maximum dry density for the material determined as per IS:2720(Part 8). The surface of any layer of material on completion of compaction shall be well closed, free from movement under compaction equipment and from compaction planes, ridges, cracks or loose material. All loose, segregated or otherwise defective areas shall be made good to the full thickness of layer and re-compacted.

Surface Finish and Quality Control of Work:

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

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

Arrangements for Traffic :

During the period of construction, arrangement of traffic shall be maintained in accordance with clause 112.

Measurements for payment:-

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

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

Rate:-

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

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

ITEM No [6] Providing & laying compacted WBM of Grading-I MCBT metal of size 90 to 45 mm in required layers include. using 27% stone screening, 13.2 mm size and 8% stone dust as filler including spreading watering & consolidation by vibratory roller etc. comp.

404.1 SCOPE

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

404.2 Materials

404.2.1 Coarse Aggregates

Coarse aggregates shall be either crushed or broken stone, crushed slag, overburnt (Jhama) brick aggregates or any other naturally occurring aggregates such as kankar and laterite of suitable quality. Materials other than crushed gravel / shingle is used, not less than 90 percent by weight of the gravel / shingle pieces retained on 4.75mm sieve shall have at least two fractured faces. The aggregates shall conform to the physical requirements set forth in Table 400-8. The type and size range of the aggregate shall be specified in the contract or shall be as specified by the Engineer. If the water absorption value of the coarse aggregate is greater than 2 percent, the soundness test shall be carried out on the material delivered to site as per IS:2386 (Part-5).

TABLE 400-8. PHYSICAL REQUIREMENTS OF COARSE AGGREGATES FOR WATER BOUND MACADAM FOR SUB-BASE / BASE COURSES

	TEST	TEST METHOD	REQUIREMENTS
1	*Los Angeles Abrasion Value or * Aggregate impact value	I.S. 2386 - Part -4 I.S. 2386 - Part -4 or I.S. 5640 **	40 % (Max.) 30 % (Max.)
2	Combined Flakiness and Elongation indices (Total) * * *	I.S. 2386 - Part -1	30 % (Max.)

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

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

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

404.2.2 Crushed Broken Stone

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

404.2.3 Crushed Slag

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

- | | |
|------------------------|--|
| (i) Chemical Stability | : To comply with requirement of appendix of BS :1047 |
| (ii) Sulphur Content | : Maximum 2 Percent |
| (iii) Water Absorption | : Maximum 10 Percent |

404.2.4 Overburnt (Jhama) Brick aggregates :

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

404.2.5 Grading requirement of Coarse aggregates :

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

404.2.6 Screenings

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

TABLE 400-9 : GRADING REQUIREMENTS OF COARSE AGGREGATES

Grading No.	Size Range	I.S.Sieve	Percentage by Weight
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	53mm to 22.4 mm	63 mm	100
		53 mm	95 - 90
		45 mm	65 - 90
		22.4 mm	0 - 10
		11.2 mm	0 - 5

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

Screenings shall conform to the grading set forth in Table 400–10. The quantity of screenings required for various grades of stone aggregates are given in Table 400–11. The table also gives the quantities of materials (loose) required for 10 m² for sub-base / base compacted thickness of 75 mm. The use of screenings shall be omitted in the case of soft aggregates such as brick metal, kankar, laterites etc. as they are likely to get crushed to a certain extent under rollers.

404.2.7 Binding Material

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

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

TABLE 400 – 10. GRADING FOR SCREENINGS

Grading	Size of Screenings	I.S.Sieve	Percentage by Weight
A	13.2 mm	13.2 mm	100
		11.2 mm	90 - 100
		5.6 mm	15 - 35
		180 micron	0 - 10
B	11.2 mm	11.2 mm	100
		9.5 mm	80 - 100
		5.6 mm	50 - 70
		180 micron	15- 35

TABLE 400 – 11. APPROXIMATE QUANTITIES OF COARSE AGGREGATES AND SCREENINGS REQUIRED FOR 75 MM COMPACTED THICKNESS OF WATER BOUND MACADAM (WBM) SUB-BASE / BASE COURSE FOR 10 M² AREA

Classification	Size Range	Compact Thickness	Loose Quantity	Screenings			
				Stone Screenings		Crushable type Such as murrum &	
				Grading Classification & Size	For W.B.M./ Sub Base/ Base Course (Loose Qty.)	Grading Classification & Size	Loose Quantity
Grading -1	90 mm to 45 mm	75 mm	0.91 to 1.07 Cum	Type -A 13.2 mm	0.12 to 0.15 Cum	No Uniform	0.22 to 0.24 Cum
Do	Do	Do	Do	Type - B 11.2 mm	0.20 to 0.22 Cum	Do	Do
Grading -2	53 mm to 22.4 mm	75 mm	Do	Do	0.18 to 0.21 Cum	Do.	Do.

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

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

404.3 Construction Operations

404.3.1 Preparation of base :

The surface of the sub grade sub-base/base to receive the water bound macadam course shall be prepared to the specified grade and camber and cleaned of dust, dirt and other extraneous material. Any ruts or soft yielding places shall be corrected in an approved manner and rolled until firm surface is obtained.

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

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

404.3.2 Inverted Choke / Sub surface Drainage layer

If water bound macadam is to be laid directly over the subgrade, without any other intervening pavement course, a 25 mm course of screenings (Grading B) or coarse sand shall be spread on the prepared subgrade before application of the aggregates is taken up. In case of a fine sand or

silty or clayey subgrade, it is advisable to lay 100 mm insulating layer of screening or coarse sand on top of Fine grained soil, the gradation of which will depend upon whether it is intended to act as a drainage layer as well. As a preferred alternative to inverted choke, appropriate geosynthetics performing functions of separation and drainage may be used over the prepared subgrade as directed by the Engineer. Section 700 shall be applicable for use of geosynthetics.

404.3.3 Lateral Confinement of Aggregates

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

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

404.3.4 Spreading coarse aggregates

The coarse aggregates shall be spread uniformly and evenly upon the prepared sub grade/sub-base/ in the required quantities from the stock piles to proper profile by using templates placed across the road about 6 m apart, in such quantities that the thickness of each compacted layer is not more than 75 mm. In no case shall these be dumped in heaps directly on the area where there are to be laid nor shall their hauling over a partly completed base be permitted. Wherever possible approved mechanical devices such as aggregate spreader shall be used to spread the aggregates uniformly so as to minimize the need for manual rectification afterwards.

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

The surface of the aggregate 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

The coarse aggregate shall not normally be spread more than 3 days in advance of the subsequent construction operations

404.3.5 Rolling:

Immediately following the spreading of the coarse 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 Except on super elevated portions and carriageway with unidirectional cross-fall, where the rolling shall proceed from inner edge to the outer,

rolling shall begin from the edges gradually progressing towards the 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 overlapping preceding tracks by at least one half width.

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

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

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

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

404.3.6 Application of screenings:

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

The screenings shall be applied at a slow and uniform rate (in three or more applications) so as to ensure filling of all voids. This shall be accompanied by dry rolling and brooming with mechanical brooms, hand brooms or both. In no case shall the screenings be applied so fast and thick as to form cakes or ridges on the surface in such a manner as would prevent filling of voids or prevent the direct bearing of the roller on the coarse aggregate. These operations shall continue until no more screenings can be forced into the voids of the coarse aggregate.

The spreading, rolling and booming of screenings shall be carried out in only such lengths of the road which could be completed within one day's operation.

404.3.7 Sprinkling of water and grouting :

After application of screenings, the surface shall be copiously sprinkled with water, swept and rolled. 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 have been thoroughly keyed, well-bonded and firmly set in its full depth and a grout has been formed of screenings. Care shall be taken to see that the sub base or sub grade does not get damaged due to the addition of excessive quantities of water during construction.

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

Application of binding material :

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

404.3.8 Setting and drying :

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

404.4 Surface Finish and Quality Control of Work

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

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

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

404.4.4 Reconstruction of defective macadam :

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

404.5 Arrangement for Traffic

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

404.6 Mode of Measurement & payment

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

404.7 RATE

The Contract unit rate for water bound macadam sub-base/base course shall be payable in full for carrying out the required operations including full compensation for all components listed below including arrangement of water used in the work as approved by the Engineer.

- (i) Making arrangements for traffic to Clause 112 except for initial treatment to verges, shoulders and construction of diversions;
- (ii) Supplying all materials to be incorporated in the work including all royalties, fees, rents where applicable with all leads and lifts,
- (iii) All labour, tools, equipment and incidental to complete the work to the Specifications
- (iv) Carrying out the work in part widths of the road where required and carrying out the required tests for Quality Control

- ITEM [7]** Providing and laying compacted WBM of Grading-II MCBT metal of size 45 to 63mm in required layers including using 16% stone screening, 13.2mm size and 8% stone dust as filler including spreading watering & consolidation by vibratory roller etc. comp.

404.1 SCOPE

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

404.2 Materials

404.2.1 Coarse Aggrtegates

Coarse aggregates shall be either crushed or broken stone, crushed slag, overburnt (Jhama) brick aggregates or any other naturally occurring aggregates such as kankar and laterite of suitable quality. Materials other than crushed gravel / shingle is used, not less than 90 percent by weight of the gravel / shingle pieces retained on 4.75mm sieve shall have at least two fractured faces. The aggregates shall conform to the physical requirements set forth in Table 400-8. The type and size range of the aggregate shall be specified in the contract or shall be as specified by the Engineer. If the water absorption value of the coarse aggregate is greater than 2 percent, the soundness test shall be carried out on the material delivered to site as per IS:2386 (Part-5).

TABLE 400-8. PHYSICAL REQUIREMENTS OF COARSE AGGREGATES FOR WATER BOUND MACADAM FOR SUB-BASE / BASE COURSES

	TEST	TEST METHOD	REQUIREMENTS
1	*Los Angeles Abrasion Value or	I.S. 2386 - Part -4	40 % (Max.)
	* Aggregate impact value	I.S. 2386 - Part -4 or I.S. 5640 * *	30 % (Max.)
2	Combined Flakiness and Elongation indices (Total) * * *	I.S. 2386 - Part -1	30 % (Max.)

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

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

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

404.2.2 Crushed Broken Stone

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

404.2.3 Crushed Slag

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

- | | |
|------------------------|--|
| (i) Chemical Stability | : To comply with requirement of appendix of BS :1047 |
| (ii) Sulphur Content | : Maximum 2 Percent |
| (iii) Water Absorption | : Maximum 10 Percent |

404.2.4 Overburnt (Jhama) Brick aggregates :

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

404.2.5 Grading requirement of Coarse aggregates :

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

404.2.6 Screenings

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

TABLE 400-9 : GRADING REQUIREMENTS OF COARSE AGGREGATES

Grading No.	Size Range	I.S.Sieve Designation	Percentage by Weight Passing the Sieve
1	63mm to 45 mm	75 mm	100
		63 mm	90 - 100
		53 mm	25 - 75
		45 mm	0 - 15
		22.4 mm	0 - 5
2	53mm to 22.4 mm	63 mm	100
		53 mm	95 - 90
		45 mm	65 - 90
		22.4 mm	0 - 10
		11.2 mm	0 - 5

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

Screenings shall conform to the grading set forth in Table 400–10. The quantity of screenings required for various grades of stone aggregates are given in Table 400–11. The table also gives the quantities of materials (loose) required for 10 m² for sub-base / base compacted thickness of 75 mm. The use of screenings shall be omitted in the case of soft aggregates such as brick metal, kankar, laterites etc. as they are likely to get crushed to a certain extent under rollers.

404.2.7 Binding Material

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

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

TABLE 400 – 10. GRADING FOR SCREENINGS

Grading Classification	Size of Screenings	I.S.Sieve Designation	Percentage by Weight Passing the Sieve
A	13.2 mm	13.2 mm	100
		11.2 mm	90 - 100
		5.6 mm	15 - 35
		180 micron	0 - 10
B	11.2 mm	11.2 mm	100
		9.5 mm	80 - 100
		5.6 mm	50 - 70
		180 micron	May-25

TABLE 400 – 11. APPROXIMATE QUANTITIES OF COARSE AGGREGATES AND SCREENINGS REQUIRED FOR 75 MM COMPACTED THICKNESS OF WATER BOUND MACADAM (WBM) SUB-BASE / BASE COURSE FOR 10 M² AREA

Classification	Size Range	Compact Thickness	Loose Quantity	Screenings			
				Stone Screenings		Crushable type Such as murrum & Gravel	
				Grading Classification & Size	For W.B.M./ Sub Base/ Base Course (Loose Qty.)	Grading Classification & Size	Loose Quantity
Grading -1	63 mm to 45 mm	75 mm	0.91 to 1.07 Cum	Type -A 13.2 mm	0.12 to 0.15 Cum	No Uniform	0.22 to 0.24 Cum
Do	Do	Do	Do	Type - B 11.2 mm	0.20 to 0.22 Cum	Do	Do
Grading -2	53 mm to 22.4 mm	75 mm	Do	Do	0.18 to 0.21 Cum	Do.	Do.

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

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

404.3 Construction Operations

404.3.1 Preparation of base :

The surface of the sub grade sub-base/base to receive the water bound macadam course shall be prepared to the specified grade and camber and cleaned of dust, dirt and other extraneous material. Any ruts or soft yielding places shall be corrected in an approved manner and rolled until firm surface is obtained.

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

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

404.3.2 Inverted Choke / Sub surface Drainage layer

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

404.3.3 Lateral Confinement of Aggregates

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

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

404.3.4 Spreading coarse aggregates

The coarse aggregates shall be spread uniformly and evenly upon the prepared sub grade/sub-base/ in the required quantities from the stock piles to proper profile by using templates placed across the road about. 6 m apart, in such quantities that the thickness of each compacted layer is not more than 75 mm. In no case shall these be dumped in heaps directly on the area where there are to be laid nor shall their hauling over a partly completed base be permitted. Wherever possible approved mechanical devices such as aggregate spreader shall be used to spread the aggregates uniformly so as to minimize the need for manual rectification afterwards.

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

The surface of the aggregate 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 aggregate shall not normally be spread more than 3 days in advance of the subsequent construction operations

404.3.5 Rolling:

Immediately following the spreading of the coarse 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 super elevated portions and carriageway with unidirectional cross-fall, where the rolling shall proceed from inner edge to the outer, rolling shall begin from the edges gradually progressing towards the 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 overlapping preceding tracks by at least one half width.

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

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

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

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

404.3.6 Application of screenings:

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

The screenings shall be applied at a slow and uniform rate (in three or more applications) so as to ensure filling of all voids. This shall be accompanied by dry rolling and brooming with mechanical brooms, hand brooms or both. In no case shall the screenings be applied so fast and thick as to form cakes or ridges on the surface in such a manner as would prevent filling of voids or prevent the direct bearing of the roller on the coarse aggregate. These operations shall continue until no more screenings can be forced into the voids of the coarse aggregate.

The spreading, rolling and booming of screenings shall be carried out in only such lengths of the road which could be completed within one day's operation.

404.3.7 Sprinkling of water and grouting :

After application of screenings, the surface shall be copiously sprinkled with water, swept and rolled. 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 have been thoroughly keyed, well-bonded and firmly set in its full depth and a grout has been formed of screenings. Care shall be taken to see that the sub base or sub grade does not get damaged due to the addition of excessive quantities of water during construction.

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

Application of binding material :

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

404.3.8 Setting and drying :

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

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

404.4 Surface Finish and Quality Control of Work

- 404.4.1** The surface finish of construction shall conform to the requirements of Clause 902.
- 404.4.2** Control on the quality of materials and works shall be exercised by the Engineer in accordance with Section 900.
- 404.4.3** The water bound macadam work shall not be carried out when the atmospheric temperature is less than 10° C in the shade.

404.4.4 Reconstruction of defective macadam :

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

404.5 Arrangement for Traffic

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

404.6 Mode of Measurement & payment

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

404.7 RATE

The Contract unit rate for water bound macadam sub-base/base course shall be payable in full for carrying out the required operations including full compensation for all components listed below including arrangement of water used in the work as approved by the Engineer.

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

ITEM Providing and laying Compacted of Specified Hard Murrum in side
No: 8 shoulder / Raise Up inclu.carraige of material and spreading on prepared
base including compacting as per MOST Specification etc... complete.

- 1 The Hard Murrum shall be approved quarry as approved by the Ex. Engineer prior to collection. Filling of boxes, shall not be allowed till the metal is broken to the specified site.
- 2 The Hard Murrum shall be as uniform in size as possible. The Hard Murrum shall be hard, tough, solid durable of black trap quarry of close texture, free from decay and weathering. The stone shall be angular and roughly cubical in shape and round elongated or flaky materials shall be rejected. No sound or long rubble or angular chips smaller than specified size shall be allowed.

Grading for Hard Murrum.

I.S.Sieve Designation	Grading - 1
75 mm	100
53 mm	.....
26.5 mm	55 - 75
9.5 mm	.....
4.75 mm	10 - 30
2.36 mm	.....
0.425 mm	.....
0.075 mm	< 10
C.B.R. Value	Greater Than 20

Material passing through 425 micro sieve for all the three gradings when tested according to I.S. 2720 (Part-5) shall have liquid limit and plastic index not more than 25 and 6 respectively.

- 3 All unsound, weathered or disintegrated stone obtained from the under surface layer of the quarry or other layers of boulders shall be rejected.
- 4 Wherever any doubt as to whether above requirement are satisfied in whole or part of the collection it shall be got screened by the Contractor if so ordered by the Executive Engineer, and for which no extra payment shall be claimed by the contractor
- 5 Any collection which does not fully satisfy the above requirements is liable to be rejected all together.

- 6 Regular stacks shall be made by the contractor on a fairly level ground. All the stack shall be marked by white wash immediately on being measured and recorded by the Engineer-in-charge.
- 7 The rate includes blasting the rock, if any, breaking the quarry spauls, stacking measuring in pharas etc. complete.
- 8 Stacks shall as per actual requirements and any materials in excess shall have to be transported by the contractor at the places directed by the Executive Engineer at the risk and cost of the contractor.
- 9 While stacking materials the depositing should commence at one end of the K.M. and carried continuously towards the other end unless the Executive Engineer shall direct otherwise and as a rule measurements shall be taken after metal for half kilometer or Km. has been fully collected. Any fraction of these distance shall not be measured up.
- 10 The measurements shall be recorded in on Cum. basis on level computing method after rolling and consolidation and shall be paid accordingly.

*** Spreading Hard Murrum in grade & camber complete**

- 1 The Hard Murrum shall be only be allowed to be spread after the written permission of the Executive Engineer is obtained.
- 2 The permission for spreading the metal shall *be* given by the Executive Engineer if
 - (i) The full quantity of a particular mile(kilometer)is completely collected.
 - (ii) The collection of metal-is also completed in the adjoining two miles (Kilometers)
 - (iii) The measurements are recorded in the Measurement book.
- 3 H.M. shall if required, be screened, if containing rubbish dust, grass etc. it shall than be filled in basket & conveyed where required and spread evenly on the prepared surface be given twisting motion to the basket at the time of spreading. The surface shall then (15 m) by means of templates and strings as well as with camber boards and spirit level.
- 4 Between the straight length and curves and at the meeting points of the convex and concave portions of the reverse curves, the change in camber of the road, due to super elevations shall be made as well as with camber boards and spirit level.
- 5 At the time of spreading H.M. small quantity (about 4 to 5 percent) of metal as directed, shall be retained at the first instance. It shall be spread later 0:1 after partial consolidated as required to rectify the camber and to fill up the hollows if any. No extra amount shall be paid for this.
- 6 Measurements shall be paid as per the measurements of collection less the quantity remained to be spread and on cubic metre basis.

- 7 The rate includes the cost of screening the Q.S. if any spreading, sectioning, with template and adding reserved quota of metal, while/oiling is in progress for making good hollows and camber.
- 8 The surface shall be brought to the required camber which shall be checked at every 50 ft.(15 M) by means off templates of while the necessary of the in between shall tested by strings and corrected as required.
- 9 The centre line shall first be marked in the subgrade which is properly consolidated and has uniform carnber and grade as required
- 10 The Q. S. shall be laid for a small length on 25 ft. (8 M.) and then the edge stones shall be laid.
- 11 Pegs shall be driven on either side of the road and joined with strings true and parallel with a distance between they equal to the width be laid with over metal similarly.
- 12 The Hard Murrum shall be laid as close as possible so as too leave minimum possible interstices and voids.
- 13 Before roiling is allowed on soling the side berms shall be filled upto the top of the soling and at least 3'-0" (1 m.) on either side so as to prevent metal layer getting disturbed at times during rolling. The rate is inclusive of all the operations as stated above.
- 14 Immediately following the spreading of the coarse aggregates rolling shall be started with three wheeled power roller of 8 - to - 10 tone capacity or tendum roller or equivalent vibratory roller. The weight of the roller shall depend upon the type of the aggregate and be indicated by Engineer-in-charge.
- 15 Except on super elevated portions where the roiling shall proceed from inner edge to outer, rolling shall 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 centre line of the road, in successive passes uniformly lapping preceding tracks by at least one half the width.
- 16 Rolling shall continue until the aggregate is thoroughly keyed and the creeping of the aggregate a head of the roller is no longer visible. During rolling, slight sprinkling of water may be done, if necessary. Rolling shall no be done when the sub grade is soft or yielding or when it causes a wave like motion in the sub grade or sub base course.
- 17 The rolled surface shall be checked transversely and longitudinally with templates and any irregularities corrected by loosening the surface, adding or removing necessary amounts of aggregate and re - rolling until the entire surface conform to desired camber and grade. In no case shall the base of screening be permitted to make up depression.

- 18 The blindage material where it is required to be used shall be applied successively in two or more thin layer 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 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.
- 19 After the final compaction of water bound macadam course, the road shall be allowed to any over night Next morning hungry spots shall be filled with screenings of binding materials 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 - in - charge 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.
- 20 Payment shall be made in **Cubic meter** basis.

**ITEM No. Providing & fixing ordinary K.M. Stone of approved Precast C.C.1:2:4
[14] incl. necessary reinforcement as per I.R.C. Type design fixing in c.c. 1:
4:8 incl. Painting , lettering etc. complete.**

The work shall be carried out as per the item of ordinary Kilometer stone except that the size of kilometer stone shall be smaller than that of ordinary kilometer stone as per I.R.C. 26 (Type design for 200 meters stone) the indicator stone shall be fixed in C.C. 1:5:10 which will consist of one part of cement, five part of good sand and ten parts of good brick bats. Rate includes all labor and curing etc. necessary for concrete. The measurement for payment as well as the operation included in the unit rate shall be as per ordinary kilometer stones.

**ITEM No. Providing and fixing Hecto-meter stone as per I.R.C Type design incl.
[15] painting, lettering etc. complete. (A) Fixing in C.C.1:5:10**

The work shall be carried out as per the item of ordinary Kilometer stone except that the size of kilometer stone shall be smaller than that of ordinary kilometer stone as per I.R.C. 26 (Type design for 200 meters stone) the indicator stone shall be fixed in C.C. 1:5:10 which will consist of one part of cement, five part of good sand and ten parts of good brick bats. Rate includes all labor and curing etc. necessary for concrete. The measurement for payment as well as the operation included in the unit rate shall be as per ordinary kilometer stones.

**ITEM No. Providing & fixing indicator stone as per I.R.C.Type design incl. white
[16] washing etc. comp. (a) fixing in C.C. 1:5:10.**

- 1 Indicator stones shall be of approved quality and of the size 20 cm x 20 cm, its length shall not be less than 80 cms. The top 38 cm shall be chisel dressed on all sides. The size shape and dimension of indication stones shall be fixed firmly in position in embankment or cutting as the case may be. The exposed part of the indicator stone shall be done by the contractor at his own cost. The measurement for payment shall be per number of indicator stone fixed in position.
- 2 Unit rate indicator stone includes the cost of all materials' labour, tools, fixing and while washing as directed by the Engineer in - Charge.

ITEM No. Providing & fixing logo board of M.M.G.S.Y. as per standard design of [17] National Rural Road Development Agency diamond size 600 x 600 mm, 1.50mm thick plate & board size 900 x 250mm, 1.50mm thick M.S. plate and 2.40 meter deep length sunble angle 75 x75x6 mm size incl. fitting & painting lettering with luminous colour as per drawing including fixing in C.C. 1:3:6 etc. complete.

SCOPE :

1701.1 The work covers supplying and installing traffic signs conforming to IRC:67 complete in all respects in accordance with these specifications and as approved by the Engineer

1701.2 MATERIAL :

1701.2.1 The colour, configuration, size and location of all traffic signs for roads shall be in accordance with the Code of Practice for Road Signs, IRC:67, or as shown on the drawings. In the absence of any details or for any missing details, the same shall be provided as directed by the Engineer.

1701.2.2 The signs shall be semi-reflective, as shown on the drawings, fixed over mild steel sheeting duly stove enameled in white colour in front and grey colour on back, red engineering grade tape on borders and required message in non-reflective black sheeting of engineering grade tape as per Clause 1701.3.7 of these Specifications

Road signs, in particular, the cautionary/warning signs and mandatory/regulatory signs in the approaches of level crossings or narrow bridges may be reflectorised using luminous paints or other similar reflective material

1701.2.3 It is desirable that cautionary/warning and mandatory signs are fabricated through process of screen printing. In case the facility is not locally available in the region of work, these signs and informative signs may have inscription/message having cut letters of non-reflective black sheeting which shall be bonded well on the base sheeting as directed by the Engineer.

1701.2.4 The sizes and dimensions of different categories of signs shall be in accordance with IRC : 67.

1701.2.5 Language of inscription and font for informative signs shall be in accordance with IRC:67.

1701.2.6 The informative signs shall have prescribed Round plate type logo (0.45 mtr. dia) of Kishan Path Yojana on top of sign board as shown in Fig. 1700.1

- 1701.2.7 Typical Kishan Path Yojana logo and informatory sign board. The specifications and design of typical Kishan Path Yojana Informatory Sign Board shall be given in Annexure-1700.1 of these Specifications duly approved by the Engineer.
- 1701.3 The various materials and fabrication of the traffic signs shall conform to the following requirements
- 1701.3.1 **Concrete** : Concrete for footing shall be of the grade shown on the contract drawings or of minimum M15 grade conforming to Section 801 of these Specifications.
- 1701.3.2 **Reinforcing Steel** : Reinforcing steel shall conform to the requirement of IS:1786 unless otherwise shown on the drawing
- 1701.3.3 Bolts, nuts, washers : High strength bolts shall conform to IS:1367.
- 1701.3.4 **M.S. Sheets, Plates and supports** : Plates and support sections for the sign posts shall conform to IS:2062 or any other relevant IS Specifications
- 1701.3.5 **Reflectorised Paint** : Reflectorised paint shall conform to IS:5 or the manufacturer's specifications in case of proprietary product and as approved by the Engineer.
- 1701.3.6 Non reflectorised paint : Non-reflectorised paint shall conform to IS:164 and as approved by the Engineer.
- 1701.3.7 **Engineering grade sheeting** : The sheeting shall be enclosed lens type consisting of microscopic lens elements embedded beneath the surface of a smooth, flexible, transparent, water-proof plastic resulting in a non-exposed lens optical reflecting system. The retro-reflective surface after cleaning with soap and water and in dry condition shall have the minimum coefficient of retro-reflection (determined in accordance with ASTM Standard) as indicated in Table 17001
- When totally wet, the sheeting shall not show less than 90 per cent of the values of retro-reflection indicated in Table 17001. At the end of 5 years, the sheeting shall retain at least 50 per cent of its original retroreflectance.

**TABLE ACCEPTABLE MINIMUM COEFFICIENT OF RETRO REFLECTION FOR
17001 ENGINEERING GRADE SHEETING (CANDEL AS PER LUX PER SQUARE METRE**

Observation Angle in Degree	Entrance Angle in degree	White	Yellow	Orange	Green	Red	Blue
0.2	4	70	50	25	9.0	14.5	4.0
0.2	+30	30	22	7.0	3.5	6.0	1.7
0.5	-.4	30	25	13.5	4.5	7.5	2.0
0.5	+30	15	13	4.0	2.2	3.0	0.8

1701.3.8 Signs with a maximum side dimension not exceeding 600 mm shall not be less than 1.5 mm thick. All others shall be at least 2 mm thick. The thickness of the sheet shall be related to the size of the sign board and its support and shall be such that it does not bend or deform under the prevailing wind and other loads

1701.3.9 In respect of sign sizes not covered by IRC:67, the structural details (thickness, etc) shall be as per the approved drawings.

1701.4 **INSTALLATION.**

Sign posts, their foundations and sign mountings shall be so constructed as to hold these in a proper and permanent position against the normal storm wind loads or displacement by vandalism. Normally signs with an area upto 0.9 Sqm. can be mounted on a single post and for greater area two or more supports shall be provided. Sign supports may be of mild steel, reinforced concrete or Galvanised iron (G.I.) posts and should be firmly fixed to the ground by means of properly designed foundation. The work of foundation shall conform to relevant Specifications as specified.

1701.4.2 All components of signs and supports, other than the reflective portion and G.I. posts shall be thoroughly de-scaled, cleaned primed and painted with two coats of epoxy paint. Any part of mild steel (M.S.) post below ground shall be painted with three coats of red lead paint.

1701.4.3 The signs shall be fixed to the posts by welding in the case of steel and by bolts and washers of suitable size in the case of reinforced concrete or G.I. posts. After the nuts have been tightened, the tails of the bolts shall be furred over with a hammer to prevent removal

1701.4.4 Mild steel sheets of sign boards shall be stove enameled on both sides infurnance at required temperature, the lettering, borders shall be painted with ready mix synthetic enamel paint of superior quality in required shade and colour as specified

1705.5 **MEASUREMENTS FOR PAYMENT**

The measurement of standard cautionary, mandatory and facility information signs shall be in numbers of different types of sign supplied and fixed, while for direction and place identification signs, these shall be measured by area in square metres.

1701.6 **RATE**

The contract unit rate shall be payment in full for the cost of making the road sign including all materials and installing it at the site and incidentals to complete the work to the specifications

ITEM No. Citizen's Information board - Providing and Fixing of Typical **M.M.G.S.Y.**

- [18] information board as per instruction . Two MS plate of 1.60 mm thick of 900 mm x 750 mm size fixed at top & Bottom duly Welded with M.S. angles of 25 x 25 x 5 mm thick plate shall be welded by two Vertical M.S. Flats & Four horizontal M.S. Flats 5 mm thick to 75 mm x 75 mm of 12 SWG square tubes posts duly embedded in Cement Concrete M - 15 grade blocks of 600mm x 600mm x 75mm below Ground level. Painting New Letters & Figure of any shade with ready mixed synthetic enamel paint of Superior quality in required shade and colour. All Sections of Framed Posts and Steel tube will be painted with Primer and Two Coats of Epoxy Paints as Per Drawing Clause 1701 and Annexure 1700.1 (10.16)

The work shall be carried out as per relevant specification of this Tender Item No. - 17. The contract unit rate includes the Cost of A C P Sheet and All required Material shall be as Per IRC : 67- 2012 . **With A warranty for 7 years for the Retro reflective sheeting from original manufacturer & a certified copy of 3 year outdoor exposure test report from third party test lab for the product offered shall be submitted by contractor. (B) Class-B Type-4 Retro Reflective sheeting**

Measurement shall be per **Number** of sign Board Fixed.

ITEM No. Village Name Sign :-Providing and fixing sign boards made out of 2mm

- [19] aluminium sheet / 4mm ACP (Aluminum composite Panel); size 90x60 cms. rectangular as per design of IRC-67-2012. Pre treated with phosphating process & acid etching; coated with one coat of epoxy primer and two coats of best quality epoxy paint ; reflectorised with High Intensity Prismatic Grade retro reflective sheeting of Type-4 as per ASTM D-4956 and latest M.O.S.T. Specifications; 3.3mtr long stand post of Iron Angle 75 x 75 x 6mm / 65NB Circular MS Pipe as required and frame fabricated from suitable size iron angle of 35 x 35 x 3mm; painted with best quality epoxy coatings in black and white bends. the details of symbol or inscription / numerals for each board shall be as per the instruction of engineer in charge. The fixing at site shall be in 1:2:4 CC block of size 45 x 45 x 60 Cms. for each leg including excavation, curing etc. complete under the supervision of engineer in charge. (A) Engineer Grade (V. R.)

The work shall be carried out as per relevant specification of this Tender Item No. - 17. The contract unit rate includes the Cost of A C P Sheet and All required Material Shall be as Per IRC : 67- 2012 . **With A warranty for 7 years for the Retro reflective sheeting from original manufacturer & a certified copy of 3 year outdoor exposure test report from third party test lab for the product offered shall be submitted by contractor. (B) Class-B Type-4 Retro Reflective sheeting**

Measurement shall be per **Number** of sign Board Fixed.

ITEM No. [20] Direction (Junction) Sign :- Providing and fixing sign boards made out of 2mm aluminium sheet / 4mm ACP (Aluminum composite Panel); size 244x122 cms. rectangular as per design of IRC-67-2012. Pre treated with phosphating process & acid etching; coated with one coat of epoxy primer and two coats of best quality epoxy paint ; reflectorised with High Intensity Prismatic Grade retro reflectivesheeting of Type-4 as per ASTM D-4956 and latest M.O.S.T.Specifications; 4.0mtr (2 Nos.) long stand post of Iron Angle 75 x 75 x 6mm / 65NB Circular MS Pipe as required and frame fabricated from suitable size iron angle of 50x50x5mm; painted with bestquality epoxy coatings in black and white bends. The details of symbol for each board shall be as per the instruction of engineer in charge. The fixing at site shall be in 1:2:4 CC blockof size 45 x 45 x 60 Cms. for each leg including excavation, curing etc.complete under the supervision of engineer in charge.

The work shall be carried out as per relevant specification of this Tender Item No. - 17. The contract unit rate includes the Cost of A C P Sheet and All required Material Shall be as Per IRC : 67- 2012 . **With A warranty for 7 years for the Retro reflective sheeting from original manufacturer & a certified copy of 3 year outdoor exposure test report from third party test lab for the product offered shall be submitted by contractor. (B) Class-B Type-4 Retro Reflective sheeting**

Measurement shall be per **Number** of sign Board Fixed.

ITEM No. **Cautionary Warning Sign** :-Providing and fixing sign boards made out of
[21] 2mm aluminium sheet / 4mm ACP (Aluminum composite Panel); size 90 x 90 cms. equilateral triangle as per design of IRC-67-2012. Pre treated with phosphating process & acid etching; coated with one coat of epoxy primer and two coats of best quality epoxy paint ; reflectorised with High Intensity Prismatic Grade retro reflectivesheeting of Type-4 as per ASTM D-4956 and latest M.O.S.T.Specifications; 3.6mtr long stand post of Iron Angle 75 x 75 x 6mm / 65NB Circular MS Pipe as required and frame fabricated from suitable size iron angle of 35 x 35 x 3mm; painted with bestquality epoxy coatings in black and white bends. The details of symbol for each board shall be as per the instruction of engineer in charge. The fixing at site shall be in 1:2:4 CC blockof size 45 x 45 x 60 Cms. for each leg including excavation, curing etc.complete under the supervision of engineer in charge. Engineer Grade (V. R.)

The work shall be carried out as per relevant specification of this Tender Item No. - 17. The contract unit rate includes the Cost of A C P Sheet and All required Material Shall be as Per IRC : 67- 2012 . **With A warranty for 7 years for the Retro reflective sheeting from original manufacturer & a certified copy of 3 year outdoor exposure test report from third party test lab for the product offered shall be submitted by contractor. (B) Class-B Type-4 Retro Reflective sheeting**

Measurement shall be per **Number** of sign Board Fixed.

ITEM No. **Distance Informatory / Destination Sign** :-Providing and fixing sign
[22] boards made out of 2mm aluminium sheet / 4mm ACP (Aluminum composite Panel); size 180x120 cms. rectangular as per design of IRC-67-2012. Pre treated with phosphating process & acid etching; coated with one coat of epoxy primer and two coats of best quality epoxy paint ; reflectorised with High Intensity Prismatic Grade retro reflectivesheeting of Type-4 as per ASTM D-4956 and latest M.O.S.T.Specifications; 4.0mtr (2 Nos.) long stand post of Iron Angle 75 x 75 x 6mm / 65NB Circular MS Pipe as required and frame fabricated from suitable size iron angle of 50 x 50 x 5mm; painted with bestquality epoxy coatings in black and white bends. The details of symbol for each board shall be as per the instruction of engineer in charge. The fixing at site shall be in 1:2:4 CC blockof size 45 x 45 x 60 Cms. for each leg including excavation, curing etc.complete under the supervision of engineer in charge. Engineer Grade (V. R.)

The work shall be carried out as per relevant specification of this Tender Item No. - 17. The contract unit rate includes the Cost of A C P Sheet and All required Material Shall be as Per IRC : 67- 2012 . **With A warranty for 7 years for the Retro reflective sheeting from original manufacturer & a certified copy of 3 year outdoor exposure test report from third party test lab for the product offered shall be submitted by contractor. (B) Class-B Type-4 Retro Reflective sheeting**

Measurement shall be per **Number** of sign Board Fixed.

ITEM No. **Hazard Marker Sign** :-Providing and fixing sign boards made out of [23] 1.5mm aluminium sheet / 3mm ACP (Aluminum composite Panel); size 90x30 cms. rectangular as per design of IRC-67-2012. Pre treated with phosphating process & acid etching; coated with one coat of epoxy primer and two coats of best quality epoxy paint ; reflectorised with High Intensity Prismatic Grade retro reflectivesheeting of Type-4 as per ASTM D-4956 and latest M.O.S.T.Specifications; 1.8mtr long stand post of Iron Angle 75 x 75 x 6mm / 65NB Circular MS Pipe as required and frame fabricated from suitable size iron angle of 35 x 35 x 3mm; painted with bestquality epoxy coatings in black and white bends. The details of symbol for each board shall be as per the instruction of engineer in charge. The fixing at site shall be in 1:2:4 CC blockof size 45 x 45 x 60 Cms. for each leg including excavation, curing etc.complete under the supervision of engineer in charge. Engineer Grade (V. R.)

The work shall be carried out as per relevant specification of this Tender Item No. - 17. The contract unit rate includes the Cost of A C P Sheet and All required Material Shall be as Per IRC : 67- 2012 . **With A warranty for 7 years for the Retro reflective sheeting from original manufacturer & a certified copy of 3 year outdoor exposure test report from third party test lab for the product offered shall be submitted by contractor. (B) Class-B Type-4 Retro Reflective sheeting**

Measurement shall be per **Number** of sign Board Fixed.

ITEM No. [24] Road marking with hot applied thermoplastic paints with reflectorising glass beads on bitumin surface providing and laying a hot applied thermoplastic compound 2.5 mm thick including reflectorising glass beads @ 250gms per sqm area, thickness of 2.5mm is excluding of surface applied glass beds as per IRC:35-2015. The finished surface to be level, uniform and free from streaks and holes. zebra patta /bump patta lane/center line/ edge line/cut patta. The white color marking should provide liminance coefficinet on cemend road shall be min 130 mcd/m2/lux and Asphalt road shall be min 100 mcd/m2/lux during the service life during the day time. The marking should meet the performance criteria for night time reflectivity, wet reflectivity and skid resistance as mentioned in the section-15 of IRC 35-2015. Warranty for the Retro reflectivity should be two years.

803.1. General

The color, width and layout of road markings shall be in accordance with the Code of Practice for Road Markings with paints, IRC : 35, and as specified in the drawings or as directed by the Engineer

803.2. Materials

Road markings shall be of ordinary road marking paint, hot applied thermo plastic compound, or reflectorised paint as specified in the item and the material shall meet the requirements as specified below

803.3. Ordinary Road Marking Paint

803.3.1. Ordinary paint used for road marking shall conform to. Grade I as per IS: 164

803.3.2. The road marking shall preferably be laid with appropriate road marking machinery

803.3.3. Laying thickness of road marking paint shall be as specified by the Engineer

803.4. HOT APPLIED THERMOPLASTIC ROAD MARKING

803.4.1. General:

- (I)** The work under this section consists of marking traffic stripes using a thermo plastic compound meeting the requirements specified here in
- (II)** The thermoplastic compound shall be screened /extruded on to the pavement surface in a molten state by suitable machine capable of controlled preparation and laying with surface application of glass beads at a specific rate. Upon cooling to ambient pavement temperature, it shall produce an adherent pavem pavement marking of specified thickness and width and capable of resisting deformation by traffic.

- (III) The color of the compound shall be white or yellow (IS color No. 356) as specified in the drawings or as directed by the Engineer
- (IV) Where the compound is to be applied to cement concrete pavement, a scaling primer is recommended by the manufacturer, shall be applied to the pavement in advance of placing of the stripes to ensure proper bonding of the compound. On new concrete surface any laitance and / or curing compound shall be removed before the markings are applied

803.4.2. Thermoplastic Material

803.4.2.1. General:

The thermoplastic material shall be homogeneously composed of aggregate pigment, resins and glass reflectorising beads

803.4.2.2. Requirements :

- (I) **Composition:** The pigment, beads, and aggregate shall be uniformly dispersed in the resin. The material shall be free from all skins, dirt and foreign objects and shall comply with requirements indicated in Table 800-3.

**TABLE 900-3 PROPORTIONS OF CONSTITUENTS OF MARKING MATERIAL
PERCENTAGE BY WEIGHT.**

Component	White	Yellow
Binder	18.0 Min	
Glass Beads	30-40	30-40
Titanium Diaoxide	10.0 Min.	....
Calcium Carboonate &	42.0 Max.	See.
Yellow Pigments	.....	Note

Note:

Amount of yellow pigment calcium carbonate and inert fillers shall be at the option of the manufacturer, provided all other requirements of this Specification are met.

Properties: The properties of thermoplastic material, when tested in accordance with ASTM D36/BS-3262- (Paint 1), shall be as below:

(a) Luminance:

White: Daylight luminance at 45 degrees-65 per cent min. as per AASHTO M 249

Yellow: Daylight luminance it 45 degien-45 per cent min. as per AASHTO M 249

- (b) **Drying time:** When applied at a temperature specified by the manufacturer and to the required thickness, the material shall set to been traffic in not mom than 15 minutes.
- © Skid resistance: not less than 45 as per BS 6044.
- (d) Cracking resistance at low temperature: The material shall show no cracks on application to concrete blocks.
- (e) Softening point: 102.5 + 9.50 C as per AASTM D 36.
- (f) Flow resistance: Not more than 25 per cent as per AASHTO M 249.

- (g) Yellowness Index (for white thermoplastic paint): not more than 0.12 as per AASHTO M 249
- (III) **Storage life:** The material shall meet the requirements of these Specifications for a period of one year. The thermoplastic material must also melt uniformly with no evidence of skins or un melted particles for the one year storage period. Any material not meeting the above requirements "I am replaced by the manufacturer/ supplier/Contractor.
- (iv) **Reflectorization:** Shall be achieved by incorporation of beads. The grading and other properties of the bonds shall be as specified in Clause 803.4.3.
- (V) **Marking:** Each container of the thermoplastic material shall be clearly and indelibly marked with the following information:
- 1 The name, trade mark or other means of identification of manufacturer.
 - 2 Batch number.
 - 3 Date of manufacture.
 - 4 Color (white or yellow)
 - 5 Maximum application temperature and maximum safe beating temperature.

(vi) Sampling and testing:

The thermoplastic material shall be sampled and tested in accordance with the appropriate ASTM/BS method. The Contractor shall furnish to the Employer a copy of certified test reports from the manufacturers of the thermoplastic material showing results of all tests specified herein and shall certify that the material meets all requirements of this Specification.

803.4.3. Reflectorising glass beads

803.4. 3.1. General: This Specification covers two types of glass beads to be used for the production of reflectorised pavement markings.

Type I beads -are those which are a constituent of the basic thermoplastic compound vide Table 800-3 and Type 2 beads are those which are to be sprayed on the surface vide Clause 803.6.3.

803.4.3.2. The glass beads shall be transparent, colour less and free from milkiness, dark particles and excessive air inclusions. These shall conform to the requirements spelt out in Clause 803.4.3.3.

A. Gradation: The glass beads shall meet the gradation requirements for the two types as given in

Table 800-4.

TABLE 800-4 GRADATION REQUIREMENTS FOR GLASS BEAD

Sieve Size Per cent retained	Type 1	Type 2
1.18 mm	0 To 3	.....
850 micron	5 to 20	0 to 5
600 micron	....	5 to 20
425 micron	65 to 95	.....
300 micron	....	30 to 75
180 micron	0 to 10	0 to 15
Below 180 micron	....

- B. **Roundness:** The glass beads shall have a minimum of 70 per cent true spheres.

- C. **Reflective index:** The glass beads shall have a minimum reflective index of 1.50.
- D. Free flowing properties: The glass beads shall be free of hard lumps and clusters and shall dispense readily under any conditions suitable for paint striping. They shall pass the free flow-test.

803.4.3.4. Test methods: The specific requirements shall be tested with the following methods:

(i) **Free-flow test:** Spread 100 grams of beads evenly in a 100 mm diameter glass dish. Place the dish in a 250 mm inside diameter desiccators which is filled within 25 mm of the top of a desiccator's plate with sulphuric acid water solution (specific gravity 1.10). Cover the desiccators and let it stand for 4 hours at 20 to 29 degree C. Remove sample from desiccators, transfer beads to a pan and inspect for lumps or clusters. Then pour beads into a clean, dry glass funnel having a 100 mm stem and 6 mm orifices, if necessary initiate flow by lightly tapping the funnel. The glass spheres shall be essentially free of lumps and clusters and shall flow freely through the funnel.

(ii) **The requirements of gradation,** roundness and refractive index of glass beads and the amount of glass beads in the compound shall be tested as per BS 6088 and BS 3262 (Part 1).

(iii) The Contractor shall furnish to the Employer a copy of certified test reports from the manufacturer of glass beads obtained from a reputed laboratory showing results of all tests specified herein and shall certify that the material meets all requirements of this Specification. However if so required these tests may be carried out as directed by the Engineer.

803.4.4. Application properties of thermoplastic material

803.4.4.1. The thermoplastic material shall readily get screened / extruded at temperatures specified by the manufacturers for respective method of application to produce a line of specified thickness which shall be continuous and uniform in shape having clear and sharp edges.

803.4.4.2. The material upon heating to application temperatures shall not exude fumes, which are toxic, obnoxious or injurious to persons or property

803.4.5. Preparation:

(i) The material shall be melted in accordance with the manufacturer's instructions in a heater fitted with a mechanical stirrer to give a smooth consistency to the thermoplastic material to avoid local overheating. The temperature of the mass shall be within the range specified by the manufacturer, and shall on no account be allowed to exceed the maximum temperature stated by the manufacturer. The molten material should be used as

expeditiously as possible and for thermoplastic material which has natural binders or is otherwise sensitive to prolonged heating, the material shall not be maintained in a molten condition for more than 4 hours.

(ii) After transfer to the laying equipment, the material shall be maintained within the temperature range specified by the manufacturer for achieving the desired consistency for laying.

803.4.6. Properties of finished road marking

- (a) The stripe shall not be slippery when wet.
- (b) The marking shall not lift from the pavement in freezing weather.
- (c) After application and proper drying, the stripe shall show no appreciable deformation or discoloration under traffic and under road temperatures up to 60 degree centigrade
- (d) The marking shall not deteriorate by contact with sodium chloride, calcium chloride or oil drippings from traffic.
- (e) The stripe or marking shall maintain its original dimensions and position. Cold ductility of the material shall be such as to permit normal movement with the road surface without chopping or cracking.
- (f) The color of yellow marking shall conform to IS Color No. 356 as given in IS: 164.

803.5. Reflectorised Paint

Reflectorised paint, if used, shall conform to the Specification by the manufacturers and approved by the Engineer. Reflectorising glass beads for reflectorising paints where used shall conform to the requirement of Clause 803.4.3.

803.6. Application

803.6.1. Marking shall be done by machine. For locations where painting cannot be done by machine, For locations where painting cannot be done by machine, approved manual methods shall be used with prior approval of the Engineer. The Contractor shall maintain control over traffic while painting operations are in progress so as to cause minimum inconvenience to traffic compatible with protecting the workmen.

803.6.2. The thermoplastic material shall be applied hot either by screening or extrusion process. After transfer to the laying apparatus, the material shall be laid at a temperature within the range specified by the manufacturer for the particular method of laying being used. The paint shall be applied using a screed or extrusion machine.

803.6.3. The pavement temperature shall not be less than 10°C during application. All surfaces to be marked shall be thoroughly cleaned of all dust, dirt grease, oil and all other foreign matter before application of the paint. The material, when formed into traffic stripes, must be readily renewable by placing an overlay of new material directly over an old line of compatible material. Such new material shall so bond itself to the old line that no splitting or separation takes place.

Thermoplastic paint shall be applied in intermittent or continuous lines of uniform thickness of at least 2.5 mm unless specified otherwise. Where arrows or letters are to be provided, thermoplastic compound may be hand-sprayed. In addition to the beads included in the material, a further quantity of glass beads of Type 2, conforming to the above noted Specification shall be sprayed uniformly into a mono-layer on to the hot paint line in quick succession of the paint spraying operation. The glass beads shall be applied at the rate of 250 grams per square metre area.

803.6.4. The minimum thickness specified is exclusive of surface applied glass beads. The method of thickness measurement shall be in accordance with Appendices B and C of BS - 3262 (Part 3).

803.6.5. The finished lines shall be free from ruggedness on sides and ends and be parallel to the general alignment of the carriageway. The upper surface of the lines shall be level, uniform and free from streaks.

803.7. Measurements for Payment

803.7.1. The painted markings shall be measured in sq. meter of actual area marked (excluding the gaps, if any).

803.7.2. In respect of markings like directional arrows and lettering, etc., the measurement shall be by numbers.

803.8. Rate: The Contract unit rate for road markings shall be payment in full compensation for The Contract unit rate for road markings shall be payment in full compensation for furnishing a labour, materials, tools, equipment, including all incidental costs necessary for carrying out the work at the site conforming to these Specifications complete as per the approved drawing(s) or as directed by the Engineer and all other incidental costs necessary to complete the work to these Specifications.

ITEM No. Cat Eye / Road Stud / RPM: Supplying Raised Pavement Markers made of [25] polycarbonate and ABS moulded body and reflective panels with Micro prismatic lens (No Glass bead lens) capable of providing total internal reflection of the light entering the lens face and shall support a load of 13635 kgs. tested in accordance to ASTM D 4280 Type H and complying to Specifications of Category A of MORTH Circular No RW/NH/33023/ 10-97 & DO III Dt 11.06. 1997.

General requirements: The retro-reflective sheeting used on the sign shall consist of the white or coloured sheeting having a smooth outer surface which has the property of retro-reflection over its entire surface. It shall be weather-resistant and show colour fastness. It shall be new and unused & shall show no evidence of cracking, scaling, and pitting, blistering, edge lifting or curling and shall have negligible shrinkage or expansion. A certificate of having tested the sheeting for these properties in an unprotected outdoor exposure facing the sun for two years and its having passed these tests shall be obtained from a reputed laboratory, by the manufacturer of the sheeting. The reflective sheeting shall be either of Engineering Grade material with enclosed lens or of High Intensity Grade with encapsulated lens. The type of the sheeting to be used would depend upon the type, functional hierarchy and importance of the road

The Unit Rate For Payment Shall be Per **Number**.

ITEM No. Type - A, "W" : Metal Beam Crash Barrier (Providing and erecting a "W" [26] metal beam crash barrier comprising of 3 mm thick corrugated sheet metal beam rail, 70 cm above road/ground level, fixed on ISMC series channel vertical post, 150 x 75 x 5 mm spaced 2 m centre to centre, 1.8 m high, 1.1 m below ground/road level, all steel parts and fittings to be galvanised by hot dip process, all fittings to conform to IS:1367 and IS:1364, metal beam rail to be fixed on the vertical post with a spacer of channel section 150 x 75 x 5 mm, 330 mm long complete as per clause 811)

1404.3.1 General.

- a. Bridge railing/crash barrier includes the portion of the structure erected on and above the kerb for the protection of pedestrians and traffic.
- b. Railing/crash barriers shall not be constructed until the centering falsework for the span has been released and the span is selfsupporting. For concrete with steel reinforcement, specifications of the items of controlled concrete and reinforcement mentioned under relevant sections of this specifications shall be applicable.

- c. The type of railing/crash barrier shall be carefully erected true to line and grade. Posts shall be vertical with a tolerance not to exceeding 6 mm in 3 m. The pockets left for posts shall be filled up with nonshrinkable mortar.
- d. The type of railing/crash barrier to be constructed shall be as shown on the drawings and shall conform to **IRC: 5 and IRC: 6**.
- e. Care shall be exercised in assembling expansion joints in the railing/crash barriers to ensure that they function properly.
- f. The bridge railing/crash barriers shall be amenable to quick repairs.
- g. Railing/crash barrier materials, particularly metal railing/crash barriers shall be handled and stored with care, so that the material and parts are kept clean and free from damage. Railing/crash barrier materials shall be stored above the ground on platforms, skids, or other supports and kept free from grease, dirt and other contaminants.

Any material which is lost, stolen or damaged after delivery shall be replaced or repaired by the Contractor. Methods of repair shall not damage the material or protective coating.

1404.3.2 Metal Railing/crash barriers

All complete steel rail elements, pipe terminal sections, posts, bolts, nuts, hardware and other steel fittings shall be galvanised or painted with an approved paint

If galvanised, all elements of the railing/crash barrier shall be free from abrasions, rough or sharp edges, and shall not be kinked, twisted or bent. If straightening is necessary, it shall be done by methods approved by the Engineer.

Damaged galvanised surfaces, edges of holes and ends of steel railing/crash barrier cut after galvanising shall be cleaned and re-galvanised.

The railing/crash barrier shall be carefully adjusted prior to fixing in place to ensure proper matching at abutting joints and correct alignment and camber throughout their length. Holes for field connections shall be drilled with the railing/crash barrier in place in the structure at proper grade and alignment.

Unless otherwise specified on the drawings, metal railing/crash barrier shall be given one shop coat of paint and three coats of paint after erection if sections are not galvanised.

Railing/crash barriers shall not follow any irregularity in the alignment of the deck. When shown on the drawings, the rail elements shall be curved before erection.

ITEM No [27] Excavation for foundation in sand gravel, clay, soft soils & murrum etc. including shoring strutting and dewatering as necessary and disposing of the excavated stuff as directed. (A) Depth upto 3.0 M.

- 1 Excavation for structures shall consist of the removal of materials for the construction of foundations for bridges, culverts, retaining walls, headwalls, cut off. walls, pipe culverts and other similar structures, in accordance with the requirements, of these specifications and the lines and dimensions shown on the drawings or as indicated by the Engineer-in-charge. The work shall include all necessary sheeting, shoring, bracing, draining and pumping and the removal of all logs, stumps, shrubs, and other deleterious matter and obstruction necessary for the foundations, trimming bottoms of excavations; back filling and clearing up the site and the disposal of all surplus materials.
- 2 After the site has been cleared the limits of excavations shall be set out true to lines, curves, slopes, grades and sections as shown on the drawings or as directed by the Engineer-in-charge. The contractor shall provide all labour, survey instruments and materials such as stirrings, pegs, nails, bamboos, stones, lime, mortar, concrete etc. required in connection with the setting out of works.

and the establishment of bench mark, centre line stones and other marks and stakes as long as in the opinion of the Engineer-in-charge, they are required for the work

- 3 Excavation shall be taken to the width of the 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 personal 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 materials 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, rain or other reasons, the contractor shall take adequate measure such as bailing pumping, to keep the foundation trenches dry when so required and to protect the green concrete/ masonry against damage by erosion or sudden rising of water level. The methods to be adopted in this regard and, other details thereof shall be left to the choice of the contractor but subject to 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 production arrangements and for the quality and safety of the works.
- 6 Pumping from the interior of any foundation enclosure shall be done in such a manner as to preclude
- 7 The bottom of the foundation shall be levelled 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. To bring 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 take adequate protective measures to see that the excavation operations do not affect or damage adjoining structures.
- 9 Backfilling shall be done with approved materials after concrete or masonry is fully set and carried out in such a way as not to cause undue 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 materials is to be used in the construction of embankment, it shall be directly deposited at the required location within 100 metres lead

- 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 100 metres lead. Unsuitable and surplus materials not intended for use 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 materials encountered, limited to the dimensions shown on the drawing or as directed by the Engineer-in-charge. Excavation over increased width cutting of slopes, shoring, shuttering 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 of excavation for structures shall be paid in full for carrying out the required operations-including :-
 - i. Settings out and fixing bench marks and centre lines stones
 - ii. Construction of necessary shoring and bracing and their subsequent removal.
 - iii. Removal of all logs, stumps, Grubs, and other deleterious, matter and obstructions for placing the foundations including trimming of bottoms of excavations
 - iv. Foundation sealing, dewatering including pumping
 - v. Backfilling, Clearing up the site and disposal of all surplus materials Within all lifts and lead upto 100 metres
 - vi. All labour, materials tools equipment, safeguards and incidentals necessary to complete the work to the specification
- 14 Excavation shall be for ordinary soil such as vegetation or organic soil, turf, sand, silt, loam, clay, mud, black cotton soil, soft shale or soft murrum, a mixture of these and similar materials which yields to the ordinary application of pick and shovel, or other ordinary -digging equipment. Removal of gravel or any other nodular material having in any one direction. exceeding 75 mm. occurring in such strata shall be deemed to be covered under this category. The classification of excavation shall be decided by the Engineer-in-charge and his decision shall be final and binding on the contractor

ITEM No [28] Excavation in large boulders and soft rock by wedging including shorting strutting and dewatering as necessary and disposing of the excavated stuff as directed.

1 to 13. Para 1 to 13 of the item No. 26 of excavation for foundation in all sorts of soil shall apply.

- 14 Excavation shall be in hard soil such as stiff heavy clay, hard shale or compact murrum conglomerate or other soft or disintergrated rock which may be quarried or spilt with crow bars, boulders which do not require blasting having diameter in any direction of more than 300mm. and any rock which in dry state may be hard, requiring blasting but which when wet become soft and manageable by means other than blasting. The classification of excavation shall be decided by the Engineer-in-charge and his decision shall be final and binding on the contractor

ITEM No [29] Excavation in hard rock by dry wet blasting & chiesel-ling inclu.dewatering, preparing foundation base by proper benching and stepping and disposing of the excava ted stuff as directed. (A) Required Blasting

1 to 13. Para 1 to 13 of the **item No.27.** of excavation for foundation in all sorts of soil shall apply.

- 14 Excavation shall be in any rock or boulders having diameter in any one direction of more than 300 mm. for which the use of mechanical plant or blasting is required. The classification of excavation shall be decided by the Engineer-in-charge and his decision shall be final and binding on the contractor. Merely the use of explosive in. excavation will not be considered as a reason for higher classification unless blasting is clearly necessary in the opinion of the Engineer-in-charge
- 15 Where blasting is prohibited for any reason, excavation shall be harried out by chiseling. wedding or any other approved method
- 16 Blasting shall be carried out only with the written permission of the Engineer-in-charge. All the statutory laws, regulations, rules etc. pertaining to the acquisition, transport, storage, handling and use of explosive shall be strictly followed

- 17 The contractor may adopt any method or methods of blasting consistent with the safety and job requirements, after approval from the Engineer-in-charge
- 18 The magazine for the storage of explosives shall be built to the design and specifications of the Explosives Department concerned and located at the approved site. No unauthorized person shall be admitted into the magazine which when not in use shall be kept securely locked. No matches or inflammable materials shall be allowed in the magazine. The magazine shall have an effective lightning conductor. The following shall be hung in the lobby of magazine
- (a) A copy of the relevant rules regarding safe storage both in English and in the language with which the workers concerned are familiar
 - (b) A statement of up-to-date stock in the magazine
 - (c) A certificate showing the last date of testing of the lightning conductor
 - (d) A notice that smoking is strictly prohibited
- 19 In addition to these, the contractor shall also observe the following instructions and any further additional instructions which may be given by the Engineer-in-charge and shall be responsible for damage to property and any accident which may occur to workmen or the public on account of any operations connected with the storage, handling or use of explosive and blasting. The Engineer-in-charge shall frequently check the contractor's compliance with these precautions
- 20 All the materials, tools and equipment used for blasting operations shall be approved type. The Engineer-in-charge may specify the types of explosive to be allowed in special cases. The fuse to be used in wet locations shall be sufficiently water-resistant as to be unaffected when immersed in water for 30 minutes. The rate of burning of the fuse shall be uniform and definitely known to permit such a safe length being cut as will permit sufficient time to time for the firer to reach to place of safety before explosion takes place. Detonators shall be capable of giving effective blasting of the explosives. Detonators shall be capable of giving effective blasting of the explosives. The blasting powder, explosive detonators, fuses, etc., shall be fresh and not damaged due to damp, moisture or, any other cause. They shall be inspected totally and removed immediately, if found unsuitable.
- 21 The blasting operation shall remain in charge of competent and experienced supervisory staff and workmen who are thoroughly acquainted with the details of handling explosives and blasting operations
- 22 The blasting shall be carried out during fixed hours of the day preferably during the mid-day luncheon hour or at the close of the work as ordered in writing by the Engineer-in-charge. The hours shall be made known to the people in the vicinity. All the charges shall be prepared by the man in charge only.

- 23 Red danger flags - shall be displayed permanently in all directions during the blasting operations,- People, except those who actually light the fuse, shall be prohibited from entering this area. The flags shall be planted 200 meters from the blasting site in all directions and all persons including- workmen shall be excluded from the flagged area at least 10 minutes before the firing. a warning whistle being sounded for the purpose.
- 24 The charge holes shall be drilled in suitable places. to required depths. Blasting should be as light as possible consistent with thorough breakage of the materials necessary for economic loading and hauling. Any method of blasting which leads to over-shooting shall be discontinued.
- 25 When blasting is done with powder, the fuse cut to the required length shall be inserted into the hole and the powder dropped in. The powder shall be gently tamped with copper rods with rounded ends. The explosive powder shall then be covered with tamping materials which shall be tamped light but firmly.
- 26 When blasting is done with dynamite and other high explosives, dynamite, cartridges shall be prepared by inserting the square cut end of a fuse into the detonator and finishing it with nippers at the open end, the detonator gently pushed into the primer leaving 1/3rd of copper tube exposed outside. The paper of the cartridge shall then be closed up and securely bound with wire, or twine. The primer shall be housed into the explosive. Bore holes shall be of such size that the cartridge can easily go down. The holes shall be cleared of all debris and explosive inserted. The space of

about 20 cm. above the charge shall then be gently filled with dry clay,, passed home & the rest of the tamping formed of any convenient materials gently packed with a wooden rammer.
- 27 At a time, not more than 10 such charges will be prepared and fired. The man in charge shall blow a whistle in a recognised manner or cautioning the people, All the people shall then be required to move to safe distance.

the charge shall be lighted by the man in charge only. the man in charge shall count the number of explosions. He shall satisfy himself that all the charges have been exploded before allowing the workmen to go back to the work site
- 28 In case of a misfire, the following procedure shall be observed
- i (1) Sufficient time shall be allowed to account for the delayed blast. The man in charge shall inspect all the charges and determine the missed charges
 - ii If it is blasting powder charge it shall be completely flooded with water. A new hole shall be drilled at about 45 cm. from the old hole and fired. This should be repeated till the old charge is blasted
 - iii In case of charges of gelatine, dynamite etc., the man in charge shall gently remove the tamping and the primer with the detonator. A fresh detonator and primer shall then be used to blast the charge

Alternatively, the hole may be cleared of 30 cm. of tamping and the direction then ascertained by placing a stick in the hold. Another hole may then be drilled 15 cm. away and parallel to it. This hole shall then be charged and fired when the misfired hole should explode at the same time. The man in charge shall at once report to the contractors Officer and Engineer-in-charge all cases of misfire, the cause of the same and what steps were taken in connection therewith

29 If a misfire has been found to be due to defective. detonator or dynamite, the whole quantity in the box from which defective article was taken must, be sent to the authority directed by the Engineer-in-charge for inspection to ascertain whether all the remaining materials in the box are also defective

30 A careful and day to day account of the explosive shall be maintained by the contractor in an approved manner in a register which shall be open to inspection by the Engineer-in-charge. at all times

31 Excavation shall be measured after removal of over burden by taking cross-sections at suitable intervals in the original position before the work starts and after its completion and computing the volumes in cubic metres by the method of average and areas. Where it is not feasible to compute volumes by this method because of erratic location of isolated deposits; the volumes shall be computed by other accepted methods.

At the option of the Engineer-in-charge, the contractor shall leave depth indicators during excavations of such shape and size, and in such positions as directed so as to indicate the original ground level as

accurately as possible. The contractor shall see that these remain intact till the final measurements are taken. Where cross-sectional measurements, could not be taken due to irregular configuration, or where the rock is admixed with other classes of material, the volumes shall be computed on the basis of stacks of excavated rubble after making 40 per cent deduction therefrom

**ITEM No. Diversion of water course / providing cofferdam & bund or island as may
[30] be necessary for foundation and maintaining the same for the period as
&[31] may be necessary (A) Diversion By Channel. Abutment Right incl. Wing
Wall & Return**

1 The item provides for the diversion of water course by suitable means such as by constructing ring bunds, coffer-dams, channeling, islanding or any other suitable means as may be necessary and approved by Engineer-in-charge. This item will not include dewatering of foundations, trenches, which will be covered in the item of open excavation. The contractor shall take all necessary protective measures against possible erosion due to tide variations if

any and maintain the coffer dams, bund or island in proper manner during construction,

He shall not be entitled for any payment or compensation in the event of washing of the cofferdam, bund or island at any time, either due to tidal waters if any or floods, or any other reasons whatsoever, and the contractor shall reconstruct the same. If required at his risk and cost. The size of the coffer dam, bund or island shall be such as would allow without obstruction and inconvenience enough working free space all around the foundation works.

- 2 The contractor shall plan, construct and maintain satisfactorily necessary diversion channels and protective works so as to safely pass the stream flow and also satisfactorily meet with any sudden rise of flow due to tides, flood or any other reason, without damaging the foundation works. The coffer dam or bund shall be such as to give sufficient working space for construction, inspection and installations of pumping machinery inside the enclosed area. The coffer dam or bund shall be of adequate section and properly designed, constructed to prevent ingress of water as practically as possible in the foundation pits and to protect green concrete or masonry work
- 3 Adequate pumping arrangement shall be made for dewatering the inside of coffer dam, bunds etc. Pumps of adequate capacity and in required number shall be provided to ensure adequate pumping
- 4 The coffer dam, bund or island shall be completely removed and their materials shall be disposed of in the manner as directed by the Engineer-in-charge when no longer required
- 5 The measurements for paying will be per number of pier or abutment for which diversion of water course etc. is required to be made. Unit of abutment will be inclusive of returns or wingwalls attached to it
- 6 The unit cost includes all Materials labour and equipment to complete the job. Diversion of channels etc. will have to be constructed and maintained till all operations to complete the entire bridge structure are completed as may be necessary.

ITEM No [32] Providing & fixing mild steel dowel bars of minimum 32 mm dia. for anchoring by drilling holes in foundation strata including necessary bending, hooking of dowel bars and grouting the holes complete as per detailed drawing and as directed.

- 1 1. This Item Provides for necessary TMT steel Bars of 32 mm dia. For anchoring in foundations strata as per detailed drawing and as directed by engineer – in – charge. For this purpose 100 mm holes shall be kept in steining

itself at regular intervals as shown in drawing or as directed by Engineer - in - charge. TMT bar shall be brought by Contractor him self at his own cost. . The Items includes transporting bars to the site of works. Handling , cutting , bending, hooking , and placing in the same position as required as per Drawing. The Grout hole should not be less than 100 mm dia. The anchorage length of bar shall not be less than 60 times dia. Of bar Grouting of grout hole shall be of proportion of 1:2 (1 Part of cement and 2 Part of sand) and shall be done under pressure As directed. These dowel bar shall be inserted through holes kept in the well steining to the bottom of the grout holes. Grout shall not be less than 1.00 mt. in depth. In case no dowel bars are ultimately decided to provided in the holes of steining kept for the purposes. The same shall be filled with the concrete of the same proportion as of well steining at the cost of the contractor.

- 2 Mode of Measurement will be per **Running Meter** of dowel bars considered as one of number from bottom of grout hole to the top of steining.
- 3 Unit Rate includes cost of Material , labour , tools and plants and grouting the steining holes to complete the work.

ITEM No. Providing & Filling in foundation with ordinary Cement Concrete M- 150 [33] mix & Providing necessary Vertical Pin & headers incl form work vibrating ramming and curing etc. complete

- 1 In case of ordinary concrete, mix is not required to be designed by preliminary tests and proportions of cement, fine aggregate and coarse aggregate are specified by column as given in tables below for different grades of concrete designated 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 150 mm cubes, expressed in Kg /cm²
- 3 The ordinary concrete mix shall generally be specified by volume shall be worked out taking 50 Kg of cement as 0.035 cubic meter 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 – II)
- 4 Ingredient required for ordinary concrete containing one 50 Kg bag of cement of different proportions of mix shall be as given in table below.

Grade of Concrete	Mix by volume	Total quantity of dry aggregate by volume per 50 kg of cement to be taken as sum of the individual volumes of fine and coarse aggt max	Proportion of fine aggt. to coarse aggregate	Quantity of water per 50 Kg of cement mix
1	2	3	4	5
(1 Cubic metre = 1000 Litres)				
Ordinary	Liter		General 1:2 for fine aggregate to coarse aggregate by volume but subject to a upper limit 1:1 ½ & a lower limit of 1:3	
M – 100	1:3:6	300		34
M – 150	1:2:4	20		32
M – 200	1:1 ½ :3	160		30
M – 250	1:1:2	100		27

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

Example :- For an average grading of line aggregate (that is zone II of IS : 383 – 1963) the proportions shall be 1:1, 1:2 and 1:3 for maximum size of aggregates 0 mm 20 mm and 40 mm respectively (after carrying out sieve analysis.

Note 2 :- A mix leaner than M – 100 (1:3:6) may be used for non structural parts, if provided in the contract. in such case grading of aggregate shall be by volume . other requirement for mixing, placing and 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
(i)	RCC well curb, RCC well steining and RCC piles	40 mm
(ii)	RCC well seining	63 mm
(iii)	Well cap or pile cap, solid type	40 mm
(iv)	RCC work in cross girders deck slab, wearing coars, kerb, light	20 mm
	light ports, blast walls, approach slab etc and hollow type piers, abutment wings wall and their pier caps	
(v)	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

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 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 substance. 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 materials which has deteriorated or has been damaged or is other wise 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 dry and water tight sheds. Wherever bulk storage containers are used, their capacity should be sufficient to cater to the requirement at sit and should be cleaned at least once every 3 to 4 months. The aggregate shall be stored in such a was as to prevent admixture of foreign materials. Different size of fine or coarse 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 other to prevent iner mixing the materials.
- 9 The water for mixing shall be potable water to satisfaction of the engineer in charges. 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 out the construction .

Mixing shall be continued till materials are uniformly distributed and uniform colour of the entire mass is obtained and each individual particle of the coarse aggregate show complete coating mortar containing its proportionate amount of cement in no case shall the mixing the done for less than 2 minutes after all ingredients have been put in to the mixer

- 11 When hand mixing is permitted by the Engineer in charge for small jobs or for certain other reasons. It shall be on a smooth water tight platform large enough to allow efficient turning over of the ingredients of concrete before and after adding water. Mixing platform shall be so arranged that no foreign, materials shall get mixed with concrete not does the mixing water flow out. Cement in

required number of bags shall be placed in a uniform layer on top of the measured quantity of fine and coarse aggregate. which shall also be spread in a layer of uniform thickness on the mixing platform. Dry coarse and fine aggregate and cement shall then be mixed thoroughly by turning over to get a mixture of uniform colour. Enough water shall then be added gradually through a rose can and the mass turned over till a mix of required consistency is obtained. In hand mixing quantity of cement shall be increase by 10 percent 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

- 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 places. All from 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 being given, It shall have to be obtained again from the Engineer- in – charge .Concreting being given it shall proceed continuously over the area between construction joins . Fresh concrete shall not be placed against concrete which has been in position for more than 30 minutes unless a proper construction joint is formed . Concrete shall be compacted in its final position within 30 minutes of its

discharge from the mixer unless carried in properly design agitators, operating continuously. When this time shall be within 2 hours of the additional of cement to the mix and within 30 minutes of its discharge from the agitator. Except where otherwise depth of not more than 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 in to place from a height exceeding 2 metres. When trunking of 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 shall be freshly mixed and placed immediately before placing of new concrete. Where concrete has not fully hardened, all laitance shall be removed by scrubbing the well surface with wire

or bristly brushed, care being taken to avoid dislodgement of any particles of coarse aggregate. The surface shall then be thoroughly wetted, all free water removed and then coated with neat cement grout. The first layer of concrete to be placed on this surface shall not exceed 150 mm in thickness, and shall be well rammed against old work particular attention being given to comers 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 to that spare equipment is always available in the event of break downs

- 17 Immediately after compaction, concrete shall be protected against harmful

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

- 18 The water for mixing shall be potable water to satisfaction of the engineer in charges. The quantity of water shall be just sufficient to produce a dense concrete of required workability for the job.
 - (a) Shuttering i.e., form work required for forming the concrete
 - (b) Scaffolding i.e., form work required for supporting shuttering. Forms for shuttering shall be constructed only in metal suitably lined. Forms for scaffolding shall be constructed of metal or timber. Both shuttering and scaffolding shall be of substantial rigid construction and shuttering shall be true to shape and dimensions shown on the drawings. All bolts and rivets shall be counter sunk and well ground to provide a smooth, plane surface
- 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 prescribe lines occurring during

and after placing the concrete. Screw jacks or hard wood wedges where required shall be provided to make up any settlement in the formwork either before or during the placing of concrete. Suitable camber shall be provided in horizontal members of structure, specially in long spans to counteract the effects of any fixed as to provide for such camber. Forms shall be so constructed as to be removable in sections in the desired sequence, without damaging the surface of concrete or disturbing other sections. Unless otherwise specified or directed, chamfers or fillets of sized 25mm x 25 mm shall be provided at all angles of formwork to avoid sharp corners.
- 20 The inside surfaces of shuttering shall, except in the case of permanent formwork or where otherwise agreed to by the Engineer in charge, be coated with an approved material to prevent adhesion of concrete to the formwork. Release agents shall be applied strictly in accordance with the manufacturer's instructions and shall not be allowed to come into contact with any reinforcement or pre stressing tendons and anchorages. Different release agents shall not be used in formwork for concrete which will be visible in the finished works
- 21 Special measurements shall be taken to ensure that the form work does not hinder the shrinkage of concrete because without these cracking could occur before the form work is removed. Wherever applicable arrangements must be made to ensure that the formwork does not restrain the shortening & hogging

of the beams or slabs during tensioning of the tendons.

The formwork 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 camber so as to ensure the correct final shape of the structures having regard to the deformation of a false work, scaffolding or propping and the instantaneous or deferred deformation due to various causes affecting pre stressed structures. Where there are re entrant angles in the concrete sections the formwork 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. Formwork 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 false work and forms as to their strength alignment and general fitness, but such inspection shall not relieve the contractor of his responsibility for safety of men, machinery, materials and for results obtained.

- 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 of 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 25mm. 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 removal of forms, all exposed bars or bolts passing through the Cement concrete member and used for shuttering or any other purpose

shall be cut inside the cement concrete member to a depth of atleast 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, honeycomb spots, broken edges or corners and other defects, shall be thoroughly cleaned, saturated with water and carefully pointed and rendered true with mortar of cement and fine aggregate mixed in the proportions used in the grade of concrete that is being finished and of as dry as consistency as is possible to use. Considerable pressure shall be applied in filling and pointing to ensure thorough filling in all voids. Surfaces which have been pointed shall be kept moist for a period of twenty four hours. If rock pockets/honeycombs, in the opinion of the Engineer in charge are of such an extent or character as to affect the strength to 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

Sr. No.	Type of Work	Slumps	
		Where	Where Vibrators
(i)	Mass concrete in R.C.C. foundations, footings and retaining walls.	10 mm to 25 mm	80 mm
(ii)	Beams, slabs and columns simply	25 mm to 40	100 mm to 120 mm
(iii)	Thin R.C.C. section or section with congested steel.	40 mm to 50 mm	125 mm to 150 mm

- 25 Work 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 is less than 15 cubic metre the minimum number of cubes can be reduced to 6 with the specific permission of the Engineer in charge

Similar works tests shall be carried out whenever the quality and grading of materials is charged irrespective of the quantity of concrete proud. The number of specimens may be suitably increased as deemed necessary by the Engineer in charge when procedure of tests given above reveal a poor quality of concrete and in other special cases

- 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 specific strength

- 27 R.C.C. work shall have exposed concrete surface. Centering design and its erection shall be approved by the Engineer in charge. One carpenter with helper will invariably be kept present through out 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 be 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 departmental person not below the rank of Asstt. Engineer / Addl. Asstt. Engineer, Overseer or as instructed by the Engineer in charge. After removal of form work check 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. 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 the 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 structure or its components as shown on the drawings and according to these specifications. The rate shall also include the cost of making / fixing and removing of all centres and forms required for the work

ITEM No. Providing and casting in situ ordinary cement concrete M.-200 mix and [34] Providing necessary pinheaders incl. Shuttering scaffolding laying vibrating curing and finishing complete. without v -Grooves (A) Ht from 0.0 M to 5.0 M.

The work shall be carried out as per relevant specification of this Tender Item No. - 33. The grade of concrete shall be **Ordinary C. C. M- 200**. The concreting shall be done as per detailed drawing. The contract unit rate includes centering, shuttering, scaffolding, wherever necessary laying,

vibrating, curing and finishing comp.

The contract rate shall be for a unit of **1.00 Cumt** for completed item

**ITEM No. Providing and casting in situ ordinary cement concrete M.-200 mix and
[35] Providing necessary pinheaders incl. Shuttering scaffolding laying
vibrating curing and finishing complete. without v -Grooves (A) Ht from
5.0 M to 10.0 M.**

The work shall be carried out as per relevant specification of this Tender Item No. - 33. The grade of concrete shall be **Ordinary C. C. M- 200**. The concreting shall be done as per detailed drawing. The contract unit rate includes centering, shuttering, scaffolding, wherever necessary laying, vibrating, curing and finishing comp.

The contract rate shall be for a unit of **1.00 Cumt** for completed item

**ITEM No Providing and Filling Sand around the Pipe and Between Head Walls in
[36] layers as directed**

Area around pipes shall be filled with **sand** immediately after the pipes have been laid and the joining material has hardened. The material shall be clean, free from boulders large roots, excessive amount of sods or other vegetable matter, and lumps and shall be approved by the Engineer-in charge. Filling up to 0.3 metre above the top of the pipe shall be carefully done and the soil thoroughly rammed, temped or vibrated in layers of not exceeding 150 mm. particular care being taken to thoroughly consolidate the materials under the launches of the pipe. Filling shall be carried out simultaneously on both sides of the pipes in such a manner that unequal pressures do not occur.

In case of high embankments after filling up to the top in the above said manner a loose fill of a depth equal to external diameter of the pipe shall be placed over the pipe before further layer are added and compacted. Materials shall be filled in pharas 3m x 1.5. m x 0.5 m size and shall be measured in Cu.M.

Unit rate includes cost of materials and spreading including labour and tools needed for the above operations.

Payment shall be paid on **Cum** basis.

ITEM No. Providing and Laying filter media 600 mm thick as directed at the back of Abutments and wing walls as per detailed Specification [37]

- 1 Well graded pebbled or metal of 40 mm to 63 mm. size shall be used. The grading and tolerances of metal of pebbles shall be as under:-

Sr. No.	No. of Size Range	Sieve designation	Percentage by weight passing through the
1	63 mm. to 40 mm	90 mm	100 - 000
		63 mm	85 - 100
		50 mm	35 - 70
		40 mm	00 - 15
		20 mm	00 - 05

The size shall be 40 mm. to 63 mm. where in tolerance limit for over size shall be upto 15% and that for lower size should be upto 15% and below 20 mm. it shall be allowable upto 5%. the filter Materials shall be tightly placed to a thickness of not less than 600 mm. and provided over the entire surface behind abutments, wings or return walls to the full height.

- 2 Materials shall be first stacked in boxes of 2 m. 1. 1/2 m. x 0.5 m. size on fairly level ground and measured
- 3 The measurement for payment shall be made on **Sq Mt.. basis** of boxes. No deduction shall be made for voids

ITEM No. Providing and Casting in situ Controlled Cement Concrete M - 250 mix for R.C.C. Works in Pier Cap abutment and dirt wall including controlled cement concrete M-300 bed block or pedestal of required size below bearing as per detailed drawing, centering scaffolding wherever necessary laying vibrating curing and finishing comp. [38]

The work shall be carried out as per relevant specification of this Tender Item No. - 33. The grade of concrete shall be **Controlled C. C. M- 250**. The concreting shall be done as per detailed drawing. The contract unit rate includes centering, shuttering, scaffolding, wherever necessary laying, vibrating, curing and finishing comp.

The contract rate shall be for a unit of **1.00 Cumt** for completed item

ITEM No. Providing & fixing in position Mild Steel Dowel Bar in pier Cap or [39] Abutments Caps for anchorage in free end as per detailed drawing incl. Cutting, bending and welding.

- 1 For Mild Steel Specification for Mild bar Reinforcement shall apply.
- 2 The mild Dowell bar shall be provided and anchored in pier caps, abutments caps and super structure as per detailed drawing for free end. G.I.pipe and other material such as mastic asphalt as directed by Engineer – in – charge
- 3 The payment shall be made as per **Number** of dowel bars in anchored condition.
- 4 Unit Rate shall include cost of al materials, labour and equipments to complete the job

ITEM No. Providing & fixing in position Mild Steel Dowel Bar in pier Cap or [40] abutments Caps for anchorage in Fix end as per detailed drawing including Cutting, bending & welding.

The work shall be carried out as per relevant specification of this Tender Item **No. - 38** The grade of Steel shall be Mild Steel. The contract unit rate includes cutting , Welding ,Fixing in position etc. complete. As per Detailed Drawing

The contract rate shall be for a unit of **1.00 Number** for completed item

ITEM No. Providing and Casting in situ Controlled Cement Concrete M. - 250 for [41] R.C.C. Solid slab inclu. centering scaffolding curing and finishing comp

The work shall be carried out as per relevant specification of this Tender Item No. - 33. The grade of concrete shall be **Controlled C. C. M- 250**. The

concreting shall be done as per detailed drawing. The contract unit rate includes centering, shuttering, scaffolding, wherever necessary laying, vibrating, curing and finishing comp.

The contract rate shall be for a unit of **1.00 Cumt** for completed item

ITEM No. Providing & casting in situ Controlled Cement Conc-rete M- 250 for
[42] average 75 mm thick wearing coat laid as directed incl.finishing curing
etc. complete and filling in joints with bitumen comp.

The work shall be carried out as per relevant specification of this Tender Item No. - 33. The grade of concrete shall be **Controlled C. C. M- 250**. The concreting shall be done as per detailed drawing. The contract unit rate includes centering, shuttering, scaffolding, wherever necessary laying, vibrating, curing and finishing comp.

The contract rate shall be for a unit of **1.00 Cumt** for completed item

ITEM Providing and casting in situ controlled cement concrete concrete M-250
[43] for approach slab including formwork curing and finishing complete.
(more than 10 ton)

The work shall be carried out as per relevant specification of this Tender Item No. - 33. The grade of concrete shall be **Controlled C. C. M- 250**. The concreting shall be done as per detailed drawing. The contract unit rate includes centering, shuttering, scaffolding, wherever necessary laying, vibrating, curing and finishing comp.

The contract rate shall be for a unit of **1.00 Cumt** for completed item

ITEM No. Providing and Laying weep holes in Abbutment and Returns by using
[44] A.C.Pipe of 100 mm dia. incl. Laying in proper grade and joining etc.
comp.as per detailed Specification.

- 1 Material for the water spout shall be as mentioned in the item [as per MORTH standard drawing](#) and shall be got approved from the Engineer-in-charge.
- 2 Water spout shall be 100 mm. internal dia. cast iron grating shall be provided at the entry and shall be fixed in the recess so as to be flush with the road surface. The quality and size of the grating shall be got approved from the Engineer-in-charge. The water spouts shall project at least 10 cm. outside the concrete and shall be rigidly fixed in it. The grating and P.V.C. pipes shall be painted with two coats of anticorrosive black bitumen paint.
- 3 Measurement shall be per [number](#) of water spout fixed.
- 4 Unit rate includes cost of all materials, labour & tools to complete the work.

ITEM No. Providing and fixing Marble Slab including Engraving & Painting [46] complete. Size 60 cm x 45 cm x 40 mm.

- 1 Marble plate shall be white and of approved quality and shall be of size as mentioned in the item. Lettering shall be done by V-shape engraving and shall be filled with black paint of approved quality, lettering shall be done as directed by the Engineer - in - Charge. The Marble plate shall be fixed in neat cement at a place as directed.
- 2 Measurement shall be per **number** of marble plate fixed.
- 3 Unit rates include cost of all material labour and tools to complete the work

ITEM No. Providing 12 mm thick pre-moulded asphalt filler Joints as per Drawing. [47]

- 1 Open joints shall be constructed at the locations as directed by the Engineer-in-

charge using a wood strip, metal plate, other suitable material which is subsequently removed. When removing the material, care shall be exercised to avoid chipping or breaking the corners of the concrete. The edge of the concrete at the joints shall be edge finished. Reinforcement shall not extend across an open joint.

- 2 When performed filler is to be provided the filler shall be placed in correct position before concrete is placed against the filler. The filler material shall form part of the joint and while concreting the slab, care shall be taken to prevent the former from being displaced. After the work is completed, the exposed face of the joint shall be cleaned of all loose material sticking to it.
- 3 The material used for filling expansion joint shall be bitumen impregnated felt which shall conform to the requirements of IS : 1838, and shall be got approved from the Engineer-in-charge
The joint shall consist of large pieces and assembly of small pieces to make up the required size shall be avoided.
- 4 The expansion joint shall be measured in running meters. Thickness of the expansion joint will be 20 to 25 mm. Width of the expansion joint shall be equal to full depth of the slab
- 5 The rate shall include the cost of all materials, labor, equipments and other incidental charges for fixing the joints complete in all respect as per these specifications and as shown on the drawings.

ITEM No. Providing C. I. 100mm diameter water spouts including necessary iron [48] gratings as per drawings.

- 1 Material for the water spout shall be as mentioned in the item **as per MORTH standard drawing** and shall be got approved from the Engineer-in-charge.
- 2 Water spout shall be 100 mm. internal dia. cast iron grating shall be provided at the entry and shall be fixed in the recess so as to be flush with the road surface. The quality and size of the grating shall be got approved from the Engineer-in-charge. The water spouts shall project at least 10 cm. outside the concrete and shall be rigidly fixed in it. The grating and P.V.C. pipes shall be painted with two coats of anticorrosive black bitumen paint.
- 3 Measurement shall be per **number** of water spout fixed.
- 4 Unit rate includes cost of all materials, labour and tools to complete the work.

ITEM No. [49] Providing and fixing sign board made out of 2 mm aluminium sheet size 90 x 90 cms. equilateral triangle as per design of I.R.C. 67-1977 preferred with phosphering process and acid etching, coated with one coat of epoxy primer and two coats of best quality epoxy paint, reflectorised with retro reflective sheeting as per latest M.O.S.T. Specification :3:1 m. long. Stand Post and frame fabricated from suitable size iron and angle of 35 x 35 x 3 mm, 75 x 75 x 6 mm required, painted with best quality epoxy coatings in black and white band. The details of symbol for each board shall be as per the instruction of engineer in charge. The fixing at site shall be in C.C.1:2:4 c.c. Block of size 45 x 45 x 60 cms. for each leg. incl. excavation, curing etc. complete under the supervision of engineer in charge. (A) Engineer Grade.

The work shall be carried out as per relevant specification of this Tender Item No. - 17. The contract unit rate includes the Cost of A C P Sheet and All required Material Shall be as Per IRC : 67- 2012 .

Measurement shall be per **Number** of sign Board Fixed.

ITEM No: [50] Dismantling the existing structure including removing & stacking the dismantled materials as and where directed. (A) R.C.C. Work...

- 1.0 This work shall consist of removing as hereinafter set forth, existing culverts, bridges, pavements, kerbs and other structures like guard-rails, fences utility poles, manholes, catch basins, inlets, etc. which are in place but interfere with the new construction or are not suitable to remain in place, and of salvaging and disposing of the resulting materials and back filling the resulting trenches and pits
- 2.0 Existing culverts, bridges, pavements and other structures which are within the highway and which are designated to be removed shall be removed up to the limits and extent specified in the drawings or as indicated by the Engineer-in-charge
- 3.0 Dismantling and removal operations shall be carried out with such equipment and in such a manner as to leave undisturbed, adjacent pavement, structures and any other work to be left in place.
- 4.0 All operations necessary for the removal of any existing which might endanger new construction shall be completed prior to the start of new work
- 5.0 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 nearby.

- 6.0 Unless otherwise specified, the superstructure position of culverts/bridges shall be entirely removed and other parts removed to below the ground level or as necessary depending upon the interference they cause to the new construction. Removed or overlying or adjacent material if required in connection with the dismantling of the structures, shall be incidental to this item.
- 7.0 Where existing culverts/bridges are to be extended or otherwise incorporated in the new work. Only such part of the existing structure shall be removed as per necessary to provide a proper connection to the new work. The connecting edges shall be cut, chipped and trimmed to the required lines and grades without weakening or damaging any part of the structure to be retained. Reinforcing bars which are to be left in place so as to project into new work as dowels or ties shall not be injured during removal of concrete.
- 8.0 Pipe culverts shall be carefully removed in such a manner to avoid damage to the pipes
- 9.0 Steel structures shall unless otherwise provided be carefully dismantled in such a manner as to avoid damage to members thereof. If specified in the drawing or directed by the Engineer-in-charge that structure is to be removed in a condition suitable for re-erection, all members shall be match marked by the contractor with white lead paint before dismantling end pins, nuts, loose plates etc shall be similarly marked to indicate their proper location, all pins, pin holes and machined surfaces shall be painted with a mixture of white lead and tallow and loose parts shall be securely wired to adjacent members or packed in boxes.
- 10.0 Timber structures shall be removed in such a manner as to avoid damage to such timber or lumber as is designated to be salvaged by the Engineer-in-charge
- 11.0 In removing pavements, kerbs, gutters and other structures like structures like guard rails, 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 existing joint or out and chipped to a true line with a face perpendicular to the surface of the existing strata. Sufficient removal shall be made to provide for proper grades and connections with the new work as directed by the Engineer-in-charge
- 12.0 All concrete pavements, base courses in carriage way and shoulders etc. designated for removal shall be broken to pieces whose volume shall not exceed 0.02 cubic metre and stockpiled at designated locations of the material is to be used later or otherwise arranged for disposal as directed
- 13.0 Where directed by the Engineer-in-charge holes and depressions caused by dismantling operation shall be backfilled with excavated or other approved material and thoroughly compacted in line with surrounding area.
- 14.0 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 material within the right-of-way as directed by the Engineer-in-charge, for which Contractor will remain responsible for its safe custody and preservation or 60 days after recording measurements of the salvaged material

- 15.0 Pipe culverts that are removed shall be cleared and neatly piled on the right of way at points designated by the Engineer-in-charge.
- 16.0 Structural steel removed from old structure shall, unless otherwise specified or directed, be stored in a neat and presentable manner. Structures or portions thereof which are specified in the contract for re-erections shall be stored in separate piles
- 17.0 Timber or lumber from old structure which is designated by the Engineer-in-charge as materials to be salvaged shall have all nails and bolts removed therefrom and shall be stored in neat pile locations suitable for loading
- 18.0 All the products of dismantling operations which in the opinion of the Engineer-in-charge cannot be used or auctioned shall be disposed as directed, within 100 metres
- 19.0 The work of dismantling structures shall be paid for in units indicated below by taking measurements before and after, as applicable

i	Dismantling brick/concrete (Plain and Reinforced) Masonry	Cubic Meter
ii	Dismantling flexible and cement concrete pavement	Cubic Meter
iii	Dismantling steel structure	Tonne.
iv	Dismantling timber structure	Cubic Meter
v	Dismantling pipes, guard rails, kerbs, gutters and fencing	Linear Meter
vi	Utility poles.	Nos.

- 20.0 The Contract unit rates for the various items of dismantling shall be payment in full for carrying out the required operations including full compensation for all labour, materials, tools, equipment, safeguards and incidentals necessary to complete the work. These will also include excavation and backfilling where necessary and for handling, salvaging, piling and disposing of the dismantled materials within all lifts and up to a lead of 100 metres.

ITEM No. Providing & Filling in foundation with ordinary Cement Concrete M- 100
[51] mix & Providing necessary Vertical Pin & headers incl form work
vibrating ramming and curing etc. complete

The work shall be carried out as per relevant specification of this Tender Item No. - 33. The grade of concrete shall be **Ordinary C. C. M - 100**. The concreting shall be done as per detailed drawing. The contract unit rate includes centering, shuttering, scaffolding, wherever necessary laying, vibrating, curing and finishing comp.

The contract rate shall be for a unit of **1.00 Cumt** for completed item

ITEM No. **Diversion sign board** :-Providing & Fixing sign boards made out of 2mm
[52] aluminium sheet, size 180 x 60 cms. rectangle as per the attached
drawing pre treated with phospheting process & acid etching.coated with

one coat of epoxy priemr & two coats of best quality epoxy paint reflectorised with retro reflective sheeting as per latest M.O.S.T.Specifications; Letters & numerals should be as per IRC-30-1968,3.1m long (2nos) stand post and frame fabricated from iron angle of 35 x 35x 3mm, 50x50x5mm painted with best quality epoxy coatings in blak and white bends.The fixing at site shall be in 1:2:4 CC block of size 45 x 45x 60cms for each leg, including excavation curing etc. complete under the supervision of engineer in charge.(A) Engineer Grade (VR)...

The work shall be carried out as per relevant specification of this Tender **Item No. - 17**. The contract unit rate includes the Cost of A C P Sheet and All required Matrial Shall be as Per IRC : 67- 2012

Measurement shall be per **Number** of sign Board Fixed.

ITEM No. Danger Plate Sign :-Providing & fixing sign board made out of 2mm [53] aluminium sheet, size 30cms diameter circle, pretreated with phospheting process & acid etching, painted with one coat of epoxy primer & two coats of best quality epoxy paint reflectorised with retro reflective sheeting as per latest M.O.S.T. specifica-tions (As per attached drawng) (A) Engineer Grade (VR)...

The work shall be carried out as per relevant specification of this Tender **Item No. - 17**. The contract unit rate includes the Cost of A C P Sheet and All required Matrial Shall be as Per IRC : 67- 2012

Measurement shall be per **Number** of sign Board Fixed.

ITEM No. STOP SIGN:- Providing and fixing sing boards made out of 2mm [54] aluminium sheet; size 90 x 90cms. rectangle as per the design of IRC-67-1977 pre treated with phospheting process & acid teching;coated with one coat of epoxy primer and two coats of best quality epoxy paint;

reflectorised with retro reflective sheeting as per latest M.O.S.T. Specifications; 3.1m long stand post & frame fabricated from suitable size iron angle of 35 x 35 x 3mm 75x75x6mm as required; painted with best quality epoxy coatings in black and white bends. the details of symbol for each board shall be as per the instruction of engineer in charge. The fixing at site shall be in 1:2:4 CC block of size 45 x 45 x 60cms. for each leg. incl. excavation curing tec. comp.under the supervision of engineer in charge.(A) Engineer Grade (VR).

The work shall be carried out as per relevant specification of this Tender **Item No. - 17**. The contract unit rate includes the Cost of A C P Sheet and All required Material Shall be as Per IRC : 67- 2012

Measurement shall be per **Number** of sign Board Fixed.

ITEM No. Chevron sign :-Providing & fixing sign boards made out of 1.5mm [55] aluminium sheet/3mm ACP (Aluminum composite Panel); size 60x50cm rectangular as per design of IRC-67-2012. Pre treated with phosphating process & acid etching;coated with one coat of epoxy primer and two coats of best quality epoxy paint ; reflectorised with High Intensity Prismatic Grade retro reflectivesheeting of Type-4 as per ASTM D-4956 and latest M.O.S.T. Specifications;3.3 mtr long stand post of Iron Angle 75 x 75 x 6mm / 65NB Circular MS Pipe as required & frame fabricated from suitable size iron angle of 35x35x3mm; painted with best quality epoxy coatings in black & white bends. the details of symbol or inscription / numerals for each board shall be as per the instruction of engineer in charge. The fixing at site shall be in 1:2:4 CC block of size 45 x 45 x 60 Cms.for each leg including excavation,curing etc. comp.under the supervision of engineer in charge. A warranty for 7 years for the Retro reflective sheeting from original manufacturer & a certified copy of 3 year outdoor exposure test report from third party test lab for the product offered shall be submitted by contractor. (A) Class-B Type-4 Retro Reflective sheeting

The work shall be carried out as per relevant specification of this Tender Item No. - 17. The contract unit rate includes the Cost of A C P Sheet and All required Material Shall be as Per IRC : 67- 2012 . **With A warranty for 7 years for the Retro reflective sheeting from original manufacturer & a certified copy of 3 year outdoor exposure test report from third party test lab for the product offered shall be submitted by contractor. (B) Class-B Type-4 Retro Reflective sheeting**

ITEM No. [56] Supplying and fixing reinforced concrete heavy duty non pressure pipe with collers for culverts carrying traffic as per Indian Railway Standard specifications including setting the pipe in Cement mortar 1:2 watering and laying (to level or slope) of class NP4 of 600 mm 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 Signature.

- 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.

ITEM No. Excavation for foundation upto 1.5 mt. depth including sorting out and [57] stacking of useful materials and disposing of the excavated stuff etc. comp. Dense or Hard Soil

- 1 Excavation for structures shall consist of the removal of materials for the construction of foundations for bridges, culverts, retaining walls, headwalls, cut off. walls, pipe culverts and other similar structures, in accordance with the requirements, of these specifications and the lines and dimensions shown on the drawings or as indicated by the Engineer-in-charge. The work shall include all necessary sheeting, shoring, bracing, draining and pumping and the removal of all logs, stumps, shrubs, and other deleterious matter and obstruction necessary for the foundations, trimming bottoms of excavations; back filling and clearing up the site and the disposal of all surplus materials.
- 2 After the site has been cleared the limits of excavations shall be set out true to lines, curves, slopes, grades and sections as shown on the drawings or as directed by the Engineer-in-charge. The contractor shall provide all labour,

survey instruments and materials such as stirrings, pegs, nails, bamboos, stones, lime, mortar, concrete etc. required in connection with the setting out of works and the establishment of bench mark, centre line stones and other marks and stakes as long as in the opinion of the Engineer-in-charge, they are required for the work

- 3 Excavation shall be taken to the width of the 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 personal 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 materials 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, rain or other reasons, the contractor shall take adequate measure such as bailing, pumping, to keep the foundation trenches dry when so required and to protect the green concrete/ masonry against damage by erosion or sudden rising of water level. The methods to be adopted in this regard and, other details thereof shall be left to the choice of the contractor but subject to 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 production arrangements and for the quality and safety of the works.
- 6 Pumping from the interior of any foundation enclosure shall be done in such a manner as to preclude
- 7 The bottom of the foundation shall be levelled 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. To bring 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 take adequate protective measures to see that the excavation operations do not affect or damage adjoining structures.
- 9 Backfilling shall be done with approved materials after concrete or masonry is fully set and carried out in such a way as not to cause undue 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 materials is to be used in the construction of embankment, it shall be directly deposited at the required location within 100 metres lead
- 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 100 metres lead. Unsuitable and surplus materials not intended for use 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 materials encountered, limited to the dimensions shown on the drawing or as directed by the Engineer-in-charge. Excavation over increased width cutting of slopes, shoring, shuttering 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 of excavation for structures shall be paid in full for carrying out the required operations-including :-
 - i. Settings out and fixing bench marks and centre lines stones
 - ii. Construction of necessary shoring and bracing and their subsequent removal.
 - iii. Removal of all logs, stumps, Grubs, and other deleterious, matter and obstructions for placing the foundations including trimming of bottoms of excavations
 - iv. Foundation sealing, dewatering including pumping
 - v. Backfilling, Clearing up the site and disposal of all surplus materials Within all lifts and lead upto 100 metres
 - vi. All labour, materials tools equipment, safeguards and incidentals necessary to complete the work to the specification
- 14 Excavation shall be for ordinary soil such as vegetation or organic soil, turf, sand, silt, loam, clay, mud, black cotton soil, soft shale or soft murrum, a mixture of these and similar materials which yields to the ordinary application of pick and shovel, or other ordinary -digging equipment. Removal of gravel or any other nodular material having in any one direction. exceeding 75 mm. occurring in such strata shall be deemed to be covered under this category. The classification of excavation shall be decided by the Engineer-in-charge and his decision shall be final and binding on the contractor

ITEM No. [58] Excavation for foundation in hard murrum and boulders and very stiff or sticky, clays and other similar strata including shoring and strutting and dewatering as necessary and disposing of the excavated stuff as directed

- 1 Excavation for structures shall consist of the removal of materials for the construction of foundations for bridges, culverts, retaining walls, headwalls, cut off. walls, pipe culverts and other similar structures, in accordance with the requirements, of these specifications and the lines and dimensions shown on the drawings or as indicated by the Engineer-in-charge. The work shall include all necessary sheeting, shoring, bracing, draining and pumping and the removal of all logs, stumps, shrubs, and other deleterious matter and obstruction necessary for the foundations, trimming bottoms of excavations; back filling and clearing up the site and the disposal of all surplus materials.
- 2 After the site has been cleared the limits of excavations shall be set out true to lines, curves, slopes, grades and sections as shown on the drawings or as directed by the Engineer-in-charge. The contractor shall provide all labour, survey instruments and materials such as strings, pegs, nails, bamboos, stones, lime, mortar, concrete etc. required in connection with the setting out of works and the establishment of bench mark, centre line stones and other marks and stakes as long as in the opinion of the Engineer-in-charge, they are required for the work.
- 3 Excavation shall be taken to the width of the 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 personnel 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 materials 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, rain or other reasons, the contractor shall take adequate measure such as bailing, pumping, to keep the foundation trenches dry when so required and to protect the green concrete/ masonry against damage by erosion or sudden rising of water level. The methods to be adopted in this regard and, other details thereof shall be left to the choice of the contractor but subject to 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 production arrangements and for the quality and safety of the works.
- 6 Pumping from the interior of any foundation enclosure shall be done in such a manner as to preclude
- 7 The bottom of the foundation shall be levelled 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 !Lo bring 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 take adequate protective measures to see that the excavation operations do not affect or damage adjoining structures.
- 9 Backfilling shall be done with approved materials'after concrete or masonry is fully set and carried out in such a way as not to cause undue 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 materials is to be used in the construction of embankment, it shall be directly deposited at the required location within 100 metres lead
- 11 All useful materials not intended for use in the bank, shall be stacked neatly on Government land as directed by the Erigineer-in-charge within 100 metres lead. Unsuitable and surplus materials not intended for use 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 materials encountered, limited to the dimensions shown on the drawing or as directed by the Engineer-in-charge. Excavation over increased width cutting of slopes, shoring, shuttering 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 of excavation for structures shall be paid in full for carrying out the required operations-including :-
 - i. Settings out and fixing bench marks and centre lines stones
 - ii. Construction of necessary shoring and bracing and their subsequent removal.
 - iii. Removal of all logs, stumps, Grubs, and other deleterious, matter and obstructions for placing the foundations including trimming of bottoms of excavations
 - iv. Foundation sealing, dewatering including pumping
 - v. Backfilling, Clearing up the site and disposal of ail surplus materials With in all lifts and lead upto 100 metres
 - vi. All labour, materials 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 conglomerate or other soft or disintergrated rock which may be quarried or spilt with crow bars, boulders which do not require blasting having

dimeter in any direction of more than 300mm. and any rock which in dry state may be hard, requiring blasting but which when wet become soft and manageable by means other than blasting. The classification of excavation shall be decided by the Engineer-in-charge and his decision shall be final and binding on the contractor

**ITEM No. Providing and Casting in situ Ordinary Cement Concrete M-200 for R.C.C.
[59] Raft and cutt-off walls including necessary shuttering laying, vibrating, ramming and curing complete.**

The work shall be carried out as per relevant specification of this Tender Item No. - 33. The grade of concrete shall be **Ordinary C. C. M - 200. For Raft & Cutt- off Walls**. The concreting shall be done as per detailed drawing. The contract unit rate includes centering, shuttering, scaffolding, wherever necessary laying, vibrating, curing and finishing comp.

The contract rate shall be for a unit of **1.00 Cumt** for completed item

**ITEM No. Providing and casting in situ ordinary cement concrete M.-150mix
[60] and Providing necessary pinheaders incl. Shuttering scaffolding laying vibrating curing and finishing complete. without v -Grooves (A) Ht from**

0.0 M to 5.0 M.

The work shall be carried out as per relevant specification of this Tender Item No. - 33. The grade of concrete shall be **Ordinary C. C. M- 150**. The concreting shall be done as per detailed drawing. The contract unit rate includes centering, shuttering, scaffolding, wherever necessary laying, vibrating, curing and finishing comp.

The contract rate shall be for a unit of **1.00 Cumt** for completed item

ITEM No. Supplying and fixing reinforced concrete heavy duty non pressure pipe [61] with collers for culverts carrying traffic as per Indian Railway Standard specifications including setting the pipe in Cement mortar 1:2 watering and laying (to level or slope) of class NP4 of 900 mm 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

manufacturere having standard equipments for carring out various test as per IS : 458 at his factory.

FORM OF CERTIFICATE FOR NP3, NP2, NP1 PIPES

We..... manufacture of RCC pipes prudude 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 carryout test at our factory sites.

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

Date :-

Place :-

Manufacturer's Signature.

- 3 No pipe shall be placed in position until the foundations have been approved by the eingneer in charge, Where two or more pipes are to be laid adjacent to each other they shall be separated by a distace 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 teh 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 there cost of contractor.
- 4 The pipes shall be jointed either by collar joint or by flush joint in the former case the collers 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 joining with a joinin space 13 cm wide, The joining 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. Agter finishing, the joint shall be kept covered and damp for at least four day.
- 5 RCC pipe shall be measured along thir centre between thir inlet and outlet ends in linear **metres**.
- 6 The rate for the pipes shall include the cost of pipe including loading unloading handing storing laying in position and joining complete.

**ITEM No. Providing and fixing Guard stone as per I.R.C. Type Design including
[62] White Washing etc. complete. (I) Fixing in C.C. 1:5:10.**

- 1 The guard stone shall be of approved quality and of the size specified in the item. its length shall not be less than 75 cms . The top portion shall be rounded. The top 38 cm. shall be chisel dressed on all sides. The size, shape and dimensions of the guard stones shall be exact and shall be neatly dressed and finished.
- 2 The guard stones shall be fixed in position as directed by the Engineer- in – charge in earth only. The exposed part of the guard stones shall be given three coats of white wash. Any excavation necessary for fixing of the guard stones shall be done by the contractor at his own cost. The measurement for payment shall be per number of guard stone fixed in position
- 3 Unit rate of guard stone includes the cost of all materials , labors, tools, fixing & white washing as directed by the Engineer- in – charge .
- 4 The guard stone shall be fixed in C.C. 1:5:10 as directed the Engineer- in – charge

**ITEM No. Providing and Fixing 20 cm x 15 x 2.5 cm. Thick year plate of marble
[63] stone set in cm1:4 inclu. finishing and engraving letters etc. complete.**

- 1 Providing and fixing 30 cms x 22 cms 2 2.5 cms No and year plate of marble and of standard lettering with leads or paint including finishing etc. complete.
- 2 Marble plate shall be white and of approved quality and shall be 25 mm thick and of standard size as directed by the Engineer-in-charge of the work
- 3 Lettering shall be done by U-shape engraving and shall be filled with black paint of approved quality. Lettering shall be done as directed by the Engineer-in-charge. The marble plate shall be fixed in neat cement at a place as directed by the the Engineer-in-charge. Cement shall conform to relevant I.S. specification.
- 4 Measurement shall be per **number** of marble plate fixed.
- 5 Unit rate includes cost of all material labor etc. for complete work

**ITEM No. Providing and fixing Number plate of marble stone set in cm 1:4
[64] inclu.finishing & engraving letters etc. complete.**

The work shall be carried out as per relevant specification of this Tender Item No. - 59. The contract unit rate includes the Cost of Marble Plate, Engraving Lettering etc. Complete.

Measurement shall be per **Number** of marble plate fixed.

**ITEM No. Providing and Maintaining of diversion for traffic during the work in
[65] progress till completion of work incl.providing red lamps and necessary sign board. - For Pipe Drain.**

- 1 The Item Provided for the Temporary all-weather and Fair weather diversion during the construction period of the structure like , Causeway Dip Slab Drain major & Minor Bridge for easy going traffic
- 2 The Diversion shall be made by using Material Like Earth Work , Murrum , Hard Murrum H.B. Metal , Rubble Etc. of Approved quality
- 3 The Diversion shall be made by using Material suggested by Engineer – in-Charge from above mentioned material . The Quality of material shall be brought by Contractor at required by engineer – in – Charge
- 4 The contractor shall maintain the diversion in trafficable condition. Rolling and Watering Will also carried out by Contractor whenever required.
- 5 Near Starting point and end point of the diversion the contractor shall Provide with proper caution sign & Mark with red light at night to avoid accident. The final payment of diversion will be paid to contractor when the Structure work is ready for traffic.
- 6 The Payment shall be made on **No.** Basis.

**ITEM No. White washing with lime on wall surface (three coats) to give an even
[66] shade including thoroughly booming the surface to remove all dirt, dust; mortar drops and other foreign matter.**

1 General :

Lime shall be hydraulic lime of approved quality.

The slaked lime, if stored, shall be kept in a weather proof and damp roof shed with impervious floor and sides to protect it against rain, moisture, weather and extraneous materials mixing with it. All lime that has been damaged in any ways shall be rejected and all rejected materials shall be removed from site of work.

2 Workanship :

The fat lime shall be slaked at site and shall be mixed and stirred with about five liters of water and 1 Kg of unslaked lime to make a thin cream.- This shall be allowed to stand for a period of 24 hours' and then shall be added to each cubic meter of lime cream. Sinai quarry of ultra marine blue shall also be added to the last two coats of white wash solution and the whole solution shall be stirred thoroughly before use.

3 Preparation of surface :

The surface shall be thoroughly cleaned of all dust mortar dropping and other foreign matter before white wash is to be applied. Oil or grease spots shall be removed by suitable chemicals and smooth, surface shall be rubbed with wire brush.

Any unsound portion of the surface plaster shall be removed to full depth of plaster in rectangular patches and plastered again after raking the masonry joints properly.

4 Application of white wash :

On the surface so prepared the white wash shall be applied with brush. The first stroke of the brush shall be from top to downwards and another from bottom to upwards over the first stroke and similarly one stroke from the right and another from the left over the first stroke before it dries.

Each coat shall be allowed to dry before next coat is applied number of coats as specified in item shall be applied

5 Mode of Measurement & Payment :

All work shall be measured in the decimal system i.e. in sq. meters. Deduction (or pipe openings shall be made fully both sides of openings. The rates shall include the cost of all materials, labour, scaffolding protective etc. involved in all the operations described. The rate shall be for a unit of **one sq. meter**.

Deputy Executive Engineer
Panchayat (R & B) Sub Division
Dediapada

Executive Engineer
Panchayat (R & B) Division
Rajpipla.

