

- (12) 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 areas, breaking clods, conveying, and spreading earth in layers with all lead and lift, finishing the entire embankment and incidentals necessary to complete the work to the specifications. The cutting stuff of cutting in ordinary soil, soft murrum, soft rock, hard murrum and hard rock shall be utilized in embankment construction under this item within the lead specified in the particular item. No payment shall be made under this item for the cutting stuff used in the embankment but labour for cutting will be paid as per specifications in the particular item, and only balance quantity of earthwork brought from borrow areas will be paid in this item.

The measurement will be in cum of actual completed volume.

Item No. 6

Earthwork for embankment including breaking clods, dressing with all lead and lift and including watering rolling and consolidation of subgrade in layers at O.M.C. to required dry density including filling the depression which occur during the process using power roller 8T to 10T.(E) From Borrow area including all lead & lift

1. The Relevant Specification of Item No. 6 shall apply to this item.
2. The measurement and payment shall be in Cum basis.

Item No. 7

Earthwork in cutting including preparing slope and camber staking or utilizing the cutting stuff in bank as directed upto 200 meters from the end of the cutting with all required lead and lift. (iii) hard Rock.

301 EXCAVATIONS FOR ROADWAY AND DRAINS

301.1 Scope

This work shall consist of excavation, removal and disposal of materials necessary for the construction of roadway, side drains and waterways in accordance with requirements of these Specifications and the lines, grades and cross-sections shown in the drawings or as indicated by the Engineer. It shall include the hauling and stacking of or hauling to sites of embankment and subgrade construction suitable cut materials as required, as also the disposal of unsuitable cut materials in specified manner, with all leads and lifts, reuse of cut materials as may be deemed fit, trimming and finishing of the road to specified dimensions or as directed by the Engineer.

301.2 Classification of Excavated Material

301.2.1 Classification: All materials involved in excavation shall be classified by the Engineer in the following manner:

a) Soil:

This shall comprise topsoil, turf, sand, silt, loam, clay, mud, peat, black- cotton soil, soft shale or loose murrum, a mixture of these and similar material which yields to the ordinary application of pick, spade and/or shovel, rake or other ordinary digging equipment. Removal of gravel or any other modular material having dimension in any one direction not exceeding 75 mm shall be deemed to be covered under this category.

b) Ordinary Rock (not requiring blasting) This shall include:

- i) rock types such as laterites, shales and conglomerates, varieties of limestone and sandstone etc., which may be quarried or split with crow bars, also including any

rock which in dry state may be hard, requiring blasting but which, when wet, becomes soft and manageable by means other than blasting;

- ii) macadam surfaces such as water bound and bitumen bound; soling of roads, cement concrete pavement, cobble stone, etc. compacted murrum or stabilized soil requiring use of pick axe or shovel or both.
- iii) lime concrete, stone masonry and brick work in lime/cement mortar below ground level, reinforced cement concrete which may be broken up with crow bars or picks and stone masonry in cement mortar below ground level; and
- iv) boulders which do not require blasting found lying loose on the surface or embedded in river bed, soil, talus, slope wash and terrace material of dissimilar origin.

c) Hard Rock (requiring blasting) This shall comprise:

- i) any rock or cement concrete for the excavation of which the use of mechanical plant and/or blasting is required,
- ii) reinforced cement concrete below ground level and in bridge/ ROB/RUB/flyover piers and abutments,
- iii) boulders requiring blasting.

d) Hard Rock (using controlled blasting):

Hard rock requiring blasting as described under (c) but where controlled blasting is to be carried out in locations where built-up area, huts, and are situated at within 200m of the blast site. -

e) Hard Rock (blasting prohibited)

Hard rock requiring blasting as described under (d) but where blasting is prohibited for any reason like people living within 20 m of blast sites etc. and excavation has to be carried out by chiselling, wedging or any other agreed method.

f) Marshy soil

This shall include soils like soft clays and peats excavated below the original ground level of marshes and swamps and soils excavated from other areas requiring continuous pumping or bailing out of water.

301.2.2 Authority for Classification

The classification of excavation shall be decided by the Engineer and his decision shall be final and binding on the Contractor. Merely the use of explosives in excavation will not be considered as a reason for higher classification unless blasting is clearly necessary in the opinion of the Engineer.

301.3 Construction Operations

301.3.1 Setting Out

After the site has been cleared as per Clause 201, the limits of excavation shall be set out true to lines, curves, slopes, grades and sections as shown on the drawings or as directed by the Engineer. Clause 109 shall be applicable for the setting out operations.

301.3.2 Stripping and Storing Top soil

When so directed by the Engineer, the topsoil existing over the sites of excavation shall be stripped to specified depths and stock piled at designated locations for re-use in covering embankment slopes, cut slopes, berms and other disturbed areas where re-vegetation is desired in accordance with Clause 305.3.3. Prior to stripping the topsoil, all trees, shrubs etc. shall be removed along with their roots, with approval of the Engineer.

301.3.3 Excavation-General

All excavations shall be carried out in conformity with the directions laid here-in-under and in a manner approved by the Engineer. The work shall be so done that the suitable materials available from excavation are satisfactorily utilized as deemed fit or as approved by the Engineer.

While planning or executing excavations, the Contractor shall take all adequate precautions against soil erosion, water pollution etc. as per Clause 306, and take appropriate drainage measures to keep the site free of water in accordance with Clause 311.

The excavations shall conform to the lines, grades side slopes and levels shown on the drawings or as directed by the Engineer. The Contractor shall not excavate outside the limits of excavation. Subject to the permitted tolerances, any excess depth/width excavated beyond the specified levels/dimensions on the drawings shall be made good at the cost of the Contractor with suitable material of characteristics similar to that removed and compacted to the requirements of Clause 305.

All debris and loose material on the slopes of cuttings shall be removed. No backfilling shall be allowed to obtain required slopes excepting that when boulders or soft materials are encountered in cut slopes, these shall be excavated to approved depth on instructions of the Engineer and the resulting cavities filled with suitable material and thoroughly compacted in an appropriate manner.

After excavation, the sides of excavated area shall be trimmed and the area contoured to minimize erosion and ponding, allowing for natural drainage to take place.

301.3.4 Methods, Tools and Equipment

Only such methods tools and equipment as approved by the Engineer shall be adopted/ used in the work. If so desired by the Engineer, the Contractor shall demonstrate the efficacy of the type of equipment to be used before the commencement of work.

301.3.5 Rock Excavation

Rock, when encountered in road excavation, shall be removed upto the formation level or as otherwise indicated in the drawings. Where, however, unstable shales or other unsuitable materials are encountered at the formation level, these shall be excavated to the extent of 500 mm below the formation level or as otherwise specified. In all cases, the excavation operations shall be so carried out that at no point on cut formations the rock protrudes above the specified levels. Rocks and boulders which are likely to cause differential settlement and also local drainage problems shall be removed to the extent of 500 mm below the formation level in the formation width including side drains.

Where excavation is done to levels lower than those specified, the excess excavation shall be made good as per Clauses 301.3.3 and 301.6 to the satisfaction of the Engineer. Slopes in rock cutting shall be finished to uniform lines corresponding to slope lines shown on the drawings or as directed by the Engineer. Notwithstanding the foregoing all loose pieces of rock on excavated slope surface which move when pierced by a crowbar shall be removed.

Where blasting is to be resorted to, the same shall be carried out as per Clause 302 and all precautions indicated therein observed,

Where presplitting is prescribed to be done for the establishment of a specified slope in rock excavation, the same shall be carried out as per Clause 303.

301.3.6 Marsh Excavation

The excavation of soil from marshes/swamps shall be carried out as per the programme approved by the Engineer.

Excavation of marshes shall begin at one end and proceed in one direction across the entire marsh immediately ahead of backfilling with materials like boulders sand murrum bricks bats, dismantled concrete as approved by the Engineer. The method and sequence of excavating and backfilling shall be such as to ensure, to the extent practicable, the complete removal or displacement of all muck from within the lateral limits indicated on the drawings or as staked by the Engineer.

301.3.7 Excavation of Road Shoulders / Verge / Median for Widening of Pavement or Providing Treated Shoulders

In the works involving widening of existing pavements or providing paved shoulders the existing shoulders/verge/median shall be removed to its full width and upto top of the subgrade. The subgrade material within 500 mm from the bottom of the pavement for the widened portion or paved shoulders shall be loosened and recompact as per Clause 305. Any unsuitable material found in this portion shall be removed and replaced with the suitable material while doing so, care shall be taken to see that no portion of the existing pavement designated for retention is loosened or disturbed. If the existing pavement gets disturbed or loosened, it shall be dismantled and cut to a regular shape with sides vertical and the disturbed/loosened portion removed completely and re-laid as directed by the Engineer, at the cost of the Contractor.

301.3.8 Excavation for Surface/Sub-Surface Drains

Where the Contract provides for construction of surface/sub-surface drains, the same shall be done as per Clause 309. Excavation for these drains shall be carried out in proper sequence with other works as approved by the Engineer.

301.3.9 Slides

If slips, slides, over-breaks or subsidence occur in cuttings during the process of construction, they shall be removed at the cost of the Contractor as ordered by the Engineer. Adequate precautions shall be taken to ensure that during construction, the slopes are not rendered unstable or give rise to recurrent slides after construction. If finished slopes slide into the roadway subsequently, such slides shall be removed and paid for at the Contract rate for the class of excavation involved, provided the slides are not due to any negligence on the part of the Contractor. The classification of the debris

material from the slips, slides etc. shall conform to its condition* at the time of removal and payment made accordingly regardless of its condition earlier.

301.3.10 Dewatering

If water is met with in the excavations due to springs, seepage, rain or other causes, it shall be removed by suitable diversions, pumping or bailing out and the excavation kept dry whenever so required or directed by the Engineer. Care shall be taken to discharge the drained water into suitable outlets as not to cause damage to the works, crops or any other property. Due to any negligence on the part of the Contractor, if any such damage is caused, it shall be the sole responsibility of the Contractor to repair/restore to the original condition at his own cost or compensate for the damage.

301.3.11 Use and Disposal of Excavated Materials

All the excavated materials shall either be reused with the approval of the Engineer or disposed of with all loads and lifts as directed by the Engineer.

301.3.12 Backfilling

Backfilling of masonry/concrete hume pipe or drain excavation shall be done with approved material with all loads and lifts after concrete/masonry/hume pipe is fully set and carried out in such a way as not to cause undue thrust on any part of the structure and/or not to cause differential settlement. All space between the drain walls and the side of the excavation shall be backfilled to the original surface making due allowance for settlement, in layers not exceeding 150 mm compacted thickness to the required density, using suitable compaction equipment such as trench compactor, mechanical tamper, rammer or plate compactor as directed by the Engineer.

301.4 Plying of Construction Traffic

Construction traffic shall not use the cut formation and finished subgrade without the prior permission of the Engineer. Any damage arising out of such use shall be made good by the Contractor at his own cost.

301.5 Preservation of Property

The Contractor shall undertake all reasonable precautions for the protection and preservation of any or all existing roadside trees, drains, sewers, sub-surface drains, pipes, conduits and any other structures under or above ground, which may be affected by construction operations and which, in the opinion of the Engineer, shall be continued in use without any change. Safety measures taken by the Contractor in this respect, shall be got approved from the Engineer. However, if any, of these objects is damaged by reason of the Contractor's negligence, it shall be replaced or restored to the original condition at his cost. If the Contractor fails to do so, within the required time as directed by the Engineer or if, in the opinion of the Engineer, the actions initiated by the Contractor to replace/restore the damaged objects are not satisfactory, the Engineer shall arrange the replacement/restoration directly through any other agency at the risk and cost of the Contractor after issuing prior notice to the effect.

301.6 Preparation of Cut Formation

The cut formation, which serves as a sub-grade, shall be prepared to receive the sub-base/ base course as directed by the Engineer.

Where the material in the subgrade has a density less than specified in Table 300-1, the same shall be loosened to a depth of 500 mm and compacted in layers in accordance with the requirements of Clause 305 adding fresh material, if any required, to maintain the formation level as shown on the drawings. Any unsuitable material encountered in the subgrade level shall be removed as directed by the Engineer, replaced with suitable material and compacted in accordance with Clause 305.

In rocky formations the surface irregularities shall be corrected and the levels brought up to the specified elevation with granular base material as directed by the Engineer, laid and compacted in accordance with the respective Specifications for these materials. The unsuitable material shall be disposed of in accordance with Clause 301.3.11. After satisfying the density requirements, the cut formation shall be prepared to receive the sub-base/base course in accordance with Clauses 310 and 311.

301.7 Finishing Operations

Finishing operations shall include the work of properly shaping and dressing all excavated surfaces.

When completed, no point on the slopes shall vary from the designated slopes by more than 150 mm measured at right angles to the slope, except where excavation is in rock (ordinary or hard) where no point shall vary more than 300 mm from the designated slope. In no case shall any portion of the slope encroach on the roadway.

The finished cut formation shall satisfy the surface tolerances described in Clause 902.

Where directed, the topsoil removed and conserved (Clauses 301.3.2 and 305.3.3) shall be spread over cut slopes, shoulders and other disturbed areas. Slopes may be roughened and moistened slightly, prior to the application of topsoil, in order to provide satisfactory bond. The depth of topsoil shall be sufficient to sustain plant growth, the usual thickness being from 75 mm to 100 mm.

301.8 Measurements for Payment

Excavation for roadway shall be measured by taking cross-sections at suitable intervals before the excavation starts (after clearing and grubbing/stripping etc. as the case may be) and after its completion and computing the volumes in cum by the method of average end areas for each class of material encountered. 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, 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.

For rock excavation, the overburden shall be removed first so that necessary cross-sections could be taken for measurement. Where cross-sectional measurements could not be taken due to irregular configuration or where the rock is admixed with other classes of materials, the volumes shall be computed on the basis of measurement of stacks of excavated rubble allowing a deduction of 35% therefrom. When volume is calculated on the basis of measurement of stacks of the excavated material other than rock, a deduction of 16% of stacked volume shall be allowed.

Works involved in the preparation of cut formation shall be measured in units indicated below:

i)	Loosening and recompacting the loosened material at subgrade	Cu.m.
ii)	Loosening and removal of unsuitable material and replacing with suitable material and compacting to required density	Cu.m.
iii)	Preparing rocky subgrade	Sq.m.
iv)	Stripping including storing and reapplication of topsoil	Cu.m.

301.9 Rates

301.9.1 The Contract unit rates for the items of roadway and drain excavation shall be payment in full for carrying out the operations required for the individual items including full compensation for:

- i) setting out;
- ii) transporting the excavated materials for use or disposal with all leads and lifts by giving suitable credit towards the cost of re-usable material and salvage value of unusable material;
- iii) trimming bottoms and slopes of excavation;
- iv) dewatering;
- v) keeping the work free of water as per Clause 311;
- vi) arranging disposal sites; and
- vii) all labour, materials, tools, equipment., safety measures, testing and incidentals necessary to complete the work to Specifications.

Where presplitting of rock is prescribed it shall be governed by Clause 303.5.

301.9.2 The Contract unit rate for loosening and recompacting the loosened materials at subgrade shall include full compensation for loosening to the specified depth, including breaking clods, spreading in layers, watering where necessary and compacting to the requirements.

301.9.3 Clauses 301.9.1 and 305.8 shall apply as regards Contract unit rate for item of removal of unsuitable material and replacement with suitable material respectively.

301.9.4 The Contract unit rate for item of preparing rocky sub-grade as per Clause 301.6 shall be full compensation for providing, laying and compacting granular base material for correcting surface irregularities including all materials, labour and incidentals necessary to complete the work and all leads and lifts.

301.9.5 The Contract unit rate for the items of stripping and storing topsoil and of reapplication of topsoil shall include full compensation for all the necessary operations including all lifts and leads.

302 BLASTING OPERATIONS

302.1 General

Blasting shall be carried out in manner that completes the excavation to the lines indicated in drawings, with the least disturbance to adjacent material. It shall be done only with the written permission of the Engineer. All the statutory laws, regulations, rules, etc., pertaining to the acquisition, transportation, storage, handling and use of explosives shall be strictly followed by the contractor.

The Contractor may adopt any method or methods of blasting consistent with the safety and job requirements. Prior to starting any phase of the operation, the Contractor shall provide information describing pertinent blasting procedures, dimensions and notes.

The magazine for the storage of explosives shall be built to the designs and specifications of the Explosives Department concerned and located at the approved site. The storage places shall be clearly marked "DANGER-EXPLOSIVES". The Contractor shall be liable for property damage, injury or death resulting from the use of explosives. All permits shall be obtained by the Contractor. No unauthorized person shall be admitted into the magazine which, when not in use, shall be kept securely locked. No matches or inflammable material shall be allowed in the magazine. The magazine shall have an effective lightning conductor. The following shall be hung in the lobby of the 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, and
- d) A notice that smoking is strictly prohibited.

All explosives shall be stored in a secure manner in compliance with all laws and ordinances, and all such storage places shall be marked. Where no local laws or ordinances apply, storage shall be provided to the satisfaction of the Engineer and in general not closer than

300 m from the road or from any building or camping area or place of human occupancy. In addition to these, the Contractor shall also observe the following instructions and any further additional instructions which may be given by the Engineer and shall be responsible for damage to property and any accident which may occur to workmen or public on account of any operations connected with the storage, handling or use of explosives and blasting. The Engineer shall frequently check the Contractor's compliance with these precautions.

302.2 Materials, Tools and Equipment

All the materials, tools and equipment used for blasting operations shall be of approved type. The Engineer may specify the type of explosives 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 length being cut as will permit sufficient time to the firer to reach safely before explosion takes place. Detonators shall be capable of giving effective blasting of the explosives. The blasting powder, explosives, detonators, fuses, etc., shall be fresh and not damaged due to dampness, moisture or any other cause. They shall be inspected before use and damaged articles shall be discarded totally and removed from the site immediately.

302.3 Personnel

The blasting operation shall remain in the charge of competent and experienced supervisor and workmen who are thoroughly acquainted with the details of handling explosives and blasting operations.

302.4 Blasting Operations

The blasting shall be carried out during the pre-determined 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. The hours shall be made known to the people in the vicinity.

The Contractor shall notify each public utility company having structures in proximity to the site of the work of his intention to use explosives. Such notice shall be given sufficiently in advance to enable the companies to take such steps as they may deem necessary to protect their property from injury. In advance of any blasting work within 50 m of any railway track or structures, the Contractor shall notify the concerned Railway Authority of the location, date, time and approximate duration of such blasting operation.

Red danger flags shall be displayed prominently in all directions during the blasting operations. The flags shall be planted 200 m from the blasting site in all directions. People, except those who actually light the fuse, shall be prohibited from entering this area and all persons including workmen shall be kept away from the flagged area; and all persons; including workmen shall be removed from the flagged area at least 10 minutes before the firing. A warning siren shall be sounded for the above purpose.

Only controlled blasting shall be resorted to along with the safeguard above at locations where built-up area, huts and structures in use lie within 200 m. Similarly, excavation of hard rock without blasting is mandatory where people live within 20 m of blast site.

The charge holes shall be drilled to required depths and at suitable places. Blasting should be as light as possible consistent with thorough breakage of the material necessary for economic loading and hauling. Any method of blasting which leads to overshooting shall be discontinued.

When blasting is done with powder, the fuse cut to the required length shall be inserted into the hole and the powder dropped shall be gently tamped with copper rods with rounded ends. The explosive powder shall then be covered with tamping material which shall be tamped lightly but firmly.

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 the 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. Boreholes shall be cleared of all debris and explosives inserted. The space of about 200 mm above the charge shall then be gently filled with dry clay, pressed home and the rest of the tamping formed of any convenient material gently packed with a wooden rammer.

At a time not more than 10 such charges will be prepared and fired. The man in charge shall blow a siren in a recognized manner for cautioning the people. All the people shall then be required to move to safe distances. The charges 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.

After blasting operation, the Contractor shall compact the loose residual material below subgrade and replace the material removed below subgrade with suitable material.

- In case of misfire, the following procedure shall be observed:
- i) Sufficient time shall be allowed to account for the delayed blast. The man-in-charge shall inspect all the charges and determine the missed charge.
 - ii) If it is the blasting powder charge, it shall be completely flooded with water. A new hole shall be drilled at about 450 mm from the old hole and fired. This should blast the old charge. In case, it does not blast the old charge, the procedure shall be repeated till the old charge is blasted.
 - iii) In case of charges of gelignite, 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 300 mm of tamping and the direction then ascertained by placing a stick in the hole. Another hole may then be drilled 150 mm 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 Contractor's office and the Engineer all cases of misfire, the cause of the same and what steps were taken in connection therewith.

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 for inspection to ascertain whether all the remaining materials in the box are also defective.

302.6 Account

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

Item No. 8

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

404 WATER BOUND MACADAM SUB-BASE/BASE

404.1 Scope

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

404.2 Materials

404.2.1 Coarse Aggregates

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

slag shall be used in sub-base courses only. If crushed gravel/shingle is used, not less than 90 percent by weight of the gravel/shingle pieces retained on 4.75 mm sieve shall have at least two fractured faces. The aggregates shall conform to the physical requirements set forth in Table 400. The type and size range of the aggregate shall be specified in the Contract or shall be as specified by the Engineer. If the water absorption value of the coarse aggregate is greater than 2 percent, the soundness test shall be carried out on the material delivered to site as per IS:2386 (Part 5).

Table 400-8 : Physical Requirements of Coarse Aggregates for Water Bound Macadam for Sub-base/Base Courses

S.No.	Test	Test Method	Requirements
1) ***	Los Angeles Abrasion value or Aggregate Impact value	IS: 2386(Part4)	40 percent (Max)
		IS: 2386 (Part-4) or 15:5640*	30 percent (Max)
2)	Combined Flakiness and Elongation Indices (Total) **	IS:2386 (Part-1)	35 percent (Max)

* Aggregates which get softened in presence of water shall be tested for Impact value under wet conditions in accordance with 18:5640.

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

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

404.2.2 Crushed or Broken Stone

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

404.2.3 Crushed Slag

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

- | | | |
|------|--------------------|--|
| i) | Chemical stability | To comply with requirements of appendix of BS:1047 |
| ii) | Sulphur content | Maximum 2 percent |
| iii) | Water 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 moorum or gravel (other than rounded river borne material) may be used for this purpose provided liquid limit and plasticity index of such material are below 20 and 6 respectively and fraction passing 75 micron sieve does not exceed 10 percent.

Table 400-9 : Grading Requirements of Coarse Aggregates

Grading No.	Size Range	IS Sieve Designation	Percent by weight Passing
1)	63 mm to 45 mm	75mm	100
		63mm	90-100
		53mm	25-75
		45mm	0-1.5
		22.4 mm	0-5
2)	53 mm to 22.4 mm	63mm	100
		53mm	95-100
		45mm	65-90
		22.4 mm	0-10
		11.2 mm	0-5

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

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

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

404.2.7 Binding Material

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

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

Table 400-10: Grading For Screenings

Grading Classification	Size of Screenings	IS Sieve Designation	Percent by Weight Passing the sieve
A	13.2 mm	13.2 mm	100
		11.2 mm	95-100
		5.6mm	15-35
		180 micron	0-10
B	11.2 mm	11.2 mm	100
		9.5mm	80-100
		5.6mm	50-70
		180 micron	5-25

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

Classification	Size Range	Compacted Thickness	Loose Qty.	Screenings			
				Stone Screening		Crushable Type Such as Moorum or Gravel	
				Grading Classification & Size	For WBM Sub-base/ Base Course (Loose Quantity)	Grading Classification & Size	Loose Qty.
Grading 1	63mm to 45 mm	75mm	0.91 to 1.07 m ³	Type A 13.2 mm	0.12 to 0.15 m ³	Not uniform	0.22 to 0.24 m ³
-do-	-do-	-do-	-do-	Type B 11.2 mm	0.20 to 0.22 m ³	-do-	-do-
Grading 2	53mm to 22.4 mm	75mm	-do-	-do-	0.18 to 0.21 m ³	-do-	-do-

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

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

404.3 Construction Operations

404.3.1 Preparation of Base

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

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

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

404.3.2 Inverted Choke/Sub-surface Drainage Layer

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

404.3.3 lateral Confinement of Aggregates

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

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

404.3.4 Spreading Coarse Aggregates

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

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

The surface of the aggregates spread shall be carefully checked with templates and all high or low spots remedied by removing or adding aggregates as may be required. The surface shall be checked frequently with a straight edge while spreading and rolling so as to ensure a finished surface as per approved drawings.

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

404.3.5

Rolling

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

Except on superelevated portions and carriageway with unidirectional cross-fall, where the rolling shall proceed from inner edge to the outer, rolling shall begin from the edges gradually progressing towards the center. First the edge/edges shall be compacted with roller running forward and backward. The roller shall then move inward parallel to the center line of the road, in successive passes uniformly overlapping preceding tracks by at least one-half width.

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

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

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

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

404.3.6

Application of Screenings

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

by mechanical spreaders, or directly from tipper with suitable grit spreading arrangement. Tipper operating for spreading the screenings shall be equipped with pneumatic tyres and operated so as not to disturb the coarse aggregates.

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

404.3.7 Sprinkling of Water and Grouting

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

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

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

404 3.8 Setting and Drying

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

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

404.4 Surface Finish and Quality Control of Work

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

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

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

404.4.4 Reconstruction of Defective Macadam

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

404.5 Arrangements for Traffic

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

404.6 Measurements for Payment

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

404.7 Rate

The Contract unit rate for water bound macadam sub-base/base course shall be payable in full for carrying out the required operations including full compensation for all components listed in Clause 401.7 (i) to (v), including arrangement of water used in the work as approved by the Engineer.

Item No. 9

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

1. The relevant specification of MoRT&H (5th revision) as per Item description given in section 400 shall apply to this item.
2. The Mode of Measurement & payment shall be done in cum basis.

Item No. 10

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

304 EXCAVATIONS FOR STRUCTURES

304.1 Scope

Excavation for structures shall consist of the removal of material for the construction of foundations for bridges, culverts, retaining walls, headwalls, cutoff 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. The work shall include construction of the necessary cofferdams and cribs and their subsequent removal, all necessary sheeting, shoring, bracing, draining and

pumping; the removal of all logs, stumps, grubs and other deleterious matter and obstruction, necessary for placing the foundations; trimming bottoms of excavations; backfilling and clearing up the site and the disposal of all surplus material.

304.2 Classification of Excavation

All materials involved in excavation shall be classified in accordance with Clause 301.2.

304.3 Construction Operations

304.3.1 Setting Out

After the site has been cleared according to Clause 201, the limits of excavation shall be set out true to lines, curves and slopes to Clause 301.3.1.

304.3.2 Excavation

Excavation shall be taken to the width of the lowest step of the footing including additional width as required for construction operation. The sides shall be left plumb where the nature of soil allows it. Where the nature of soil or the depth of the trench and season of the year do not permit vertical sides, the Contractor at his own cost 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.

The depth to which the excavation is to be carried out shall be as shown on the drawings, unless the type of material encountered is such as to require changes, in which case the depth shall be as ordered by the Engineer. Propping shall be undertaken when any foundation or stressed zone from an adjoining structure is within a line of 1 vertical to 2 horizontals from the bottom of the excavation.

Where blasting is to be resorted-to, the same shall be carried out in accordance with Clause 302 and all precautions indicated therein observed. Where blasting is likely to endanger adjoining foundations or other structures, necessary precautions such as controlled blasting, providing rubber mat cover to prevent flying of debris etc. shall be taken to prevent any damage.

304.3.3 Dewatering and Protection

Normally, open foundations shall be laid dry. Where water is met with in excavation due to stream flow, seepage, springs, rain or other reasons, the Contractor shall take adequate measures such as bailing, pumping, constructing diversion channels, drainage channels, bunds, depression of water level by well-point system, cofferdams and other necessary works 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 the approval of the Engineer. Approval of the Engineer shall, however, not relieve the Contractor of the responsibility for the adequacy of dewatering and protection arrangements for the quality and safety of the works.

Where cofferdams are required, these shall be carried to adequate depths and heights, be safely designed and constructed and be made as watertight as is necessary for facilitating construction to be carried out inside them, the interior dimensions of the cofferdams shall be such as to give sufficient clearance for the construction and inspection and to permit installation of pumping equipments, etc., inside the enclosed area.

If it is determined beforehand that the foundations cannot be laid dry or the situation is found that the percolation is too heavy for keeping the foundation dry, the foundation concrete shall be laid under water by tremie pipe only. In case of flowing water or artesian springs, the flow shall be stopped or reduced as far as possible at the time of placing the concrete.

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

At the discretion of the Contractor, cement grouting or other approved methods may be used to prevent or reduce seepage and to protect the excavation area.

The Contractor shall take all precautions in diverting channels and in discharging the drained water as not to cause damage to the works, crops or any other property.

304.3.4

Preparation of Foundation

The bottom of the foundation shall be levelled both longitudinally and transversely or stepped as directed by the Engineer. 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, the extra depth shall be made up with concrete as per Clause 2104.1 at the cost of the Contractor. Ordinary filling shall not be permitted to bring the foundation to the design level as shown in the drawing.

When rock or other hard strata is encountered, it shall be freed of all soft and loose material, cleaned and cut to a firm surface either level or stepped as directed by the Engineer. All seams shall be cleaned out and filled with cement mortar or grout to the satisfaction of the Engineer. In the case of excavation in rock, annular space around footing shall be filled with lean concrete M 15 upto the top level of rock.

If the depth of fill required is more than 1.5 m in soft rock or 0.6 m in hard rock above the foundation level, the filling upto this level shall be done with M-15 concrete and portion above shall be filled by concrete or by boulders grouted with cement.

When foundation piles are used, the excavation for pile cap shall be done after driving/casting of all piles forming the group. After pile driving operations in a given pit are completed, all loose and displaced materials therein shall be removed to the level of the bottom of the pile cap.

304.3.5

Slips and Slip-Outs

If there are any slips or slip-outs in the excavation, these shall be removed by the Contractor at his own cost.

304.3.6

Public Safety

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. For safety precautions, guidance may be taken from IS:3764.

304.3.7 Backfilling

Backfilling shall be done with approved material 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 in layers not exceeding 150 mm compacted thickness. The compaction shall be done with the help of suitable equipment such as trench compactor, mechanical tamper, rammer, plate vibrator etc., after necessary watering, so as to achieve the maximum dry density.

304.3.8 Disposal of Surplus Excavated Materials

Clause 301.3.11 shall apply.

304.4 Measurements for Payment

Excavation for structures shall be measured in cu.m for each class of material encountered, limited to the dimensions shown on the drawings or as directed by the Engineer. Excavation over increased width, cutting of slopes, production/support to the existing structures shoring, shuttering and planking shall be deemed as incidental to the main work and shall not be measured and paid separately.

Preparation of rock foundation shall be measured in square metres.

304.5 Rates

304.5.1 The Contract unit rate for the items of excavation for structures shall be payment in full for carrying out the, required operations including full compensation for:

- i) Setting out;
- ii) Transporting the excavated materials for use or disposal with all leads and lifts;
- iii) Construction of necessary cofferdams, cribs/sheeting, shoring and bracing and their subsequent removal;
- iv) Removal of all logs, stumps, grubs and other deleterious matter and obstructions, for placing the foundations including trimming of bottoms of excavations;
- v) Foundation sealing, dewatering including pumping when no separate provision for it is made in the Contract;
- vi) Backfilling, clearing up the site and disposal of all surplus material with all leads and lifts or as otherwise specified; and
- vii) All labour, materials, tools, equipment, safety measures, diversion of traffic and incidentals necessary to complete the work to Specifications.

304.5.2 The Contract unit rate for preparation of rock foundation shall be full compensation for cutting, trimming and cleaning the foundation surface and filling/sealing of all seams with cement grout or mortar including all materials, labour and incidentals required for completing the work.

Item No. 11

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

1. The relevant specification as per Item No. 10 Shall apply to this item.
2. Mode of Measurement & payment for this item shall be done in Cum basis.

Item No. 12

Excavation for foundation upto 1.5m depth including sorting out and stacking of useful materials and disposing of the excavated stuff upto all lead. (C) Soft Rock

1. The relevant specification as per Item No. 10 Shall apply to this item.
2. Mode of Measurement & payment for this item shall be done in Cum basis.

Item No. 13

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

301.1 Scope

This work shall consist of excavation, removal and disposal of materials necessary for the construction of roadway, side drains and waterways in accordance with requirements of these Specifications and the lines, grades and cross-sections shown in the drawings or as indicated by the Engineer. It shall include the hauling and stacking of or hauling to sites of embankment and subgrade construction suitable cut materials as required, as also the disposal of unsuitable cut materials in specified manner, with all leads and lifts, reuse of cut materials as may be deemed fit, trimming and finishing of the road to specified dimensions or as directed by the Engineer.

301.2 Classification of Excavated Material

301.2.1 Classification: All materials involved in excavation shall be classified by the Engineer in the following manner:

a) Soil:

This shall comprise topsoil, turf, sand, silt, loam, clay, mud, peat, black- cotton soil, soft shale or loose murrum, a mixture of these and similar material which yields to the ordinary application of pick, spade and/or shovel, rake or other ordinary digging equipment. Removal of gravel or any other modular material having dimension in any one direction not exceeding 75 mm shall be deemed to be covered under this category.

b) Ordinary Rock (not requiring blasting) This shall include:

- i) rock types such as laterites, shales and conglomerates, varieties of limestone and sandstone etc., which may be quarried or split with crow bars, also including any rock which in dry state may be hard, requiring blasting but which, when wet, becomes soft and manageable by means other than blasting;
- ii) macadam surfaces such as water bound and bitumen bound; soling of roads, cement concrete pavement, cobble stone, etc. compacted murrum or stabilized soil requiring use of pick axe or shovel or both.
- iii) lime concrete, stone masonry and brick work in lime/cement mortar below ground level, reinforced cement concrete which may be broken up with crow bars or picks and stone masonry in cement mortar below ground level; and
- iv) boulders which do not require blasting found lying loose on the surface or embedded in river bed, soil, talus, slope wash and terrace material of dissimilar origin.

c) Hard Rock (requiring blasting) This shall comprise:

- i) any rock or cement concrete for the excavation of which the use of mechanical plant and/or blasting is required,
- ii) reinforced cement concrete below ground level and in bridge/ ROB/RUB/flyover piers and abutments,
- iii) boulders requiring blasting.

d) Hard Rock (using controlled blasting):

Hard rock requiring blasting as described under (c) but where controlled blasting is to be carried out in locations where built-up area, huts, and are situated at within 200m of the blast site. -

e) Hard Rock (blasting prohibited)

Hard rock requiring blasting as described under (d) but where blasting is prohibited for any reason like people living within 20 m of blast sites etc. and excavation has to be carried out by chiselling, wedging or any other agreed method.

f) Marshy soil

This shall include soils like soft clays and peats excavated below the original ground level of marshes and swamps and soils excavated from other areas requiring continuous pumping or bailing out of water.

301.2.2 Authority for Classification

The classification of excavation shall be decided by the Engineer and his decision shall be final and binding on the Contractor. Merely the use of explosives in excavation will not be considered as a reason for higher classification unless blasting is clearly necessary in the opinion of the Engineer.

301.3 Construction Operations

301.3.1 Setting Out

After the site has been cleared as per Clause 201, the limits of excavation shall be set out true to lines, curves, slopes, grades and sections as shown on the drawings or as directed by the Engineer. Clause 109 shall be applicable for the setting out operations.

301.3.2 Stripping and Storing Top soil

When so directed by the Engineer, the topsoil existing over the sites of excavation shall be stripped to specified depths and stock piled at designated locations for re-use in covering embankment slopes, cut slopes, berms, and other disturbed areas where re-vegetation is desired in accordance with Clause 305.3.3. Prior to stripping the topsoil, all trees, shrubs etc. shall be removed along with their roots, with approval of the Engineer.

301.3.3 Excavation-General

All excavations shall be carried out in conformity with the directions laid here-in-under and in a manner approved by the Engineer. The work shall be so done that the suitable

materials available from excavation are satisfactorily utilized as deemed fit or as approved by the Engineer.

While planning or executing excavations, the Contractor shall take all adequate precautions against soil erosion, water pollution etc. as per Clause 306, and take appropriate drainage measures to keep the site free of water in accordance with Clause 311.

The excavations shall conform to the lines, grades side slopes and levels shown on the drawings or as directed by the Engineer. The Contractor shall not excavate outside the limits of excavation. Subject to the permitted tolerances, any excess depth/width excavated beyond the specified levels/dimensions on the drawings shall be made good at the cost of the Contractor with suitable material of characteristics similar to that removed and compacted to the requirements of Clause 305.

All debris and loose material on the slopes of cuttings shall be removed. No backfilling shall be allowed to obtain required slopes excepting that when boulders or soft materials are encountered in cut slopes, these shall be excavated to approved depth on instructions of the Engineer and the resulting cavities filled with suitable material and thoroughly compacted in an appropriate manner.

After excavation, the sides of excavated area shall be trimmed and the area contoured to minimize erosion and ponding, allowing for natural drainage to take place.

301.3.4 Methods, Tools, and Equipment

Only such methods tools and equipment as approved by the Engineer shall be adopted/ used in the work. If so desired by the Engineer, the Contractor shall demonstrate the efficacy of the type of equipment to be used before the commencement of work.

301.3.5 Rock Excavation

Rock, when encountered in road excavation, shall be removed upto the formation level or as otherwise indicated in the drawings. Where, however, unstable shales or other unsuitable materials are encountered at the formation level, these shall be excavated to the extent of 500 mm below the formation level or as otherwise specified. In all cases, the excavation operations shall be so carried out that at no point on cut formations the rock protrudes above the specified levels. Rocks and boulders which are likely to cause differential settlement and also local drainage problems shall be removed to the extent of 500 mm below the formation level in the formation width including side drains.

Where excavation is done to levels lower than those specified, the excess excavation shall be made good as per Clauses 301.3.3 and 301.6 to the satisfaction of the Engineer. Slopes in rock cutting shall be finished to uniform lines corresponding to slope lines shown on the drawings or as directed by the Engineer. Notwithstanding the foregoing all loose pieces of rock on excavated slope surface which move when pierced by a crowbar shall be removed.

Where blasting is to be resorted to, the same shall be carried out as per Clause 302 and all precautions indicated therein observed,

Where presplitting is prescribed to be done for the establishment of a specified slope in rock excavation, the same shall be carried out as per Clause 303.

301.3.6 Marsh Excavation

The excavation of soil from marshes/swamps shall be carried out as per the programme approved by the Engineer.

Excavation of marshes shall begin at one end and proceed in one direction across the entire marsh immediately ahead of backfilling with materials like boulders sand murrum bricks bats, dismantled concrete as approved by the Engineer. The method and sequence of excavating and backfilling shall be such as to ensure, to the extent practicable, the complete removal or displacement of all muck from within the lateral limits indicated on the drawings or as staked by the Engineer.

301.3.7 Excavation of Road Shoulders / Verge / Median for Widening of Pavement or Providing Treated Shoulders

In the works involving widening of existing pavements or providing paved shoulders the existing shoulders/verge/median shall be removed to its full width and upto top of the subgrade. The subgrade material within 500 mm from the bottom of the pavement for the widened portion or paved shoulders shall be loosened and recompacted as per Clause 305. Any unsuitable material found in this portion shall be removed and replaced with the suitable material while doing so, care shall be taken to see that no portion of the existing pavement designated for retention is loosened or disturbed. If the existing pavement gets disturbed or loosened, it shall be dismantled and cut to a regular shape with sides vertical and the disturbed/loosened portion removed completely and re-laid as directed by the Engineer, at the cost of the Contractor.

301.3.8 Excavation for Surface/Sub-Surface Drains

Where the Contract provides for construction of surface/sub-surface drains, the same shall be done as per Clause 309. Excavation for these drains shall be carried out in proper sequence with other works as approved by the Engineer.

301.3.9 Slides

If slips, slides, over-breaks or subsidence occur in cuttings during the process of construction, they shall be removed at the cost of the Contractor as ordered by the Engineer. Adequate precautions shall be taken to ensure that during construction, the slopes are not rendered unstable or give rise to recurrent slides after construction. If finished slopes slide into the roadway subsequently, such slides shall be removed and paid for at the Contract rate for the class of excavation involved, provided the slides are not due to any negligence on the part of the Contractor. The classification of the debris material from the slips, slides etc. shall conform to its condition* at the time of removal and payment made accordingly regardless of its condition earlier.

301.3.10 Dewatering

If water is met with in the excavations due to springs, seepage, rain or other causes, it shall be removed by suitable diversions, pumping or bailing out and the excavation kept dry whenever so required or directed by the Engineer. Care shall be taken to discharge the drained water into suitable outlets as not to cause damage to the works, crops or any other property. Due to any negligence on the part of the Contractor, if any such damage is caused, it shall be the sole responsibility of the Contractor to repair/restore to the original condition at his own cost or compensate for the damage.

301.3.11 Use and Disposal of Excavated Materials

All the excavated materials shall either be reused with the approval of the Engineer or disposed of with all leads and lifts as directed by the Engineer.

301.3.12

Backfilling

Backfilling of masonry/concrete hume pipe or drain excavation shall be done with approved material with all leads and lifts after concrete/masonry/hume pipe is fully set and carried out in such a way as not to cause undue thrust on any part of the structure and/or not to cause differential settlement. All space between the drain walls and the side of the excavation shall be backfilled to the original surface making due allowance for settlement, in layers not exceeding 150 mm compacted thickness to the required density, using suitable compaction equipment such as trench compactor, mechanical tamper, rammer or plate compactor as directed by the Engineer.

301.4

Plying of Construction Traffic

Construction traffic shall not use the cut formation and finished subgrade without the prior permission of the Engineer. Any damage arising out of such use shall be made good by the Contractor at his own cost.

301.5

Preservation of Property

The Contractor shall undertake all reasonable precautions for the protection and preservation of any or all existing roadside trees, drains, sewers, sub-surface drains, pipes, conduits and any other structures under or above ground, which may be affected by construction operations and which, in the opinion of the Engineer, shall be continued in use without any change. Safety measures taken by the Contractor in this respect, shall be got approved from the Engineer. However, if any, of these objects is damaged by reason of the Contractor's negligence, it shall be replaced or restored to the original condition at his cost. If the Contractor fails to do so, within the required time as directed by the Engineer or if, in the opinion of the Engineer, the actions initiated by the Contractor to replace/restore the damaged objects are not satisfactory, the Engineer shall arrange the replacement/restoration directly through any other agency at the risk and cost of the Contractor after issuing prior notice to the effect.

301.6

Preparation of Cut Formation

The cut formation, which serves as a sub-grade, shall be prepared to receive the sub-base/ base course as directed by the Engineer.

Where the material in the subgrade has a density less than specified in Table 300-1, the same shall be loosened to a depth of 500 mm and compacted in layers in accordance with the requirements of Clause 305 adding fresh material, if any required, to maintain the formation level as shown on the drawings. Any unsuitable material encountered in the subgrade level shall be removed as directed by the Engineer, replaced with suitable material and compacted in accordance with Clause 305.

In rocky formations the surface irregularities shall be corrected and the levels brought up to the specified elevation with granular base material as directed by the Engineer, laid and compacted in accordance with the respective Specifications for these materials. The unsuitable material shall be disposed of in accordance with Clause 301.3.11. After satisfying the density requirements, the cut formation shall be prepared to receive the sub-base/base course in accordance with Clauses 310 and 311.

301.7

Finishing Operations

Finishing operations shall include the work of properly shaping and dressing all excavated surfaces.

When completed, no point on the slopes shall vary from the designated slopes by more than 150 mm measured at right angles to the slope, except where excavation is in rock (ordinary or hard) where no point shall vary more than 300 mm from the designated slope. In no case shall any portion of the slope encroach on the roadway.

The finished cut formation shall satisfy the surface tolerances described in Clause 902.

Where directed, the topsoil removed and conserved (Clauses 301.3.2 and 305.3.3) shall be spread over cut slopes, shoulders and other disturbed areas. Slopes may be roughened and moistened slightly, prior to the application of topsoil, in order to provide satisfactory bond. The depth of topsoil shall be sufficient to sustain plant growth, the usual thickness being from 75 mm to 100 mm.

301.8 Measurements for Payment

Excavation for roadway shall be measured by taking cross-sections at suitable intervals before the excavation starts (after clearing and grubbing/stripping etc. as the case may be) and after its completion and computing the volumes in cu.m by the method of average end areas for each class of material encountered. 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, 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.

For rock excavation, the overburden shall be removed first so that necessary cross-sections could be taken for measurement. Where cross-sectional measurements could not be taken due to irregular configuration or where the rock is admixed with other classes of materials, the volumes shall be computed on the basis of measurement of stacks of excavated rubble allowing a deduction of 35% therefrom. When volume is calculated on the basis of measurement of stacks of the excavated material other than rock, a deduction of 16% of stacked volume shall be allowed.

Works involved in the preparation of cut formation shall be measured in units indicated below:

v)	Loosening and recompacting the loosened material at subgrade	Cum.
vi)	Loosening and removal of unsuitable material and replacing with suitable material and compacting to required density	Cum.
vii)	Preparing rocky subgrade	Sqm.
viii)	Stripping including storing and reapplication of topsoil	Cum.

301.9 Rates

301.9.1 The Contract unit rates for the items of roadway and drain excavation shall be payment in full for carrying out the operations required for the individual items including full compensation for:

- ii) setting out;

- ii) transporting the excavated materials for use or disposal with all leads and lifts by giving suitable credit towards the cost of re-usable material and salvage value of unusable material;
- iii) trimming bottoms and slopes of excavation;
- iv) dewatering;
- v) keeping the work free of water as per Clause 311;
- vi) arranging disposal sites; and
- vii) all labour, materials, tools, equipment., safety measures, testing and incidentals necessary to complete the work to Specifications.

Where presplitting of rock is prescribed it shall be governed by Clause 303.5.

301.9.2 The Contract unit rate for loosening and recompacting the loosened materials at subgrade shall include full compensation for loosening to the specified depth, including breaking clods, spreading in layers, watering where necessary and compacting to the requirements.

301.9.3 Clauses 301.9.1 and 305.8 shall apply as regards Contract unit rate for item of removal of unsuitable material and replacement with suitable material respectively.

301.9.4 The Contract unit rate for item of preparing rocky sub-grade as per Clause 301.6 shall be full compensation for providing, laying and compacting granular base material for correcting surface irregularities including all materials, labour and incidentals necessary to complete the work and all leads and lifts.

301.9.5 The Contract unit rate for the items of stripping and storing topsoil and of reapplication of topsoil shall include full compensation for all the necessary operations including all lifts and leads.

302 BLASTING OPERATIONS

302.1 General

Blasting shall be carried out in manner that completes the excavation to the lines indicated in drawings, with the least disturbance to adjacent material. It shall be done only with the written permission of the Engineer. All the statutory laws, regulations, rules, etc., pertaining to the acquisition, transportation, storage, handling and use of explosives shall be strictly followed by the contractor.

The Contractor may adopt any method or methods of blasting consistent with the safety and job requirements. Prior to starting any phase of the operation, the Contractor shall provide information describing pertinent blasting procedures, dimensions and notes.

The magazine for the storage of explosives shall be built to the designs and specifications of the Explosives Department concerned and located at the approved site. The storage places shall be clearly marked "DANGER-EXPLOSIVES". The Contractor shall be liable for property damage, injury or death resulting from the use of explosives. All permits shall be obtained by the Contractor. No unauthorized person shall be admitted into the magazine which, when not in use, shall be kept securely locked. No matches or inflammable material shall be allowed in the magazine. The magazine shall have an effective lightning conductor. The following shall be hung in the lobby of the 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, and
- d) A notice that smoking is strictly prohibited.

All explosives shall be stored in a secure manner in compliance with all laws and ordinances, and all such storage places shall be marked. Where no local laws or ordinances apply, storage shall be provided to the satisfaction of the Engineer and in general not closer than

300 m from the road or from any building or camping area or place of human occupancy. In addition to these, the Contractor shall also observe the following instructions and any further additional instructions which may be given by the Engineer and shall be responsible for damage to property and any accident which may occur to workmen or public on account of any operations connected with the storage, handling or use of explosives and blasting. The Engineer shall frequently check the Contractor's compliance with these precautions.

302.2 Materials, Tools and Equipment

All the materials, tools and equipment used for blasting operations shall be of approved type. The Engineer may specify the type of explosives 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 length being cut as will permit sufficient time to the firer to reach safely before explosion takes place. Detonators shall be capable of giving effective blasting of the explosives. The blasting powder, explosives, detonators, fuses, etc., shall be fresh and not damaged due to dampness, moisture or any other cause. They shall be inspected before use and damaged articles shall be discarded totally and removed from the site immediately.

302.3 Personnel

The blasting operation shall remain in the charge of competent and experienced supervisor and workmen who are thoroughly acquainted with the details of handling explosives and blasting operations.

302.4 Blasting Operations

The blasting shall be carried out during the pre-determined 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. The hours shall be made known to the people in the vicinity.

The Contractor shall notify each public utility company having structures in proximity to the site of the work of his intention to use explosives. Such notice shall be given sufficiently in advance to enable the companies to take such steps as they may deem necessary to protect their property from injury. In advance of any blasting work within 50 m of any railway track or structures, the Contractor shall notify the concerned Railway Authority of the location, date, time and approximate duration of such blasting operation.

Red danger flags shall be displayed prominently in all directions during the blasting operations. The flags shall be planted 200 m from the blasting site in all directions. People, except those who actually light the fuse, shall be prohibited from entering this area and all persons including workmen shall be kept away from the flagged area; and

all persons; including workmen shall be removed from the flagged area at least 10 minutes before the firing. A warning siren shall be sounded for the above purpose.

Only controlled blasting shall be resorted to along with the safeguard above at locations where built-up area, huts and structures in use lie within 200 m. Similarly, excavation of hard rock without blasting is mandatory where people live within 20 m of blast site.

The charge holes shall be drilled to required depths and at suitable places. Blasting should be as light as possible consistent with thorough breakage of the material necessary for economic loading and hauling. Any method of blasting which leads to overshooting shall be discontinued.

When blasting is done with powder, the fuse cut to the required length shall be inserted into the hole and the powder dropped shall be gently tamped with copper rods with rounded ends. The explosive powder shall then be covered with tamping material which shall be tamped lightly but firmly.

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 the 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. Boreholes shall be cleared of all debris and explosives inserted. The space of about 200 mm above the charge shall then be gently filled with dry clay, pressed home and the rest of the tamping formed of any convenient material gently packed with a wooden rammer.

At a time not more than 10 such charges will be prepared and fired. The man in charge shall blow a siren in a recognized manner for cautioning the people. All the people shall then be required to move to safe distances. The charges 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.

After blasting operation, the Contractor shall compact the loose residual material below subgrade and replace the material removed below subgrade with suitable material.

302.5

Misfire

In case of misfire, the following procedure shall be observed:

- iii) Sufficient time shall be allowed to account for the delayed blast. The man-in-charge shall inspect all the charges and determine the missed charge.
- iv) If it is the blasting powder charge, it shall be completely flooded with water. A new hole shall be drilled at about 450 mm from the old hole and fired. This should blast the old charge. In case, it does not blast the old charge, the procedure shall be repeated till the old charge is blasted.
- iii) In case of charges of gelignite, 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 300 mm of tamping and the direction then ascertained by placing a stick in the hole. Another hole may then be drilled 150 mm 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 Contractor's office and the Engineer all cases of misfire, the cause of the same and what steps were taken in connection therewith.

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 for inspection to ascertain whether all the remaining materials in the box are also defective.

302.6 Account

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

304 EXCAVATIONS FOR STRUCTURES

304.1 Scope

Excavation for structures shall consist of the removal of material for the construction of foundations for bridges, culverts, retaining walls, headwalls, cutoff 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. The work shall include construction of the necessary cofferdams and cribs and their subsequent removal; all necessary sheeting, shoring, bracing, draining and pumping; the removal of all logs, stumps, grubs and other deleterious matter and obstruction, necessary for placing the foundations; trimming bottoms of excavations; backfilling and clearing up the site and the disposal of all surplus material.

304.2 Classification of Excavation

All materials involved in excavation shall be classified in accordance with Clause 301.2.

304.3 Construction Operations

304.3.1 Setting Out

After the site has been cleared according to Clause 201, the limits of excavation shall be set out true to lines, curves and slopes to Clause 301.3.1.

304.3.2 Excavation

Excavation shall be taken to the width of the lowest step of the footing including additional width as required for construction operation. The sides shall be left plumb where the nature of soil allows it. Where the nature of soil or the depth of the trench and season of the year do not permit vertical sides, the Contractor at his own cost 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.

The depth to which the excavation is to be carried out shall be as shown on the drawings, unless the type of material encountered is such as to require changes, in which case the depth shall be as ordered by the Engineer. Propping shall be undertaken when any foundation or stressed zone from an adjoining structure is within a line of 1 vertical to 2 horizontals from the bottom of the excavation.

Where blasting is to be resorted-to, the same shall be carried out in accordance with Clause 302 and all precautions indicated therein observed. Where blasting is likely to endanger adjoining foundations or other structures, necessary precautions such as

controlled blasting, providing rubber mat cover to prevent flying of debris etc. shall be taken to prevent any damage.

304.3.3 Dewatering and Protection

Normally, open foundations shall be laid dry. Where water is met with in excavation due to stream flow, seepage, springs, rain or other reasons, the Contractor shall take adequate measures such as bailing, pumping, constructing diversion channels, drainage channels, bunds, depression of water level by well-point system, cofferdams and other necessary works 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 the approval of the Engineer. Approval of the Engineer shall, however, not relieve the Contractor of the responsibility for the adequacy of dewatering and protection arrangements for the quality and safety of the works.

Where cofferdams are required, these shall be carried to adequate depths and heights, be safely designed and constructed and be made as watertight as is necessary for facilitating construction to be carried out inside them, the interior dimensions of the cofferdams shall be such as to give sufficient clearance for the construction and inspection and to permit installation of pumping equipments, etc., inside the enclosed area.

If it is determined beforehand that the foundations cannot be laid dry or the situation is found that the percolation is too heavy for keeping the foundation dry, the foundation concrete shall be laid under water by tremie pipe only. In case of flowing water or artesian springs, the flow shall be stopped or reduced as far as possible at the time of placing the concrete.

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

At the discretion of the Contractor, cement grouting or other approved methods may be used to prevent or reduce seepage and to protect the excavation area.

The Contractor shall take all precautions in diverting channels and in discharging the drained water as not to cause damage to the works, crops or any other property.

304.3.4 Preparation of Foundation

The bottom of the foundation shall be levelled both longitudinally and transversely or stepped as directed by the Engineer. 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, the extra depth shall be made up with concrete as per Clause 2104.1 at the cost of the Contractor. Ordinary filling shall not be permitted to bring the foundation to the design level as shown in the drawing.

When rock or other hard strata is encountered, it shall be freed of all soft and loose material, cleaned and cut to a firm surface either level or stepped as directed by the Engineer. All seams shall be cleaned out and filled with cement mortar or grout to the

satisfaction of the Engineer. In the case of excavation in rock, annular space around footing shall be filled with lean concrete M 15 upto the top level of rock.

If the depth of fill required is more than 1.5 m in soft rock or 0.6 m in hard rock above the foundation level, the filling upto this level shall be done with M-15 concrete-and portion above shall be filled by concrete or by boulders grouted with cement.

When foundation piles are used, the excavation for pile cap shall be done after driving/casting of all piles forming the group. After pile driving operations in a given pit are completed, all loose and displaced materials therein shall be removed to the level of the bottom of the- pile cap.

304.3.5 Slips and Slip-Outs

If there are any slips or slip-outs in the excavation, these shall be removed by the Contractor at his own cost.

304.3.6 Public Safety

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. For safety precautions, guidance may be taken from IS:3764.

304.3.7 Backfilling

Backfilling shall be done with approved material 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 in layers not exceeding 150 mm compacted thickness. The compaction shall be done with the help of suitable equipment such as trench compactor, mechanical tamper, rammer, plate vibrator etc., after necessary watering, so as to achieve the maximum dry density.

304.3.8 Disposal of Surplus Excavated Materials

Clause 301.3.11 shall apply.

304.4 Measurements for Payment

Excavation for structures shall be measured in cum for each class of material encountered, limited to the dimensions shown on the drawings or as directed by the Engineer. Excavation over increased width, cutting of slopes, production/support to the existing structures shoring, shuttering and planking shall be deemed as incidental to the main work and shall not be measured and paid separately.

Preparation of rock foundation shall be measured in square metres.

304.5 Rates

304:5.1 The Contract unit rate for the items of excavation for structures shall be payment in full for carrying out the, required operations including full compensation for:

- i) Setting out;
- ii) Transporting the excavated materials for use or disposal with all leads and lifts;
- iii) Construction of necessary cofferdams, cribs/sheeting, shoring and bracing and their subsequent removal;
- iv) Removal of all logs, stumps, grubs and other deleterious matter and obstructions, for placing the foundations including trimming of bottoms of excavations;
- v) Foundation sealing, dewatering including pumping when no separate provision for it is made in the Contract;
- vi) Backfilling, clearing up the site and disposal of all surplus material with all leads and lifts or as otherwise specified; and
- vii) All labour, materials, tools, equipment, safety measures, diversion of traffic and incidentals necessary to complete the work to Specifications.

304.5.2 The Contract unit rate for preparation of rock foundation shall be full compensation for cutting, trimming, and cleaning the foundation surface and filling/sealing of all seams with cement grout or mortar including all materials, labour and incidentals required for completing the work.

Item No. 14

Excavation of foundation in Sand gravel clay soft soil and murrum etc. including shoring, strutting dewatering as necessary and disposing of the excavated stuff as directed. Depth upto 3.00mt.

- 1. The relevant specification as per Item No. 10 Shall apply to this item.
- 2. Mode of Measurement & payment for this item shall be done in Cum basis.

Item No. 15

Excavation of foundation in hard murrum and boulders and very stiff or sticky clays and other similar strata including shorting out and strutting and dewatering as necessary and disposing of the excavated stuff as directed.

- 1. The relevant specification as per Item No. 10 Shall apply to this item.
- 2. Mode of Measurement & payment for this item shall be done in Cum basis.

Item No. 16

Excavation in large boulders and soft rock by wedging including shoring, strutting, and dewatering as necessary and disposing of the excavated stuff as directed.

- 1. The relevant specification as per Item No. 13 Shall apply to this item.
- 2. Mode of Measurement & payment for this item shall be done in Cum basis.

Item No. 17

Excavation in hard rock by dry-wet blasting and chiseling including dewatering, preparing foundation base by proper benching, and stepping and disposing of the excavated stuff as directed (B) Blasting prohibited.

- 1. The relevant specification as per Item No. 13 Shall apply to this item.
- 2. Mode of Measurement & payment for this item shall be done in Cum basis.

Item No. 18

Providing and fixing Mild steel dowel bar of minimum 32mm 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. The relevant specifications of MoRT&H (5th revision) section 2100, 1600 & 1700 as per item description shall apply to this item.

2. 32 mm Dia. MS dowel bar must be confirming to IS:432 (Part-I)
3. The measurement & payment shall be in Rmt basis.

Item No. 19

Providing and laying rubble for apron (Each stone weighting not less than 40kg) including and packing and filling in the interstices with quarry spall.

1. The relevant specifications as per MORTH specification as given in section 2500 shall apply to this item.
2. The measurement and payment shall be in Cum basis.

Item No. 20

Providing and casting in situ ordinary cement concrete M15 mix and providing necessary vertical pin headers including formwork, vibrating, ramming, and curing complete.

1. The relevant specifications given for machine mixed plain cement concrete M15 grade as per Section -1500, 1700 & 2100 of MORT&H fifth revision specification.
2. The measurement & payment shall be per cum basis.
3. The rate is inclusive of all materials, including necessary dewatering, mixing in fully automatic batch mix plant, transport, curing, vibrating, placing in position, shuttering, formworks, de-shuttering carefully, making good the damages, fixing embedment, inserts, pockets, wherever necessary, with all lead and lift with contractor's labour, tools & plants, machineries, as required.

Item No. 21

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

1. The relevant specification as per Item No. 20 Shall apply to this item.
2. The measurement and payment shall be done in Cum basis.

Item No. 22

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

1. The relevant specification as per Item No. 20 Shall apply to this item.
2. The measurement and payment shall be done in Cum basis.

Item No. 23

Providing and filling in foundation with ordinary cement concrete M-150 mix and providing necessary vertical pin headers incl. Formwork, vibrating, ramming, and curing complete.

1. The relevant specification as per Item No. 20 Shall apply to this item.
2. The measurement and payment shall be done in Cum basis.

Item No. 24

Providing & laying rubble soling (hand packing) on prepared surface and filling interstice with sand including all material, spreading, watering etc. completed as directed.

1. The Relevant specification of MoRT&H (5th revision) shall be applied as per item description and as directed by engineer in-charge.
2. The measurement and payment shall be in cum basis.

Item No. 25

Providing and laying Rigid Flooring complete as per drawing and technical specifications laid over cement concert bedding. (A) Rubble stone laid in cement mortar 1:3

1 RUBBLE STONE/CEMENT CONCRETE BLOCK FLOORING OVER CEMENT CONCRETE BEDDING

1.1 The work shall consist of constructing rubble stone/cement concrete block flooring laid over a bedding of cement concrete (M15).

1.2 Construction Operations

Excavations for laying the bedding and floor protection works shall be carried out as per specifications under proper supervision before laying the foundation and protection walls, the excavated trenches shall be inspected by the Engineer to ensure that:

- a) There are no loose pockets and unfilled depressions left in the trench
- b) The soil at the founding level is properly compacted to true lines and level so as to have even bedding.
- c) All concrete and other elements are laid in dry bed.

Bedding of cement concrete nominal mix (grade M15) of 300 mm thickness shall then be laid in accordance with Section 1700 of these Specifications except that the surface of the concrete shall not be given a smooth finish.

Flooring shall consist of 150 mm thick flat stone/cement concrete block M15 grade conforming to Section 1700 of these Specifications. It shall be bedded on a layer of cement mortar (1:3) prepared to Section 1300 of these Specifications. Spalls shall be used to fill in the voids. The joints shall be filled with cement mortar and finished neat. The stone shall break joints and the thickness of joints shall not exceed 20 mm. The top of flooring shall be kept 300 mm below the lowest bed level.

2 TESTS AND STANDARDS OF ACCEPTANCE

The materials shall be tested in accordance with these Specifications and shall meet the prescribed criteria.

The work shall conform to these Specifications and shall meet the prescribed standards of acceptance.

3 MEASUREMENTS FOR PAYMENT

Rubble stone/cement concrete block flooring and cement concrete bedding shall be measured in cubic metres for each class of material.

Preparation of base for laying the flooring shall be deemed incidental to the work.

For laying apron, excavation upto an average depth of 150 mm shall be deemed to be included in the main item and shall not be measured separately unless otherwise specified. Excavation more than 150 mm shall be measured in cubic metres as per Section 300 of these Specifications.

If directed by the Engineer, the materials shall have to be stacked at site before laying and such stacking shall be considered incidental to the work.

4 RATE

The contract unit rate for rubble stone/cement concrete block flooring shall include the cost of all material, labour and tools and plant for completing the work as per specifications for the relevant item.

Item No. 26

Providing & laying 22.5 cm thick dry rubble stone pitching on side slope on existing earthwork on murrum bed 7.50 cm thick & filling interstice with murrum & providing Flush pointing in CM 1:3 etc complete including curing & preparing slope in Earth work as directed.

1. The relevant specifications of MoRT&H (5th revision) as given in Section no. 2504 & 2506 shall apply to this item.
2. The measurement and payment shall be in Sqm basis.

Item No. 27

Providing parapet of ordinary cement concrete M20 as per detailed drawing with necessary reinforcement including shuttering laying vibrating and finishing to line and level complete (ii) cast in situ.

1 Cast In-Situ Concrete Railing / Crash Barrier

The portion of the railing/crash barrier or parapet which is to be cast in-situ shall be constructed in accordance with the requirements for Structural Concrete Section and reinforcement conforming to Sections 1600 and 1700 of these Specifications.

Forms shall be fabricated conforming to the shape of railing/crash barrier shown on the drawings. It shall be ensured that no form joint appears on plane surfaces. For bridges/viaducts of length more than 500 m horizontal slip forms shall be used for casting of crash barriers.

All mouldings panel work and bevel strips shall be constructed according to the details shown on the drawings. All comers in the finished work shall be true, sharp and clean-cut and shall be free from cracks, spalls, or other defects. Castings of posts shall be done in single pour.

2 TESTS AND STANDARDS OF ACCEPTANCE

The material shall be tested in accordance with these Specifications and shall meet the prescribed criteria and requirements.

The work shall conform to these Specifications and shall meet the prescribed standards of acceptance.

3 The Mode of Measurement for cast in-situ railing/parapet wall shall measure in running metres basis.

4 The contract unit rate of railing shall include the cost of all labour, material, formwork, tools, and plant required for completing the work as per these Specifications.

Item No. 28

Providing parapet of ordinary cement concrete M-30 as per detailed drawings with necessary reinforcement including, shuttering, laying vibrating and finishing to line and level complete. (ii) Cast in situ.

1. The Relevant Specification of Item No. 27 shall apply to this item.
2. The measurement and payment shall be in Cum basis.

Item No. 29

Providing and casting in situ Controlled cement concrete M-200 for R.C.C. work in Piers, abutment, returns and riding returns as per drawing including centering, shuttering, scaffolding where necessary

laying, vibrating curing, and finishing complete. (A) For all Height

1. The relevant specifications given for machine mixed plain cement concrete M35 grade as per Section -1000, 1500, 1700 & 2200 of MORT&H fifth revision specification.
2. The measurement shall be per **cum.** basis.
3. The rate is inclusive of all materials, including necessary dewatering, mixing in fully automatic batch mix plant, transport, curing, vibrating, placing in position, shuttering, formworks, de-shuttering carefully, making good the damages, fixing embedment, inserts, pockets, wherever necessary, with all lead and lift with contractor's labour, tools & plants, machineries, as required.
4. The mode of payment shall be in per **cum.** Basis.

Item No. 30

Providing and casting in situ Controlled cement concrete M-30 for C.C. work in Piers, abutment, returns and riding returns as per drawing including centering, shuttering, scaffolding where necessary laying, vibrating curing, and finishing complete. (A) For all Height

1. The relevant specifications given for machine mixed plain cement concrete M35 grade as per Section – 1000, 1500, 1700 & 2200 of MORT&H fifth revision specification.
2. The measurement shall be per **cum.** basis.
3. The unit rate is inclusive of all materials, including necessary dewatering, mixing in fully automatic batch mix plant, transport, curing, vibrating, placing in position, shuttering, formworks, de-shuttering carefully, making good the damages, fixing embedment, inserts, pockets, wherever necessary, with all lead and lift with contractor's labour, tools & plants, machineries, as required.
4. The mode of payment shall be in per **cum.** Basis.

Item No. 31

Providing and casting in situ Controlled Cement Concrete M-200 for R.C.C. Raft and cut-off walls including necessary shuttering laying, vibrating ramming of curing complete.

1. The relevant specifications given for machine mixed plain cement concrete M35 grade as per Section – 1000, 1500, 1700 & 2100 of MORT&H fifth revision specification.
2. The measurement shall be per **cum.** basis.
3. The unit rate is inclusive of all materials, including necessary dewatering, mixing in fully automatic batch mix plant, transport, curing, vibrating, placing in position, shuttering, formworks, de-shuttering carefully, making good the damages, fixing embedment, inserts, pockets, wherever necessary, with all lead and lift with contractor's labour, tools & plants, machineries, as required.
4. The mode of payment shall be in per **cum.** Basis.

Item No. 32

Providing and casting in situ Ordinary cement concrete M20 for C.C. Toe Wall and Curtain walls including necessary shuttering laying, vibrating, ramming, and curing complete.

1. The relevant specifications given for machine mixed plain cement concrete M35 grade as per Section – 1000, 1500, 1700 & 2200 of MORT&H fifth revision specification.
2. The measurement shall be per **cum.** basis.
3. The unit rate is inclusive of all materials, including necessary dewatering, mixing in fully automatic batch mix plant, transport, curing, vibrating, placing in position, shuttering, formworks, de-shuttering carefully, making good the damages, fixing embedment, inserts, pockets, wherever necessary, with all lead and lift with contractor's labour, tools & plants, machineries, as required.
4. The mode of payment shall be in per **cum.** Basis.

Item No. 33

Providing and casting in situ Controlled Cement Concrete M25 for R.C.C. Raft and cut-off walls including necessary shuttering laying, vibrating ramming of curing complete.

1. The Relevant Specification of Item No. 31 shall apply to this item.
2. The measurement and payment shall be in Cum basis.

Item No. 34

Providing and casting in situ Controlled Cement Concrete M30 for R.C.C. Raft and cut-off walls including necessary shuttering laying, vibrating ramming of curing complete.

1. The Relevant Specification of Item No. 31 shall apply to this item.
2. The measurement and payment shall be in Cum basis.

Item No. 35

Providing and casting in situ Controlled Cement concrete M20 mix for R.C.C. works in pier cap, abutment cap, and dirt wall including controlled cement concrete M 25 bed block or pedestals for required size below bearings as per detailed drawings, centering, shuttering, scaffolding wherever necessary laying, vibrating, curing, and finishing complete.

1. The Relevant Specification of Item No. 32 shall apply to this item.
2. The measurement and payment shall be in Cum basis.

Item No. 36

Providing and casting in situ Controlled Cement concrete M30 mix for R.C.C. works in pier cap, abutment cap, and dirt wall including controlled cement concrete M 35 bed block or pedestals for required size below bearings as per detailed drawings, centering, shuttering, scaffolding wherever necessary laying, vibrating, curing, and finishing complete.

1. The Relevant Specification of Item No. 32 shall apply to this item.
2. The measurement and payment shall be in Cum basis.

Item No. 37

Providing and casting in situ Controlled cement concrete M25 for R.C.C. Solid slab including centering, scaffolding, curing, and finishing complete.

1. The relevant specifications given for machine mixed plain cement concrete M35 grade as per Section – 1000, 1500, 1700 & 2300 of MORT&H fifth revision specification.
2. The measurement shall be per cum. basis.
3. The unit rate is inclusive of all materials, including necessary dewatering, mixing in fully automatic batch mix plant, transport, curing, vibrating, placing in position, shuttering, formworks, de-shuttering carefully, making good the damages, fixing embedment, inserts, pockets, wherever necessary, with all lead and lift with contractor's labour, tools & plants, machineries, as required.
4. The mode of payment shall be in per cum. Basis.

Item No. 38

Providing and casting in situ Controlled cement concrete M30 for R.C.C. solid slab including centering, scaffolding, curing, and finishing complete.

1. The Relevant Specification of Item No. 37 shall apply to this item.
2. The measurement and payment shall be in Cum basis.

Item No. 39

Providing and casting in situ Controlled cement concrete M20 for average 75/150 mm thick wearing coat laid as directed including. tamping, vibrating, finishing, curing, and filling in joints with bitumen complete.

1. The relevant specifications given for machine mixed plain cement concrete M35 grade as per Section – 1000, 1500, 1700 & 2700 of MORT&H fifth revision specification.
2. The measurement shall be per cum. basis.
3. The unit rate is inclusive of all materials, including necessary dewatering, mixing in fully automatic batch mix plant, transport, curing, vibrating, placing in position, shuttering, formworks, de-shuttering carefully, making good the damages, fixing embedment, inserts, pockets, wherever necessary, with all lead and lift with contractor's labour, tools & plants, machineries, as required.
4. The mode of payment shall be in per cum. Basis.

Item No. 40

Providing and casting in situ Controlled cement concrete M30 for average 75mm thick wearing coat laid as directed including. tamping, vibrating, finishing, curing, and filling in joints with bitumen complete.

1. The Relevant Specification of Item No. 39 shall apply to this item.
2. The measurement and payment shall be in Cum basis.

Item No. 41

Providing and casting in situ Controlled cement concrete M20 mix for Approach slab including formwork, curing, and finishing complete.

1. The relevant specifications given for machine mixed plain cement concrete M35 grade as per Section – 1000, 1500, 1700 & 2700 of MORT&H fifth revision specification.
2. The measurement shall be per cum. basis.
3. The unit rate is inclusive of all materials, including necessary dewatering, mixing in fully automatic batch mix plant, transport, curing, vibrating, placing in position, shuttering, formworks, de-shuttering carefully, making good the damages, fixing embedment, inserts, pockets, wherever necessary, with all lead and lift with contractor's labour, tools & plants, machineries, as required.
4. The mode of payment shall be in per cum. Basis.

Item No. 42

Providing and casting in situ Controlled cement concrete- M25 mix for Approach slab including formwork, curing, and finishing complete.

1. The Relevant Specification of Item No. 41 shall apply to this item.
2. The measurement and payment shall be in Cum basis.

Item No. 43

Providing and casting in situ Controlled cement concrete M-30 mix for Approach slab including formwork, curing, and finishing complete.

1. The Relevant Specification of Item No. 41 shall apply to this item.
2. The measurement and payment shall be in Cum basis.

Item No. 44

Providing and casting in situ Controlled cement concrete- M20 mix for kerbs/Kerb blocks including formwork, curing, and finishing complete.

1. The relevant specifications given for machine mixed plain cement concrete M35 grade as per Section – 409, 1000, 1500 & 1700 of MORT&H fifth revision specification.
2. The measurement shall be per cum. basis.
3. The unit rate is inclusive of all materials, including necessary dewatering, mixing in fully automatic batch mix plant, transport, curing, vibrating, placing in position, shuttering, formworks, de-shuttering carefully, making good the damages, fixing embedment, inserts, pockets, wherever necessary, with all lead and lift with contractor's labour, tools & plants, machineries, as required.

4. The mode of payment shall be in per cum. Basis.

Item No. 45

Providing and casting in situ Controlled cement concrete M30 mix for kerbs/Kerb blocks including formwork, curing, and finishing complete.

1. The relevant specifications given for machine mixed plain cement concrete M35 grade as per Section – 409, 1000, 1500 & 1700 of MORT&H fifth revision specification.
2. The measurement shall be per cum. basis.
3. The unit rate is inclusive of all materials, including necessary dewatering, mixing in fully automatic batch mix plant, transport, curing, vibrating, placing in position, shuttering, formworks, de-shuttering carefully, making good the damages, fixing embedment, inserts, pockets, wherever necessary, with all lead and lift with contractor's labour, tools & plants, machineries, as required.
4. The mode of payment shall be in per cum. Basis.

Item No. 46

Providing and laying weep hole in Abutment and returns by using A.C pipe of 100mm. Incl. fixing in proper grade and jointing the complete as per detailed specification.

1 WEEP HOLES

Weep holes shall be provided on all plain concrete, reinforced concrete, brick masonry and stone masonry structures such as, abutment, wing wall and return walls as shown on the drawings or as directed by the Engineer to permit water to flow out without building up pressure in the back fill. Weep holes shall be provided with 100 mm diameter AC/PVC/HDPE pipe for structures in plain/reinforced concrete or brick masonry. In case of stone masonry, weep holes shall be of rectangular shape 80 mm wide, 150 mm high or circular with 150 mm diameter. Weep holes shall extend through the full width of concrete/masonry with slope of about 1 vertical: 20 horizontals towards the draining face. The spacing of weep holes shall be 1 m in either direction or as shown in the drawings with the lowest at 150 mm above the low water level or ground level whichever is higher or as directed by the Engineer.

2 TESTS AND STANDARDS OF ACCEPTANCE

The material shall be tested in accordance with these Specifications and shall meet the prescribed criteria and requirements.

The work shall conform to these Specifications and shall meet the prescribed standards of acceptance.

3 MEASUREMENTS FOR PAYMENT

Weep holes in concrete/brick masonry structure shall be measured in numbers. For structures in stone masonry, weep holes shall be deemed to be included in the item of stone masonry work and shall not be measured separately.

4 RATES

The contract unit rate for weep holes shall include the cost of all labour, material, tools, and plant required for completing the work as per these Specifications.

Item No. 47

Providing and laying filter media 600mm. thick directed at the back of abutments, returns and wing walls as per detailed specifications.

1. Well graded pebbles or metal of 40 mm to 63 mm size shall be used. The grading and tolerance of metal of pebbles should be as under.

Sr. No.	No. of Size range	Sieve designation	Percentage by weight passing through the sieve
1.	63 mm to 40 mm	90 mm	100-50
		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 wherein, tolerance limit for oversize shall be upto 15% and that for lower size should be upto 15% below 20 mm. It shall be tightly placed to a thickness 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 x 1.5 m x 0.5 m size on fairly level ground and measured.
3. The measurement & payment shall be made on **square meter** basis.
4. The unit rate includes the cost of materials, scaffolding, labour, and tools to complete the work.

Item No. 48

Providing and filling sand behind abutments and between riding return, square return in layers as directed.

1. The sand to be used for filling shall be coarse, granular, clean, free from dust and deleterious matters obtained from a source as approved by the Engineer-in-charge. Sand between returns shall confirm to I.S.: 383.
2. Sand between returns and below raft foundations shall be filled in suitable layers not exceeding 20 cms. at a time and each layer shall be well compacted.
3. Mode of measurement shall be the total cubical content (in **cmt.**) of the area covered by sand filling.

Item No. 49

Providing and fixing in position Mild steel dowel bars in pier cap or abutment caps for anchorage in fixed end as per detailed drawings including cutting bending and welding complete.

1. The relevant specifications as per IS 1786 Specification & as per relevant MORT&H fifth revision section 1600 shall apply to this item.
2. The measurement & payment shall be in Nos. basis.

Item No. 50

Providing and fixing in position Mild steel dowel bars in pier cap or abutment caps for anchorage in free end as per detailed drawings including cutting bending and welding complete.

1. The relevant specifications as per IS 1786 Specification & as per relevant MORT&H fifth revision section 1600 shall apply to this item.
2. The measurement & payment shall be in Nos. basis.

Item No. 51

Providing and laying in Position FE -500/550D TMT bar reinforcement including cutting, bending, hooking, and tying complete as per detailed drawings. For the RCC Raft footing, Open Footing.

1 DESCRIPTION

This work shall consist of furnishing and placing coated or uncoated mild steel or high strength deformed reinforcement bars of the shape and dimensions shown on the drawings and conforming to these Specifications or as approved by the Engineer.

2 GENERAL

Steel for reinforcement shall meet the requirements of Section 1000 of these Specifications.

Reinforcements may be either mild steel or high strength deformed bars. They may be uncoated or coated with epoxy.

3 PROTECTIONS OF REINFORCEMENT

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

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

In case of fusion bonded epoxy coated reinforcement or hot dipped galvanized bars used, reference shall be made Clause 1010.3.2 of Section 1000 of these specifications.

4 BENDING OF REINFORCEMENT

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

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

Bars shall be bent cold to the specified shape and dimensions or as directed by the Engineer using a proper bar bender, operated by hand or power to obtain the correct shape and radii of bends.

Bars shall not be bent or straightened in a manner that will damage the parent material or the coating.

Bars bent during transport or handling shall be straightened before being used on work. They shall not be heated to facilitate straightening.

5 PLACING OF REINFORCEMENT

- a) The reinforcement cage should generally be fabricated in the yard at ground level and then shifted and placed in position. The reinforcement shall be placed strictly in

- accordance with the drawings and shall be assembled in position only when the structure is otherwise ready for placing of concrete. Prolonged time gap between assembling of reinforcement and casting of concrete, which may result in rust formation on the surface of the bars, shall not be permitted.
- b) Reinforcement bars shall be placed accurately in position as shown on the drawings. The bars, crossing one another shall be tied together at every intersection with binding wire (annealed), conforming to IS:280 to make the skeleton of the reinforcement rigid such that the reinforcement does not get displaced during placing of concrete, or any other operation. The diameter of binding wire shall not be less than 1 mm.
 - c) Bars shall be kept in position usually by the following methods:
 - i) In case of beam and slab construction, industrially produced polymer cover blocks of thickness equal to the specified cover, shall be placed between the bars and formwork, subject to satisfactory evidence that the polymer composition is not harmful to concrete and reinforcement. Cover blocks made of concrete may be permitted by the Engineer, provided they have the same strength and specification as those of the member.
 - ii) In case of dowels for columns and walls, the vertical reinforcement shall be kept in position by means of timber templates with slots cut in them accurately, or with cover blocks tied to the reinforcement. Timber templates shall be removed after the concreting has progressed upto a level just below their location.
 - iii) Layers of reinforcements shall be separated by spacer bars at approximately one metre intervals. The minimum diameter of spacer bars shall be 12 mm or equal to maximum size of main reinforcement or maximum size of coarse aggregate, whichever is greater. Horizontal reinforcement shall not be allowed to sag between supports.
 - iv) Necessary stays, blocks, metal chairs, spacers, metal hangers, supporting wires etc. or other subsidiary reinforcement shall be provided to fix the reinforcement firmly in its correct position.
 - v) Use of pebbles, broken stone, metal pipe, brick, mortar or wooden blocks etc., as devices for positioning reinforcement shall not be permitted.
 - d) Bars coated with epoxy shall be placed on supports that do not damage the coating. Supports shall be installed in a manner such that planes of weakness are not created in hardened concrete. The coated reinforcing steel shall be held in place by use of plastic or plastic coated binding wires especially manufactured for the purpose. Refer Section 1000 of these Specifications for other requirements.
 - e) Placing and fixing of reinforcement shall be inspected and approved by the Engineer before concreting is commenced.

6 BAR SPLICES

6.1 Lapping

All reinforcement shall be furnished in full lengths as indicated on the drawing. No splicing of bars, except where shown on the drawing, shall be permitted without approval of the Engineer. The lengths of the splice shall be as indicated on drawing or as approved by the Engineer. Where practicable, overlapping bars shall not touch each other, and shall be kept apart by 25 mm or 1.25 times the maximum size of coarse aggregate, whichever is greater. If this is not feasible, overlapping bars shall be bound with annealed steel binding wire not less than 1 mm diameter and twisted tight in such a manner as to maintain minimum clear cover to the reinforcement from the concrete surface. Lapped splices shall be staggered or located at points along the span where stresses are low.

6.2 Welding

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

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

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

is 0.4 or less.

6.2.3 The method of welding shall conform to IS:2751 and IS:9417, any supplemental specifications and Clause 1904.8 of these Specifications to the satisfaction of the Engineer.

Welding may be carried out by metal arc welding process. Oxy-acetelene welding shall not be permissible. Any other process may be used subject to the approval of the Engineer and necessary additional requirements to ensure satisfactory joint performance. Precautions on overheating, choice of electrode, selection of correct current in arc welding etc., should be strictly observed.

All bars shall be butt welded except for smaller diameter bars (diameter of less than 20 mm) which may be lap welded. Single-V or Double-V butt joints may generally be used. For vertical bars single bevel or double bevel joints may be used.

Welded joints shall be located well away from bends and shall be not less than twice the bar diameter away from a bend.

Generally, shop welding in controlled conditions is to be preferred, where feasible, Site welding where necessary shall, however, be permitted when the facilities, equipment, process, consumables, operators and welding procedure, are adequate to produce and maintain uniform quality at par with that attainable in shop welding, to the satisfaction of the Engineer.

Joint welding procedures which are to be employed shall invariably be established by a procedure specification. All welders and welding operators to be employed shall be qualified by tests prescribed in IS:2751. Inspection of welds shall conform to IS:822 and destructive or non-destructive testing may be undertaken when deemed necessary. Joints with weld defects detected by visual inspection or dimensional check inspection shall not be accepted.

Suitable means shall be provided for holding the bars securely in position during welding. It must be ensured that no voids are left in welding. When welding is done in two or three stages, the surface shall be cleaned properly after each stage. Bars shall be cleaned of all loose scale, rust, grease, paint and other foreign matter before carrying

out welding. Only competent and experienced welders shall be employed on the work with the approval of the Engineer. No welding shall be done on coated bars.

M.S. electrodes used for welding shall conform to IS:814.

6.2.4 Welded joints shall preferably be located at points where steel will not be subject to more than 75 percent of the maximum permissible stresses and welds so staggered that at any one section, not more than 20 percent of the bars are welded.

6.2.5 Specimens of welded pieces of reinforcement taken from the site shall be tested. The number and frequency of tests shall be as directed by the Engineer.

6.3 Mechanical at Couplers and Anchorages

6.3.1 Mechanical Couplers

Bars may be joined with approved patented mechanical devices as indicated on the drawing or as approved by the Engineer e.g. by special grade steel sleeves swaged on to bars in end-to-end contact or by screwed couplers. In case such devices are permitted by the Engineer, they shall develop at least 125 percent of the characteristic strength of the reinforcement bar.

6.3.2 Anchorages

Bars may be anchored with approved patented mechanical anchorages as indicated on the drawing or as approved by the Engineer. The anchorages shall be connected to the reinforcing bar by the use of taper thread system. The anchorage shall be capable of developing the characteristic strength of reinforcement without damage to concrete and shall have sufficient diameter and width to develop adequate shear cone strength. The connection shall develop 125% of the characteristic strength of reinforcement bar.

7 TESTING AND ACCEPTANCE

The material shall be tested in accordance with relevant IS specifications and necessary test certificates shall be furnished. Additional tests, if required, will be got carried out by the Contractor at his own cost.

The supply fabrication and placing of reinforcement shall be in accordance with these Specifications and shall be as checked and accepted by the Engineer.

Manufacturer's test certificate regarding compliance with Indian Standards for each lot of steel, shall be obtained and submitted to the Engineer. If required by the Engineer, the Contractor shall carry out confirmatory tests in the presence of a person authorized by the Engineer.

Cost of these tests shall be borne by the Contractor. The sampling and testing procedure shall be as laid down in IS:1786. If any test piece selected from a lot fails, no re-testing shall be done and the lot shall be rejected.

8 MEASUREMENT FOR PAYMENT

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

and annealed steel wire or other methods for binding and placing, shall not be measured and cost of these items shall be deemed to be included in the rates for reinforcement.

9 RATE

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

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

Item No. 52

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

1. The Relevant Specification of Item No. 51 shall apply to this item.
2. The measurement and payment shall be in Metric tonne (M.T.) basis.

Item No. 53

Providing and laying in Position FE -500D/550D TMT bar reinforcement including cutting, bending, hooking, and tying complete as per detailed drawings for the following (A) Pier cap (B) Abutment cap & Dirt walls.

1. The Relevant Specification of Item No. 51 shall apply to this item.
2. The measurement and payment shall be in Metric tonne (M.T.) basis.

Item No. 54

Providing and laying in Position FE -500D/550D TMT bar reinforcement including cutting, bending, hooking, and tying complete as per detailed drawings for the following (A) Solid slab

1. The Relevant Specification of Item No. 51 shall apply to this item.
2. The measurement and payment shall be in Metric tonne (M.T.) basis.

Item No. 55

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

1. The Relevant Specification of Item No. 51 shall apply to this item.
2. The measurement and payment shall be in Metric tonne (M.T.) basis.

Item No. 56

Providing and fixing in position FE-500D/550D TMT bar reinforcement including cutting, bending, hooking, and tying complete as per detailed drawing (A)RCC kerb (B) RCC Footpath (C) RCC App. Slab (D) Wearing coat.

1. The Relevant Specification of Item No. 51 shall apply to this item.
2. The measurement and payment shall be in Metric tonne (M.T.) basis.

Item No. 57

Providing fusion bonded Epoxy coating not less than 175-micron thickness and up to 300 microns to reinforcement bars as per IS-13620-1993/ASTM-775 M including testing of coating at plant.

1. The relevant specification of MoRT&H (5th revision) as given in section 1000 & 1600 shall apply to this item. The Fusion Bonded Epoxy coating shall be confirming to IS-13620-1993.
2. The mode of measurement & payment shall be done in metric tonne (M.T.) basis.

Item No. 58

Providing 12mm. Thick Pre-moulded asphalt filler joints as per drawings.

3. The relevant specifications given in Section – 2604 of MORT&H fifth revision specification shall apply to this item.
4. The measurement & payment shall be in Sqm. basis

Item No. 59

Providing G.I. 100mm. Diameter water spouts including necessary iron gratings as per drawings.

1. Material for the drainage spout shall be as mentioned in the item and shall be got approved from the Engineer-in-charge.
2. Water spout shall be 100 mm internal dia. G.I. rating 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 for 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 C.I. pipes shall be painted with two coats of anticorrosive black bitumen paint.
3. Measurement & payment shall be per **number** of drainage spout fixed.
4. Unit rate includes necessary iron gratings as per drawings.

Item No. 60

Providing flood gauge marks on sub structure as per design including painting complete.

1. The width of the flood gauge be 60 cm. and will have caneri yellow background colour. The flood gauge marking will be in 10 thick strips of alternative black and white colour. the width of the strip shall be as under:

(a)	At every 10 cm.	15 cm width
(b)	At every 1/2 m.	25 cm width in black
(c)	At every meter	35 cm width in white

The lettering shall be in black colour and of 10 cm. height. The lettering shall show every meter and ½ m level. The lettering shall show level based on either GST B.M. or arbitrary B.M as furnished by Engineer in charge.

2. All the painting work shall be done in 3 coats. The paints shall be of approved make.
3. The measurements for payment shall be on linear meter Basis.
4. The unit rate includes the cost of materials, labour painting, equipment if any to complete the work.

Item No. 61

Painting Two Coats on New Concrete Surfaces (Painting two coats after filling the surface with synthetic enamel paint in all shades on new plastered concrete surfaces) - For inner face of Kerb / Crash Barrier

INTRODUCTION:

The objective of this work is to supply and application of a finish coat of Synthetic Enamel Paint on new concrete surface.

SCOPE OF WORK:

The contractor's scope of work shall comprise but not limited to the following:-

1. Preparation of all types of surfaces to be painted by removing all loose material / paint, dust, stain etc.
2. Supply & application of primer / putty wherever required.
3. Supply & application of one finish coat of Synthetic Enamel Paint of approved brand on concrete surface
4. Supply & application of Synthetic Enamel Paint of approved brand / make as per Annexure -1 on PPS fence & other as per specification and relevant item.

MATERIAL AND WORKMANSHIP:

1. All the materials, to be used in the work for the purpose of contract shall be as per standards / specifications and relevant test certificates showing requisite properties. The test certificates shall be submitted to the Engineer for his verification. Paints without test certificates or expired paints shall not be accepted.
2. All paints and paint constituents to be used for the work shall be delivered to the work area in original sealed containers, bearing manufacturer's labels, batch No., date of manufacture etc.
3. Constituent adhesives such as thinner, driers etc. shall be those recommended by the paint manufacturer.
4. The workmanship shall be one of the best class achievable in the industry and acceptable to the Engineer. Rectification on account of poor workmanship shall be done by the contractor to the satisfaction of Engineer.

Materials Required For Painting First Coat Primer and Two Subsequent Coats

Application of primer on walls / Concrete surfaces:-

- Cement primer
- Turpentine
- Putty
- Polish paper
- Wood primer
- Emery polish paper
- Water

DESCRIPTION OF ACTIVITIES TO BE CARRIED OUT AT SITE:

Preparation and cleaning of surface before painting:

- a. The existing painted surface should be cleaned thoroughly by using scrapers, wire brushes, emery paper, buffing wheels etc., thus making it free from all oil & grease, loose particles, rust, dust etc. to receive the finish coat.
- b. Surfaces shall be thoroughly cleaned to remove any dust, oil & grease with suitable cleaning agent followed by rinsing with clean water. Damaged painted areas shall be scrubbed thoroughly to achieve a clean surface. Pits / abrupt undulations shall be filled with compatible putty wherever required.
Walls, floors & ceiling and adjacent equipments and piping shall be satisfactorily protected by drop clothes.
Other precautionary measures should be taken during spray / brush painting to ensure that surrounding area /equipment is not affected.

Application of paint:

The application should be as per manufacturer's instructions / specifications. Before opening the packed drum, it should be rolled on the floor and after opening the drum paints shall be stirred well so

that no material/ pigments remains settled at the bottom. Suitably the paint shall be checked as per requirement before opening.

The choice of method of application i.e. by brush or by spray gun will be decided by the Engineer. However, adjacent equipment / structures shall be suitably protected and care shall be taken to prevent intoxication of the surrounding area. The method of paint application depending upon the area shall be jointly discussed and decided with Engineer. Paint thickness (DFT) shall be as per the item scheduled. In case the dry film thickness of finish paint is observed less than the specified values, additional coat shall have to be applied free of charge.

Inspection & check:

All the work is subject to the inspection of the Engineer or his authorized representative which shall be carried out in a manner, satisfactory to the Engineer. The contractor shall rectify any short comings pointed out by the said representative. The general inspection requirements are as follows:-

- a) No paint shall be applied until the authorized inspection has ascertained that all prepared surfaces are satisfactorily cleaned and are in a condition to ensure the proper receipt of and adhesion of the coating.
- b) The contractor shall furnish all gauges, instruments and the necessary measuring equipments required for inspecting the work, test pieces, samples etc. at site and in the shop. The Engineer's authorized representative is intended to ensure that the material and workmanship are in accordance with this specification, but it will not relieve the contractor for any of his responsibilities for the ultimate workmanship and performances.

EQUIPMENT TO BE USED IN PAINTING WORK:

- i) Drop cloth / polythene sheets:
Drop cloth and polythene sheets of suitable size & quality shall be used to protect other materials and surfaces.
- ii) Masking:
The masking material where-ever necessary shall be used in sufficient quantities to avoid falling of paint on unwanted surfaces.
- iii) Grinding / buffing wheels, wire brush & emery paper.
- iv) Electrical distribution panels switch boards & hand lamps.
- v) Kerosene, thinners, acetone etc. to remove oil / grease etc.
- vi) Painting brush:
Good quality brushes with long and flexible bristles free from any paint residue shall be used.
- vii) Neat, clean & painted scaffoldings of good quality.
- viii) Good quality ladders, platforms etc.
- ix) Safety gears to be used by personnel like respirator, face mask, hand gloves, protective clothing etc.

MAN POWER:

Experienced man power including Engineers, supervisors, inspectors and painters shall be deployed on the work. The painters shall have to be qualified by EIC before start of work. All other personnel shall be duly authorized by Site in-Charge before deploying them into work. A safety supervisor shall also be deployed for monitoring & instructing the safety aspects during the work.

INSPECTION REPORTS:

Inspection Reports in mutually agreed format shall be submitted along with completion of the work. Each RA Bill shall be submitted with inspection reports of the quantities billed for.

PROGRESS MONITORING:

The contractor shall submit a weekly report and a monthly report in mutually agreed format for monitoring the progress of work.

LIST OF APPROVED SYNTHETIC ENAMEL PAINTS

Approved Synthetic Enamel Paints Manufacturer

- i) Apcolite M/s Asian Paints
- ii) Luxol M/s Berger Paints

- iii) Neromin Synthetic Enamel M/s Kansai Nerolac Paints Ltd.
- iv) Tuffkote Chemical Resisting Enamel M/s Shalimar Paints

Application of paint:

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

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

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

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

Scaffolding:

Where scaffolding is required, it shall be erected in such a way that as far as possible no part of scaffolding shall rest against the surface to be painted. A properly secured strong and well tied suspended platform (joola) may be used for painting. Where ladders are used, pieces of old gunny bags shall be tied on their tops to avoid damage or scratches to walls.

MODE OF MEASUREMENT & PAYMENT:

The unit rate Painting two coats (including priming coat) on new R.C.C. shall include the cost of all materials, tools and plant required for mixing paint, placing & painting in position, all required specials and jointing adhesive compound, finishing as per direction of the Engineer-in-charge, and all other incidental expenses as shown on the drawings and according to these specifications. They shall also include the cost of making, fixing and removing of all scaffolding and forms required for the work.

The rate of Painting two coats (including priming coat) on new R.C.C. shall include the cost of all labour, materials tools and plant scaffolding and all incidental expenses as described herein above.

The Painting two coats (including priming coat) on new R.C.C. work shall be measured for its length and width or Height limiting dimensions to those specified on plan or as directed.

The measurement and payment Sqm basis.

Item No. 62

Filling available excavated earth (excluding rock) in trenches plinth sides of foundation etc. in layers not exceeding 20cm in depth consolidating each deposited layer by ramming and watering.

1. The relevant specification of MoRT&H (5th revision) as per item description shall apply to this item.
2. The measurement & payment shall be in Cum basis.

Item No. 63

Numbering the C.D. work with approved paint including all materials for painting etc. complete.

1. The relevant specification of MoRT&H (5th revision) as per item description shall apply to this item.
2. The measurement & payment shall be in Nos. basis.

Item No. 64

Supplying and fixing reinforced concrete heavy duty non-pressure pipes with collars for culverts carrying heavy traffic as per IS 458-1991 specification including setting and joining the pipes in C.M. 1:2 watering and laying (to level or slope) of I.S. Class NP-3 of following internal diameter with all lead and lift. (i) 600mm Dia.

1013. REINFORCED CONCRETE PIPES

1. Reinforced concrete pipes for highway structures shall be of NP3 type conforming to the requirements of IS:458.
2. The measurement and mode of payment shall be in Running meter basis.

Item No. 65

Supplying and fixing reinforced concrete heavy duty non-pressure pipes with collars for culverts carrying heavy traffic as per IS 458-1991 specification including setting and joining the pipes in C.M. 1:2 watering and laying (to level or slope) of I.S. Class NP-3 of following internal diameter with all lead and lift. (i) 900mm Dia.

1013. REINFORCED CONCRETE PIPES

1. Reinforced concrete pipes for highway structures shall be of NP3 type conforming to the requirements of IS:458.
2. The measurement and mode of payment shall be in Running meter basis.

Item No. 66

Supplying and fixing reinforced concrete heavy duty non-pressure pipes with collars for culverts carrying heavy traffic as per IS 458-1991 specification including setting and joining the pipes in C.M. 1:2 watering and laying (to level or slope) of I.S. Class NP-3 of following internal diameter with all lead and lift. (v) 900mm Dia.

1013. REINFORCED CONCRETE PIPES

1. Reinforced concrete pipes for highway structures shall be of NP3 type conforming to the requirements of IS:458.
2. The measurement and mode of payment shall be in Running meter basis.

Item No. 67

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

1013. REINFORCED CONCRETE PIPES

1. Reinforced concrete pipes for highway structures shall be of NP3 type conforming to the requirements of IS:458.
2. The measurement and mode of payment shall be in Running meter basis.

Item No. 68

Supplying and fixing reinforced concrete heavy duty non-pressure pipes with collars for culverts including setting and joining the pipes in C.M. 1:2 watering and laying (To level of slops of I.S. 458 / 1971 Class NP4 of following internal diameter. (vi) 1200 mm dia.

1013. REINFORCED CONCRETE PIPES

1. Reinforced concrete pipes for highway structures shall be of NP3 type conforming to the requirements of IS:458.
2. The measurement and mode of payment shall be in Running meter basis.

Item No. 69

Dismantling the existing structure including removing and stacking the dismantled materials as and where directed. Stone/Rubble masonry.

Relevant Specifications of MORT&H fifth revision Section – 202 shall apply to this item.

1 DISMANTLING CULVERTS, BRIDGES AND OTHER STRUCTURES/ PAVEMENTS

1.1 Scope

This work shall consist of dismantling and removing existing culverts, bridges, pavements, kerbs and other structures like guard-rails, fences, utility services, manholes, catch basins, inlets, etc., from the right of way which in the opinion of the Engineer interfere with the construction of road or are not suitable to remain in place, disposing of the surplus/unsuitable materials and backfilling to after the required compaction as directed by the Engineer.

Existing culverts, bridges, pavements and other structures which are within the highway and which are designated for removal, shall be removed upto the limit and extent specified in the drawings or as indicated by the Engineer.

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.

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

1.2 Dismantling Culverts and Bridges

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

Unless otherwise specified, the superstructure portion of culverts/bridges shall be entirely removed and other parts removed up to at least 600 mm below the sub-grade, slope face or original ground level whichever is the lowest or as necessary depending upon the interference they cause to the new construction. Removal of overlying or adjacent material, if required in connection with the dismantling of the structures, shall be incidental to this item.

Where existing culverts/bridges are to be extended or otherwise incorporated in the new work, only such part or parts of the existing structure shall be removed as are necessary and directed by the Engineer to provide a proper connection with 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. Due care should be taken to ensure that reinforcing bars which are to be left in place so as to project into the new work as dowels or ties are not injured during removal of concrete.

Pipe culverts shall be carefully removed in such a manner as to avoid damage to the pipes. Steel structures shall, unless otherwise provided, be carefully dismantled in such a manner as to avoid damage to members thereof. If specified in the drawings or directed by the Engineer that the 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 machined surfaces shall be painted with a mixture of white lead and tallow and all loose s shall be securely wired to adjacent members or packed in boxes.

Timber structures shall be removed in such a manner as to avoid damage to such timber or lumber having salvage value as is designated by the Engineer.

1.3 Dismantling Pavements and Other Structures

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

All concrete pavements, base courses in carriageway and shoulders etc., designated for oval shall be broken to pieces whose volume shall not exceed 0.02 cu.m and used with approval of the Engineer or disposed of.

1.4 Back-filling

Holes and depressions caused by dismantling operations shall be backfilled with excavated her approved materials and compacted to required density as directed by the Engineer.

1.5 Disposal of Materials

All Surplus materials shall be taken over by the Contractor which may either be re-used with approval of the Engineer or disposed of with all leads and lifts.

1.6 Measurements for Payment

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

i)	Dismantling brick/stone masonry/ concrete (plain and reinforced)	cu.m
ii)	Dismantling flexible and cement concrete pavement	cu.m
iii)	Dismantling steel structures	tonne
iv)	Dismantling timber structures	cu.m
v)	Dismantling pipes, guard rails, kerbs, gutters and fencing	linearm
vi)	Utility services	No.

Item No. 70

Dismantling the existing structure including removing and stacking the dismantled materials as and where directed. RCC Work.

1. The Relevant Specification of Item No. 69 shall apply to this item.

2. Measurements for Payment

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

i)	Dismantling brick/stone masonry/ concrete (plain and reinforced)	cu.m
ii)	Dismantling flexible and cement concrete pavement	cu.m
iii)	Dismantling steel structures	tonne
iv)	Dismantling timber structures	cu.m
v)	Dismantling pipes, guard rails, kerbs, gutters and fencing	linearm
vi)	Tiled Paver Block	Sqm

3. Rates

The Contract unit rates for the various items of dismantling shall be paid 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. The rates will include excavation and backfilling to the required compaction and for handling, giving credit towards salvage value disposing of dismantled materials with all lifts and leads.

Item No. 71

Dismantling the existing structure including removing and stacking the dismantled materials as and where directed. Structural Steel.

1. The Relevant Specification of Item No. 69 shall apply to this item.

2. **Measurements for Payment**

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

i)	Dismantling brick/stone masonry/ concrete (plain and reinforced)	cu.m
ii)	Dismantling flexible and cement concrete pavement	cu.m
iii)	Dismantling steel structures	tonne
iv)	Dismantling timber structures	cu.m
v)	Dismantling pipes, guard rails, kerbs, gutters and fencing	linearm
vi)	Tiled Paver Block	Sqm

3. **Rates**

The Contract unit rates for the various items of dismantling shall be paid 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. The rates will include excavation and backfilling to the required compaction and for handling, giving credit towards salvage value disposing of dismantled materials with all lifts and leads

Item No. 72

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

1. The Relevant Specification of Item No. 69 shall apply to this item.

2. **Measurements for Payment**

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

i)	Dismantling brick/stone masonry/ concrete (plain and reinforced)	cu.m
ii)	Dismantling flexible and cement concrete pavement	cu.m
iii)	Dismantling steel structures	tonne
iv)	Dismantling timber structures	cu.m
v)	Dismantling pipes, guard rails, kerbs, gutters and fencing	linearm
vi)	Tiled Paver Block	Sqm

3. **Rates**

The Contract unit rates for the various items of dismantling shall be paid 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. The rates will include excavation and backfilling to the required compaction and for handling, giving credit towards salvage value disposing of dismantled materials with all lifts and leads

Item No. 73

"Removing all type of Hume pipes and stacking including all lead of earthwork and dismantling of masonry works. (A) Up to 600 mm dia."

1. The Relevant Specification of Item No. 69 shall apply to this item.

2. **Measurements for Payment**

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

i)	Dismantling brick/stone masonry/ concrete (plain and reinforced)	cu.m
ii)	Dismantling flexible and cement concrete pavement	cu.m
iii)	Dismantling steel structures	tonne
iv)	Dismantling timber structures	cu.m
v)	Dismantling pipes, guard rails, kerbs, gutters and fencing	linearm
vi)	Tiled Paver Block	Sqm

3. Rates

The Contract unit rates for the various items of dismantling shall be paid 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. The rates will include excavation and backfilling to the required compaction and for handling, giving credit towards salvage value disposing of dismantled materials with all lifts and leads

Item No. 74

"Removing all type of Hume pipes and stacking including all lead of earthwork and dismantling of masonry works. (A) Above 900 mm dia.

1. The Relevant Specification of Item No. 69 shall apply to this item.

2. Measurements for Payment

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

i)	Dismantling brick/stone masonry/ concrete (plain and reinforced)	cu.m
ii)	Dismantling flexible and cement concrete pavement	cu.m
iii)	Dismantling steel structures	tonne
iv)	Dismantling timber structures	cu.m
v)	Dismantling pipes, guard rails, kerbs, gutters and fencing	linearm
vi)	Tiled Paver Block	Sqm

3. Rates

The Contract unit rates for the various items of dismantling shall be paid 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. The rates will include excavation and backfilling to the required compaction and for handling, giving credit towards salvage value disposing of dismantled materials with all lifts and leads

Item No. 75

Dismantling the existing structure including removing and stacking the dismantled materials as and where directed. (A) CC Work

1. The Relevant Specification of Item No. 69 shall apply to this item.

2. Measurements for Payment

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

i)	Dismantling brick/stone masonry/ concrete (plain and reinforced)	cu.m
ii)	Dismantling flexible and cement concrete pavement	cu.m
iii)	Dismantling steel structures	tonne

iv)	Dismantling timber structures	cu.m
v)	Dismantling pipes, guard rails, kerbs, gutters and fencing	linearm
vi)	Tiled Paver Block	Sqm

3. Rates

The Contract unit rates for the various items of dismantling shall be paid 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. The rates will include excavation and backfilling to the required compaction and for handling, giving credit towards salvage value disposing of dismantled materials with all lifts and leads

Item No. 76

Dismantling of Flexible Pavements (Dismantling of flexible pavements and disposal of dismantled materials up to a lead of 1000 metres, stacking serviceable and unserviceable materials separately) ii) By Mechanical means. A) Bituminous course

1. The Relevant Specification of Item No. 69 shall apply to this item.

2. Measurements for Payment

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

i)	Dismantling brick/stone masonry/ concrete (plain and reinforced)	cu.m
ii)	Dismantling flexible and cement concrete pavement	cu.m
iii)	Dismantling steel structures	tonne
iv)	Dismantling timber structures	cu.m
v)	Dismantling pipes, guard rails, kerbs, gutters and fencing	linearm
vi)	Tiled Paver Block	Sqm

3. Rates

The Contract unit rates for the various items of dismantling shall be paid 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. The rates will include excavation and backfilling to the required compaction and for handling, giving credit towards salvage value disposing of dismantled materials with all lifts and leads

Item No. 77

Dismantling of Cement Concrete Pavement (Dismantling of cement concrete pavement by mechanical means using pneumatic tools, breaking to pieces not exceeding 0.02 cum in volume and stock piling at designated locations and disposal of dismantled materials up to a lead of 1000 metres, stacking serviceable and unserviceable materials separately).

1. The Relevant Specification of Item No. 69 shall apply to this item.

2. Measurements for Payment

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

i)	Dismantling brick/stone masonry/ concrete (plain and reinforced)	cum
ii)	Dismantling flexible and cement concrete pavement	cum
iii)	Dismantling steel structures	tonne
iv)	Dismantling timber structures	cum
v)	Dismantling pipes, guard rails, kerbs, gutters and fencing	linearm

vi) Tiled Paver Block

Sqm

3. Rates

The Contract unit rates for the various items of dismantling shall be paid 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. The rates will include excavation and backfilling to the required compaction and for handling, giving credit towards salvage value disposing of dismantled materials with all lifts and leads

Item No. 78

Providing temporary all weather and fair-weather diversion suitable for traffic during the construction period of the bridge / Slab drain including providing necessary drains and all safety measures including red lamps / signals at night for traffic etc. complete.

1. The relevant specification of MoRT&H (5th revision) as per Item description shall apply to this item.
2. The mode of measurement & payment shall be done in Rmt. basis.

Item No. 79

Providing and fixing Flood gauge post mark of 'C' angle size 100mm x 50mm x 6mm thick (in head wall 0.500mt. And 1.50mt. outside with painting and lettering with radium color as directed.

1. The relevant specification of MoRT&H (5th revision) as per Item description shall apply to this item.
2. The mode of measurement & payment shall be done in Nos. basis.

Item No. 80

Regulatory / Mandatory Sign: - Providing and fixing sign boards made out of 2mm aluminium sheet / 4mm ACP (Aluminium composite Panel); size 60 cms Dia Circle as per design of IRC-67-2012. Pretreated with phosphating process & acid etching; coated with one coat of epoxy primer and two coats of best quality epoxy paint ; reflectorised with Micro Prismatic Grade retro reflective sheeting of Type-11 as per ASTM D-4956 and latest M.O.S.T. Specifications; 3.6mtr long stand post of 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 foreach 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 warranty for 10 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-C Type-11 Retro Reflective sheeting

1. The relevant specifications given in Section – 800 of MORT&H fifth revision specification shall apply to this item.
2. The measurement & payment shall be in Nos. basis

Item No. 81

Distance Informatory/Destination Sign: - Providing and fixing sign boards made out of 2mm aluminium sheet / 4mm ACP (Aluminium 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 Micro Prismatic Grade retro reflectivesheeting of Type-11 as per ASTM D-4956 and latest M.O.S.T.Specifications; 4.0mtr long (2 Nos.) stand post of 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 best quality epoxy coatings in black and white bends. The details of symbol foreach 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 warranty for 10 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-C Type-11 Retro Reflective sheeting

1. The relevant specifications given in Section – 800 of MORT&H fifth revision specification shall apply to this item.
2. The measurement & payment shall be in Nos. basis

Item No. 82

Diversion Ahead Sign: - Providing and fixing sign boards made out of 2mm aluminium sheet / 4mm ACP (Aluminium composite Panel); size 180x60 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 Micro Prismatic Grade retro reflectivesheeting of Type-11 as per ASTM D-4956 and latest M.O.S.T. Specifications; 3.1 mtr long stand post (2 Nos.) of 50 x 50 x 5mm / 50NB 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 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 warranty for 10 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-C Type-11 Retro Reflective sheeting

1. The relevant specifications given in Section – 800 of MORT&H fifth revision specification shall apply to this item.
2. The measurement & payment shall be in Nos. basis

Item No. 83

Men at work (2' x 2') sign: - Providing and fixing sign boards made out of 2.0 mm aluminium sheet / 4 mm ACP (Aluminium composite Panel); size 60cm x 60cm square 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 Micro Prismatic Grade retro reflectivesheeting of Type-11 as per ASTM D-4956 and latest M.O.S.T. Specifications; 3.3 mtr long stand post of 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 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 warranty for 10 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-C Type-11 Retro Reflective sheeting

1. The relevant specifications given in Section – 800 of MORT&H fifth revision specification shall apply to this item.
2. The measurement & payment shall be in Nos. basis

Item No. 84

Sign board per Square Meter: - Providing and fixing sign boards made out of 2mm aluminium sheet / 4mm ACP (Aluminium composite Panel); size 1meter x1 meter as per design of IRC-67-2012. Pretreated with phosphating process & acid etching; coated with one coat of epoxy primer and two coats of best quality epoxy paint ;reflectorised with Micro Prismatic Grade retro reflectivesheeting of Type-11 as per ASTM D-4956 and latest M.O.S.T. Specifications; 4 mtr long stand post (2 Nos.) of 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 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 warranty for 10 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-C Type-11 Retro Reflective sheeting

1. The relevant specifications given in Section – 800 of MORT&H fifth revision specification shall apply to this item.
2. The measurement & payment shall be in Nos. basis

Item No. 85

Cautionary Warning Sign: - Providing and fixing sign boards made out of 2mm aluminium sheet / 4mm ACP (Aluminium composite Panel); size 90 x 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 Micro Prismatic Grade retro reflectivesheeting of Type-11 as per ASTM D-4956 and latest M.O.S.T.Specifications; 3.6mtr long stand post of 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 foreach 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 warranty for 10 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-C Type-11 Retro Reflective sheeting

1. The relevant specifications given in Section – 800 of MORT&H fifth revision specification shall apply to this item.
2. The measurement & payment shall be in Nos. basis

Item No. 86

Chevron sign: - Providing and fixing sign boards made out of 1.5mm aluminium sheet / 3mm ACP (Aluminium composite Panel); size 60x50 cm as per design of IRC-67-2012. Pretreated with phosphating process & acid etching; coated with one coat of epoxy primer and two coats of best quality epoxy paint ;reflectorised with Micro Prismatic Grade retro reflectivesheeting of Type-11 as per ASTM D-4956 and latest M.O.S.T.Specifications; 3.3 mtr long stand post of 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 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 warranty for 10 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-C Type-11 Retro Reflective sheeting

1. The relevant specifications given in Section – 800 of MORT&H fifth revision specification shall apply to this item.
2. The measurement & payment shall be in Nos. basis

Item No. 87

Hazard Marker Sign: - Providing and fixing sign boards made out of 1.5mm aluminium sheet / 3mm ACP (Aluminium 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 Micro Prismatic Grade retro reflectivesheeting of Type-11 as per ASTM D-4956 and latest M.O.S.T. Specifications; 1.8mtr long stand post of 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

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 warranty for 10 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-C Type-11 Retro Reflective sheeting

1. The relevant specifications given in Section – 800 of MORT&H fifth revision specification shall apply to this item.
2. The measurement & payment shall be in Nos. basis

Item No. 88

Hazard Marker Sign :- Providing and fixing sign boards made out of 2.0 mm aluminium sheet / 4 mm ACP (Aluminium 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 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 60 Cms. for each leg including excavation, curing etc. Complete 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. (B) Class-B Type-4 Retro Reflective sheeting

1. The relevant specifications given in Section – 800 of MORT&H fifth revision specification shall apply to this item.
2. The measurement & payment shall be in Nos. basis

Item No. 89

Cautionary Warning Sign: Providing and fixing sign boards made out of 2mm Aluminium sheet size 90x90x90 cms. Equilateral triangle as per the design of IRC-67-1977 pretreated with phosphating 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 MOST specification 3.1 Mt. long stand post and frame fabricated from suitable size iron angle of 35x35x3mm, 75x75x6mm. as required painted with best quality epoxy coating 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 45x45x60cms. for each leg including excavation curing etc. complete under the supervision of engineer in charge (A) Engineering Grade.

1. The relevant specifications given in Section – 800 of MORT&H fifth revision specification shall apply to this item.
2. The measurement & payment shall be in Nos. basis

Item No. 90

PMGSY Project Information Board: Providing and fixing of typical PMGSY Project informatorily sign board with Logo as per 1700 of MORD specifications and drawing. The board will be a composite unit consisting of Three Plates ACM (Aluminium Composite Material), material specifications as per clause 17001.3. The top most plate will be of 3mm ACM in diamond shape of 600x600mm size, riveted with MS angle iron frame of 25mmx25mmx5mm size on back on edges. The middle 4mm ACM plate of will be 1200x150mm size riveted with MS angle iron frame of 25mmx25mmx5mm size on back on edges. The main 4mm ACM lower most plate will be 1500mmx600mm size, riveted with MS angle iron frame of 25mmx25mmx5mm size. Riveting of all the sheets over angle and flat iron frame will be done neatly to have plain surface on one side. The angle iron frame of lower most plate and flat iron frame of the middle plate will be welded to two nos. 75mm x75mm (12 SWG)

sheet tubes posts placed at 1125mm apart centre to centre. the top of the middle plate will be flushed with the top of 75mm dia medium steel tube posts and these posts will be embedded in cement concrete M15 grade block of 450x450x600mm below ground level. The height of the bottom of the lower plate will be 1200mm from normal ground level and the bottom of the middle plate will be 100mm above the top level of the lower most plate. the diamond shaped plate mounted over flat angle iron frame will be connected to middle plate by square steel section of 47mmx47mm, thickness 12SWG having a spacing of 100mm between the diamond shaped plate and middle plate and this square section will be riveted to the bottom point of the diamond shaped plate. MMGSY logo, letters and numerals on the ACM should be made up of Retro Reflective sheeting of Type-1 AEGP Class-A grade as per the latest MORD section 1700 and IRC 67-2012 specifications. All the section of the frame and posts shall be painted with primer and two coats of epoxy paint. The design, painting and lettering shall be done as per the MMGSY Signage Guide and as directed by Engineer-in-charge. A warranty for 5 years for the Retro reflective sheeting for Class-A respectively, from original manufacturer shall be submitted by contractor.

1. The relevant specifications given in Section – 800 of MORT&H fifth revision specification shall apply to this item.
2. The measurement & payment shall be in Nos. basis

Item No. 91

Road marking with hot applied thermoplastic paints with reflectorising glass beads on bitumen 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 colour marking should provide luminance coefficient on cement 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.

1. The relevant specifications given in Section – 800 of MORT&H fifth revision and latest GR of R&B Department as per SOR/ 1018/715/ C-1 part file specification shall apply to this item.
2. The measurement shall be in Sq.mt basis.
3. The rate includes of reflect rising glass beads at 250 gm/smt area. Thickness of 2.5 mm is exclusive of surface applied glass beads as per IRC 35. The finished surface to be level uniform free from streaks and holes and as per direction of engineer in charge.
4. The mode of payment shall be in per Sq.mt basis.

Item No. 92

Cat Eye / Road Stud / RPM: Supplying of Molded Twin Shanks Raised Pavement Markers made of polycarbonate and ABS moulded body and reflective panels with micro prismatic 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. The height, width and length shall not exceed 20 mm, 130 mm and 130 mm and with minimum reflective area of 13 Sqcm on each side and the slope to the base shall be 35 +/- 5 degree. The strength of detachment of the integrated cylindrical shanks, (of diameter not less than 19 +/- 2 mm and height not less than 30 +/- 2 mm) from the body is to be a minimum value of 500 Kg. Fixing will be by drilling holes on the road for the shanks to go inside, without nails and using epoxy resin-based adhesive as per manufacturers recommendation and the colour of the marker should be as per the IRC 35-2015 and as directed by Engineer-in-charge.

1. The relevant specifications given in Section – 800 of MORT&H fifth revision specification shall apply to this item.
2. The mode of measurement & payment shall be in Nos. basis

Item No. 93

Providing and applying anti-carbonation, anti-fading, mold resistant, heat insulating, and 100% acrylic breathable decorative external waterproof coating of approved shade for Pier/Abutment, Riding return, Square return, Protection wall, Pier / Abutment Cap, Dirt wall, Solid slab etc. having Viscosity @ Room Temperature by Ford cup No. B-4 (dilute 2 parts of product with 1 part of water) 18 to 30 sec. pH of 7.00 to 10.00 and Sp. Gravity @ Room Temperature 1.30±0.1, tested for carbon dioxide diffusion resistance properties for coating materials and coating systems for exterior masonry and concrete as per DIN EN 1062-6 (2002-2010) by a NBA Grade "A" accredited institution.

1. The relevant specifications as per Item Description shall apply to this item and as directed by engineer in-charge.
2. The mode of measurement & payment shall be in Sqmt basis

Item No. 94

Carrying out load test of super structure as directed including all necessary materials plant equipment, instruments, labour and arrangements for test directed.

1. The Engineer –in-charge shall instruct that a load test be made on any part of the super structure if in his opinion such a test is deemed necessary for one or more of reasons specified below:-
 - (a) The work test cubes failing to attain the specified strength.
 - (b) The shuttering being prematurely removed.
 - (c) Over loading during construction of the structure or part thereof.
 - (d) Concrete improperly cured.
 - (e) Any other circumstances attributable to negligence on the part of the contractor which, in the opinion of the Engineer-in-charge, results in the reduction of required strength of the structure or part thereof.
 - (f) Any reason other than the fore goings.
2. If the load test be ordered to be made solely or in part for the reasons (a) to (e) the test shall be carried out for contractors own cost. If the test is required to be carried out for the reasons specified at (f) here in before, the contractor shall make the test and shall be paid for the same.
3. The test load shall not be applied earlier than 28 days of the completion of placing of the concrete in the part of the structure to be tested and the latter shall not be supported during the test by the shuttering or other non-permanent support. Necessary care shall, however, be taken to ensure that in the event of failure under the test temporary support of the loaded member shall be immediately available.
4. If the result of the load test for the reasons mentioned at (a) to (e) is not satisfactory in the opinion of the Engineer-in-charge he shall instruct that the part of the structure concerned shall be taken down or cut out and reconstructed to his satisfaction or that other remedial measures shall take to make the structure secure and strong as per requirement at the contractor's own risk and cost or the work may be accepted as sub-standard work and paid at reduced rate as may be decided by the Engineer-in-charge and his decision in the matter shall be binding, on the contractor. The contractor shall provide necessary materials, instruments, equipments observations platforms, plant and labour needed for carrying out the test as required. The load in general shall be in the form of sand bags. However, the contractor may apply the test load in any other suitable manner as may be approved by the Engineer-in-charge. The contractor shall make all necessary arrangements for observation platforms, centering, taking deflection by deflectometers etc. to the entire satisfaction of the Engineer-in-charge. The test load shall be kept at least 24 hours or as directed before removal.
 Test load of superstructure shall be 1.5 times the equivalent load including maximum stresses at sections of maximum stresses at sections of maximum bending moment and or shear force for which the superstructure is designed.

5. The item for the purpose of payment shall be measured per M.T of load placed on the superstructure and the payment of the same made on completion of the test.
6. Unit rate shall include all materials, labour, measuring instruments, tools, and plant necessary to carry out the load test.

Item No. 95

Type - B, "THRIE" : Metal Beam Crash Barrier (Providing and erecting a "Thrie" metal beam crash barrier comprising of 3 mm thick corrugated sheet metal beam rail, 85 cm above road/ground level, fixed on ISMC series channel vertical post, 150 x 75 x 5 mm spaced 2 m centre to centre, 2 m high with 1.15 m below ground 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 space of channel section 150 x 75 x 5 mm, 546 mm long complete as per clause 811)

811.3 Metal Beam Crash Barrier

811.3.1 Materials

811.3.1.1 Metal beam rail shall be corrugated sheet steel beams of the class, type, section and thickness indicated on the drawings. Railing posts shall be made of steel of the section, weight and length as shown on the drawings. All complete steel rail elements terminal sections, posts, bolts, nuts, hardware and other steel fittings shall be galvanized. All elements of the railing shall be free from abrasions, rough or sharp edges and shall not be kinked, twisted or bent.

811.3.1.2 The "W" beam type safety barrier shall consist of a steel post and a 3 mm thick "W" beam rail element. The steel post and the blocking out spacer shall both be channel section of 75 mm x 150 mm & size 5 mm thick. The rail shall be 70 cm above the ground level and posts shall be spaced 2 m center-to-center. Double "W" beam barrier shall be as indicated in IRC:5-1998.

The thrie beam safety barrier shall have posts and spacers similar to the ones mentioned above for "W" beam type. The rail shall be placed at 85 cm above the ground level.

The "W" beam, the thrie beam, the posts, spacers and fasteners for steel barriers shall be galvanized by hot dip process (zinc coated, 0.55 kg per square metre; minimum single spot) unless otherwise specified. The galvanizing on all other steel parts shall conform to the relevant IS Specifications. All fittings (bolts, nuts, washers) shall conform to the IS:1367 and IS:1364. All galvanizing shall be done after fabrication.

811.3.1.3 Concrete for bedding and anchor assembly shall conform to Section 1700 of these Specifications.

811.3.2 Construction Operations

811.3.2.1 The line and grade of railing shall be true to that shown on the plans. The railing 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 in place in the structure at proper grade and alignment.

811.3.2.2 Unless otherwise specified on the drawing, railing steel posts shall be given one shop coat of paint (primer) and three coats of paint on structural steel after erection, if the sections are not galvanized. Any part of assembly below ground shall be painted with three coats of red lead paint.

811.3.2.3 Splices and end connections shall be of the type and designs specified or shown on the plans and shall be of such strength as to develop full design strength of the rail elements.

811.3.3 Installation of Posts

- 811.3.3.1 Holes shall be dug or drilled to the depth indicated on the plans or posts may be driven by approved methods and equipment, provided these are erected in proper position and are free from distortion and burring or any other damage.
- 811.3.3.2 All post holes that are dug or drilled shall of such size as will permit proper setting of the posts and allow sufficient room for backfilling and tapping.
- 811.3.3.3 Holes shall be back filled with selected earth or stable materials in layers not exceeding 100 mm thickness and each layer shall be thoroughly tamped and rammed. When backfilling and tamping are completed, the posts or anchors shall be held securely in place.
- 811.3.3.4 Post holes that are drilled in rock and holes for anchor posts shall be backfilled with concrete.
- 811.3.3.5 Posts for metal beam guardrail on bridges shall be bolted to the structure as detailed on the plans. The anchor bolts shall be set to proper location and elevation with templates and carefully checked.
- 811.3.4 Erection**
- 811.3.4.1 All guard rail anchors shall be set and attachments made and placed as indicated on the plans or as directed by the Engineer.
- 811.3.4.2 All bolts or clips used for fastening the guardrail or fittings to the posts shall be drawn up tightly. Each bolt shall have sufficient length to extend at least 6 mm through and beyond the full nut, except where such extensions might interfere with or endanger traffic in which case the bolts shall be cut off flush with the nut.
- 811.3.4.3 All railings shall be erected, drawn and adjusted so that the longitudinal tension will be uniform throughout the entire length of the rail.
- 811.3.5 End Treatment for Steel Barrier**
- 811.3.5.1 End treatments shall form an integral part of safety barriers which should not spear, vault or roll a vehicle for head-on or angled impacts. The two end treatments recommended for steel barriers are "Turned-down-guardrail" and "Anchored in back slope", as shown on the drawings or as directed by the Engineer.
- 811.3.6 Tolerance**
- The posts shall be vertical with a tolerance not exceeding 6 mm in a length of 3 m. The railing barrier shall be erected true to line and grade.
- 811.3.7 Measurements for Payment**
- 811.3.7.1 Metal beam railing barriers will be measured by linear metre of completed length as per plans and accepted in place. Terminals/anchors of various types shall be paid for by numbers.
- 811.3.7.2 Furnishing and placing anchor bolts and/or devices for guard rail posts on bridges shall be considered incidental to the construction and the costs thereof shall be included in the price for other items of construction.
- 811.3.7.3 No measurement for payment will be made for excavation or backfilling performed in connection with this construction.
- 811.3.8 Rate**

The Contract unit rate shall include full compensation for furnishing of labour, materials, tools, equipments and incidental costs necessary for doing all the work involved in constructing the metal beam railing barrier complete in place in all respects as per these Specifications.

Item No. 96

Providing and fixing guard stone as per I.R.C. type design including white washing etc. complete

1 BOUNDARY STONES

1.1 Scope

The work shall cover supply and fixing boundary stones as per designs and Specifications given in IRC:25 Type Designs for Boundary Stones" and at locations indicated in the drawings or as directed by the Engineer. The material to be used shall conform to IRC:25.

1.2 Measurements for Payment

The measurement shall be made in numbers of boundary stones supplied and fixed at site.

1.3 Rate

The Contract unit rate for boundary stones shall be full compensation for furnishing all labour, materials, tools, equipment for preparing, supplying and, fixing and all other incidental costs necessary to complete the work to these Specifications.

Item No. 97

Providing and erecting a "W" metal crash barrier comprising of 3mm thick corrugated sheet metal beam rail, 70cm above Road/Ground level, fixed on ISMC series channel vertical post, 150x75x5mm spaced 2m center to center, 1.8m high, 1.1m below ground/road level, all steel parts and fitments to be galvanized 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 150x75x5mm, 330mm long complete as per clause 810.

811.3 Metal Beam Crash Barrier

811.3.1 Materials

811.3.1.1 Metal beam rail shall be corrugated sheet steel beams of the class, type, section and thickness indicated on the drawings. Railing posts shall be made of steel of the section, weight and length as shown on the drawings. All complete steel rail elements terminal sections, posts, bolts, nuts, hardware and other steel fittings shall be galvanized. All elements of the railing shall be free from abrasions, rough or sharp edges and shall not be kinked, twisted or bent.

811.3.1.2 The "W" beam type safety barrier shall consist of a steel post and a 3 mm thick "W" beam rail element. The steel post and the blocking out spacer shall both be channel section of 75 mm x150 mm & size 5 mm thick. The rail shall be 70 cm above the ground level and posts shall be spaced 2 m center-to-center. Double "W" beam barrier shall be as indicated in IRC:5-1998.

The thrie beam safety barrier shall have posts and spacers similar to the ones mentioned above for "W" beam type. The rail shall be placed at 85 cm above the ground level.

The "W" beam, the thrie beam, the posts, spacers and fasteners for steel barriers shall be galvanized by hot dip process (zinc coated, 0.55 kg per square metre; minimum

single spot) unless otherwise specified. The galvanizing on all other steel parts shall conform to the relevant IS Specifications. All fittings (bolts, nuts, washers) shall conform to the IS:1367 and IS:1364. All galvanizing shall be done after fabrication.

- 811.3.1.3 Concrete for bedding and anchor assembly shall conform to Section 1700 of these Specifications.

811.3.2 Construction Operations

- 811.3.2.1 The line and grade of railing shall be true to that shown on the plans. The railing 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 in place in the structure at proper grade and alignment.

- 811.3.2.2 Unless otherwise specified on the drawing, railing steel posts shall be given one shop coat of paint (primer) and three coats of paint on structural steel after erection, if the sections are not galvanized. Any part of assembly below ground shall be painted with three coats of red lead paint.

- 811.3.2.3 Splices and end connections shall be of the type and designs specified or shown on the plans and shall be of such strength as to develop full design strength of the rail elements.

811.3.3 Installation of Posts

- 811.3.3.1 Holes shall be dug or drilled to the depth indicated on the plans or posts may be driven by approved methods and equipment, provided these are erected in proper position and are free from distortion and burring or any other damage.

- 811.3.3.2 All post holes that are dug or drilled shall be of such size as will permit proper setting of the posts and allow sufficient room for backfilling and tapping.

- 811.3.3.3 Holes shall be back filled with selected earth or stable materials in layers not exceeding 100 mm thickness and each layer shall be thoroughly tamped and rammed. When backfilling and tamping are completed, the posts or anchors shall be held securely in place.

- 811.3.3.4 Post holes that are drilled in rock and holes for anchor posts shall be backfilled with concrete.

- 811.3.3.5 Posts for metal beam guardrail on bridges shall be bolted to the structure as detailed on the plans. The anchor bolts shall be set to proper location and elevation with templates and carefully checked.

811.3.4 Erection

- 811.3.4.1 All guard rail anchors shall be set and attachments made and placed as indicated on the plans or as directed by the Engineer.

- 811.3.4.2 All bolts or clips used for fastening the guardrail or fittings to the posts shall be drawn up tightly. Each bolt shall have sufficient length to extend at least 6 mm through and beyond the full nut, except where such extensions might interfere with or endanger traffic in which case the bolts shall be cut off flush with the nut.

- 811.3.4.3 All railings shall be erected, drawn and adjusted so that the longitudinal tension will be uniform throughout the entire length of the rail.

- 811.3.5 End Treatment for Steel Barrier**
811.3.5.1 End treatments shall form an integral part of safety barriers which should not spear, vault or roll a vehicle for head-on or angled impacts. The two end treatments recommended for steel barriers are "Turned-down-guardrail" and "Anchored in back slope", as shown on the drawings or as directed by the Engineer.
- 811.3.6 Tolerance**
The posts shall be vertical with a tolerance not exceeding 6 mm in a length of 3 m. The railing barrier shall be erected true to line and grade.
- 811.3.7 Measurements for Payment**
811.3.7.1 Metal beam railing barriers will be measured by linear metre of completed length as per plans and accepted in place. Terminals/anchors of various types shall be paid for by numbers.
- 811.3.7.2** Furnishing and placing anchor bolts and/or devices for guard rail posts on bridges shall be considered incidental to the construction and the costs thereof shall be included in the price for other items of construction.
- 811.3.7.3** No measurement for payment will be made for excavation or backfilling performed in connection with this construction.
- 811.3.8 Rate**
The Contract unit rate shall include full compensation for furnishing of labour, materials, tools, equipments and incidental costs necessary for doing all the work involved in constructing the metal beam railing barrier complete in place in all respects as per these Specifications.

Item No. 98

Box cutting the road surface to proper slope and camber for making a base for road work including removing the excavated stuff and deposit it as directed with all lead & lift.

1. The relevant specification of MoRT&H (5th revision) as given in section 300 shall apply to this item.
2. The mode of measurement & payment shall be done in Cum basis.

Item No. 99

Scarifying bitumen macadam surface 6 cm to 10 cm. depth including stacking useful materials on road side and disposing off remaining stuff (A) On Existing Road

1. The relevant specification of MoRT&H (5th revision) as given in section 300 shall apply to this item.
2. The mode of measurement & payment shall be done in Sqm basis.

Item No. 100

Construction of Subgrade with approved material obtained from borrow pits with all lifts and leads, transporting to site spreading, grading to required slope and compacting to meet requirement to MoRTH table 300-2 in layers not more than 200 mm thick as directed by engineer in charge. (Effective CBR Minimum 8 %)

- 305 EMBANKMENT CONSTRUCTION**
- 305.1 General**
- 305.1.1 Description**

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

305.2 Materials and General Requirements

305.2.1 Physical Requirements

305.2.1.1 The materials used in embankments, subgrades, earthen shoulders and miscellaneous backfills shall be soil, moorum, gravel, reclaimed material from pavement, fly ash, pond ash, a mixture of these or any other material as approved by the Engineer. Such materials shall be free of logs, stumps, roots, rubbish or any other ingredient likely to deteriorate or affect the stability of the embankment.

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

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

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

305.2.1.3 Any fill material with a soluble sulphate content exceeding 1.9 grams of sulphate (expressed as SO_3) per litre when tested in accordance with BS:1377, Part 3, but using a 2:1 water-soil ratio shall not be deposited within 500 mm distance (or any other distance described in the Contract), of permanent works constructed out of concrete, cement bound materials or other cementitious material.

Materials with a total sulphate content (expressed SO_3 exceeding 0.5 percent by mass, when tested in accordance with BS:1377, Part 3 shall not be deposited within 500 mm, or other distances described in the Contract, of metallic items forming part of the Permanent Works.

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

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

Table 300-1 : Density Requirements of Embankment and Sub-grade Materials

S. No.	Type of Work	Maximum laboratory dry unit weight when tested as per 15:2720 (Part 8)
1)	Embankments up to 3 m height, not subjected to extensive flooding	Not less than 15.2 kN/cu.m
2)	Embankments exceeding 3 m height or embankments of any height subject to long periods of inundation	Not less than 16 kN/ cu.m
3)	Subgrade and earthen shoulders/verges/backfill	Not less than 17.5 kN/cu.m

- Notes: 1) This Table is not applicable for lightweight fill material, e.g., cinder, fly ash, etc.
2) The material to be used in subgrade shall be non-expansive and shall satisfy design CBR at the specified dry density and moisture content. In case the available materials fail to meet the requirement of CBR, use of stabilization methods in accordance with Clauses 403 and 404 or by any stabilization method approved by the Engineer shall be followed.

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

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

305.2.2 General Requirements

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

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

305.2.2.2 Borrow Materials

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

Borrow pits along the road shall be discouraged. If permitted by the Engineer, these shall not be dug continuously. Ridges of not less than 8 m width should be left at intervals not exceeding 300 m. Small drains shall be cut through the ridges to facilitate drainage. The depth of the pits shall be so regulated that their bottom does not cut an imaginary line having slope of 1 vertical to 4 horizontal projected from the edge of the final section of the bank, the maximum depth in any case being limited to 1.5 m. Also, no pit shall be dug within the offset width of a minimum of 10 m.

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

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

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

305.2.2.3 'Fly-Ash

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

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

305.2.2.4 Compaction Requirements

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

Table 3002 : Compaction Requirements for Embankment and Sub-grade

Sr. No.	Type of work/material	Relative compaction as percentage of max. laboratory dry density as per IS:2720 (Part 8)
1)	Subgrade and earthen shoulders	Not less than 97%
2)	Embankment,	Not less than 95%
3)	Expansive Clays	
	a) Subgrade and 500 mm portion just below the subgrade	Not allowed
	b) Remaining portion of embankment	90-95%

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

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

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

305.3 Construction Operations

305.3.1 Setting Out

After the site has been cleared to Clause 201, the work shall be set out to Clause 301.3.1 The limits of embankment/sub-grade shall be marked by fixing batter pegs on both sides at regular intervals as guides before commencing the earthwork. The embankment/sub-grade shall be built sufficiently wider than the design dimension so that

surplus material may be trimmed, ensuring that the remaining material is to the desired density and in position specified and conforms to the specified side slopes.

305.3.2 Dewatering

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

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

305.3.3 Stripping and Storing Topsoil

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

305.3.4 Compacting Ground Supporting Embankment/Sub-Grade

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

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

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

Any foundation treatment specified for embankments especially high embankments, resting on suspect foundations as revealed by borehole logs shall be carried out in a manner and to the depth as desired by the Engineer. Where the ground on which an embankment is to be built has any of such material types (a) to (f) in Clause 305.2.1.1 at least 500 mm of such material must be removed and replaced by acceptable fill material before embankment construction commences.

305.3.5 Spreading Material in Layers and Bringing to Appropriate Moisture Content

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

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

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

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

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

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

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

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

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

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

305.3.6 **Compaction**

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

The compaction shall be done with the help of self-propelled single drum vibratory roller or pad foot vibratory roller of 80 to 100 kN static weight or heavy pneumatic tyre roller of adequate capacity capable of achieving the required compaction. The Contractor shall demonstrate the efficacy of the equipment he intends to use by carrying out compaction

trials. The procedure to be adopted for the site trials shall be submitted to the Engineer for approval.

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

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

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

305.3.7. Drainage

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

305.3.8 Repairing of Damages Caused by Rain/Spillage of Water

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

305.3.9 Finishing Operations

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

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

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

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

305.4 Construction of Embankment and Sub-grade under Special Conditions

305.4.1 Earthwork for Widening Existing Road Embankment

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

Where the width of the widened portions is insufficient to permit the use of conventional rollers, compaction shall be carried out with the help of light weight vibratory roller, double drum walk behind roller, vibratory plate compactor or vibratory tamper or any other appropriate equipment approved by the Engineer. End dumping of material from trucks for widening operations shall be avoided except in difficult circumstances when the extra width is too narrow to permit the movement of any other types of hauling equipment.

305.4.2 Earthwork for Embankment and Sub-Grade to be placed against Sloping Ground

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

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

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

305.4.3 Earthwork over Existing Road Surface

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

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

305.4.4 Embankment and Sub-Grade Around Structures

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

Unless directed otherwise, the filling around culverts, bridges and other structures upto a distance of twice the height of the road from the back of the abutment shall be carried out

Independent of the work on the main embankment. The fill material shall not be placed against any abutment or wing wall, unless permission has been given by the Engineer but in any case, not until the concrete or masonry has been in position for 14 days. The embankment and sub-grade shall be brought up simultaneously in equal layers on each side of the structure to avoid displacement and unequal pressure. The sequence of work in this regard shall be got approved from the Engineer.

The material used for backfill shall not be an organic soil or highly plastic clay having plasticity index and liquid limit more than 20 and 40 respectively when tested according to 18:2720 (Part 5). Filling behind abutments and wing walls for all structures shall conform to the general guidelines given in IRC:78. The fill material shall be deposited in horizontal layers in loose thickness and compacted thoroughly to the requirements of Table 300-2.

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

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

305.4.5 Construction of Embankment over Ground Incapable of Supporting Construction Equipment

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

305.4.6 Embankment Construction under Water and Waterlogged Areas

305.4.6.1 Embankment Construction under Water

Where filling or backfilling is to be placed under water, only acceptable granular material or rock shall be used unless otherwise approved by the Engineer. Acceptable granular material shall be of GW, SW, GP, SP as per 18:1498 and consist of graded, hard durable particles with maximum particle size not exceeding 75 mm. The material should be non-plastic having uniformity coefficient of not less than 10. The material placed in open water shall be deposited by end tipping without compaction.

305.4.6.2 Embankment Construction in Waterlogged and Marshy Areas

The work shall be done as per IRC:34.

305.4.7 Earthwork for High Embankment

The material for high embankment construction shall conform to Clause 305.2.1.7. In the case of high embankments (more than 6 m), the Contractor shall normally use fly ash in conformity with Clause 305.2.1.1 or the material from the approved borrow area.

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

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

305.4.8 Settlement Period

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

305.5 Plying of Traffic

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

305.6 Surface Finish and Quality Control of Work

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

305.7 Sub-grade Strength

305.7.1 It shall be ensured prior to actual execution that the material to be used in the sub-grade satisfies the requirements of design CBR.

305.7.2 Sub-grade shall be compacted and finished to the design strength consistent with other physical requirements. The actual laboratory CBR values of constructed sub-grade shall be determined on remoulded samples, compacted to the field density at the field moisture content and tested for soaked/unsaturated condition as specified in the Contract.

305.8 Measurements for Payment

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

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

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

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

- 305.8.5 Construction of high embankment with specified material and in specified manner shall be measured in cu.m.
- 305.8.6 Stripping including storing and reapplication of top soil shall be measured in cu.m.
- 305.8.7 Work involving loosening and re-compacting of ground supporting embankment/sub-grade shall be measured in cu.m.
- 305.8.8 Removal of unsuitable material at embankment / sub-grade foundation and replacement with suitable material shall be measured in cu.m.
- 305.8.9 Scarifying existing granular/bituminous road surface shall be measured in square metres.
- 305.8.10 Dismantling and removal of existing cement concrete pavement shall be measured vide Clause 202.6.
- 305.8.11 Filter medium and backfill material behind abutments, wing walls and other retaining structures shall be measured as finished work in position in cu.m.
- 305.9 Rates**
- 305.9.1 The Contract unit rates for the items of embankment and sub-grade construction shall be payment in full for carrying out the required operations including full compensation for:
- i) Cost of arrangement of land as a source of supply of material of required quantity for construction unless provided otherwise in the Contract;
 - ii) Setting out;
 - iii) Compacting ground supporting embankment sub-grade except where removal and replacement of suitable material or loosening and recompacting is involved;
 - iv) Scarifying or cutting continuous horizontal benches 300 mm wide on side slopes of existing embankment and sub-grade as applicable;
 - v) Cost of watering or drying of material in borrows areas and/or embankment and sub-grade during construction as required;
 - vi) Spreading in layers, bringing to appropriate moisture and compacting to Specification requirements;
 - Vii) Shaping and dressing top and slopes of the embankment and sub... grade including rounding of corners;
 - viii) Restricted working at sites of structures;
 - ix) Working on narrow width of embankment and sub-grade;
 - x) Excavation in all soils from borrow pits/designated borrow areas including clearing and grubbing and transporting the material to embankment and sub-grade site with all leads and lifts unless otherwise provided for in the Contract;
 - xi) All labour materials, tools, equipment and incidentals necessary to complete the work to the Specifications;
 - xii) Dewatering; and
 - xiii) Keeping the embankment/completed formation free of water as per Clause 311.
 - xiv) Transporting unsuitable excavated material for disposal with all leads and lifts.
- 305.9.2 Clause 301.9.5 shall apply as regards Contract unit rates for items of stripping and storing top soil including reapplication of topsoil.
- 305.9.3 Clause 301.9.2 shall apply as regards Contract unit rate for the item of loosening and recompacting the embankment/sub-grade foundation.
- 305.9.4 Clauses 309.1.1 and 305.8 shall apply as regards Contract rates for items of removal of unsuitable material and replacement with suitable material, respectively.
- 305.9.5 The Contract unit rate for scarifying existing granular/bituminous road surface shall be payment in full for carrying out the required operations including full compensation for all labour, materials, tools, equipment and incidentals, necessary to complete the work. This will also comprise of handling, giving credit towards salvage value and disposal of the dismantled materials with all leads and lifts or as otherwise specified.

- 305.9.6 Clause 202.7 shall apply as regards Contract unit rate for dismantling and removal of existing cement concrete pavement.
- 305.9.7 The Contract unit rate for providing and laying filter material shall be payment in full for carrying out the required operations including all materials, labour, tools, equipment and incidentals to complete the work to Specifications.
- 305.9.8 The Contract unit rate for providing and compacting backfill material behind abutments and retaining walls shall be payment in full for carrying out the required operations including all materials, labour, tools, equipment and incidentals to complete the work to Specifications.
- 305.9.9 Clause 305.4.6 shall apply as regards Contract unit rate for construction of embankment under water.
- 305.9.10 Clause 305.4.7 shall apply as regards Contract unit rate for construction of high embankment. It shall include cost of instrumentation, its monitoring and settlement period, where specified in the Contract or directed by the Engineer

Item No. 101

Construction of granular sub-base (Grade - 1) by providing coarse graded material, spreading in uniform layers with motor grader on prepared surface, mixing by mix in place method with rotavator at OMC, and compacting with vibratory roller to achieve the desired density, complete as per MoRTH clause 401.

1. Relevant specification for MoRTH Cl. No. 401 shall apply to this item.
2. The measurement and payment shall be in Cum basis.

Item No. 102

Providing, laying, spreading and compacting graded stone aggregate to wet mix macadam (in two layers) specification including premixing the Material with water at OMC in mechanical mix plant carriage of mixed Material by tipper to site, laying in uniform layers with paver in sub- base / base course on well-prepared surface and compacting with vibratory roller to achieve the desired density, complete as per MoRTH clause 406.

1. Relevant specification for MoRTH Cl. No. 406 shall apply to this item.
2. The measurement and payment shall be in Cum basis.

Item No. 103

Providing and applying Prime coat with Slow Setting Bitumen Emulsion binder (SS- 1) @rate of 7.5 Kg./10 sq.m. of road surface using Emulsion pressure sprayer etc., cleaning the road surface complete including cost of material labour etc complete as directed by engineer in charge.

1. Relevant specification for MoRTH (5th revision) Cl. No. 502 shall apply to this item.
2. The measurement and payment shall be in Sqm basis.

Item No. 104

Providing and applying tack coat with Rapid Setting Bitumen Emulsion binder (RS- 1) @ rate of 2.5 Kg./10 sq.m. of road surface using Emulsion pressure sprayer etc., cleaning the road surface complete including cost of material labour etc complete as directed by engineer in charge.

1. The relevant Specification for MoRTH Clause No. 502 of 5th revision shall apply to this item.
2. The measurement and payment shall be in Sqm basis.

Item No. 105

Providing and laying 25 mm thick (Compacted) Semi -dense Bituminous concrete on existing

bituminous surface and using specified graded black trapped machine crushed aggregate with 5% Bitumen Vg-30 - 60/70 grade bitumen by Wt of total mix as per MORTH specification including heating and mixing of asphalt with B.T. chips in continuous batch mix plant and transporting same at site and spreading by sensor paver finisher and consolidation the same with pair of 8 tonnes to 10 tonnes vibratory roller to achieve desire density and including flushing the stone dust @0.03 cum/10smt including cost of required tools , plants, all machineries, equipment fire wood , oil, kerosene, charges etc. complete.

1. Relevant specification for MoRT&H (5th revision) Cl. No. 507 shall apply to this item.
2. The measurement and payment shall be in MT basis.

Item No. 106

Providing and laying compacted Bituminous concrete using BT aggregate as per MORTH gradation ,specification and asphalt Grade VG 30 mixing @54.00 Kg /MT of total Wt. of mix i.e. (5.40% of total weight mix) including heating and mixing aggregate & asphalt by batch mix plant spreading the same by sensor paver finisher including rolling & consolidation with 10-12 tonne vibratory roller, Tandem Roller ,PTR & providing all materials equipment's tools & plants, fire wood, oil , kerosene, labour charges , using contractor 's own machinery etc. Complete as directed by engineer in charge as per MORTH Specification

1. Relevant specification for MoRT&H (5th revision) Cl. No. 507 shall apply to this item.
2. The measurement and payment shall be in MT basis.

Item No. 107

Providing and laying 20 mm thick mix seal surfacing using specified graded crushed Black Trap stone aggregates as per MORTH gradation using VG-30 bulk bitumen for mixing at the rate of 5.1 % (51.00 Kg./M.T.) by hot mix process and hot laid process using paver finisher to the required camber and grade, including rolling with vibratory roller to achieve desire density including cost of fire wood, oil, Kerosene, labour charges and hire charges of machineries etc. complete.

1. Relevant specification for MoRT&H (5th revision) Cl. No. 508 shall apply to this item.
2. The measurement and payment shall be in MT basis.

Item No. 108

Construction of 100mm thick dry lean cement concrete Sub- base over a prepared sub-grade with coarse and fine aggregate conforming to IS: 383, the size of coarse aggregate not exceeding 25 mm, aggregate cement ratio not to exceed 15:1, aggregate gradation after blending to be as per table 600-1, cement content not to be less than 150 kg/ cum, optimum moisture content to be maintain during construction, concrete strength not to be less than 10 Mpa at 7 days, mixed in a batching plant, transported to site, laid with a paver compacting with 8-10 tonnes vibratory roller, finishing and curing as per MoRTH clause 601.

1. The relevant specification of MoRT&H (5th revision) as given in section 601 shall apply to this item.
2. The mode of measurement & payment shall be done in Cum basis.

Item No. 109

Construction of 200mm thick un-reinforced, dowel jointed, plain cement concrete pavement over a prepared sub base with in M-30 grade of concrete with 43 grade cement , coarse and fine aggregate conforming to IS 383, maximum size of coarse aggregate not exceeding 25 mm, mixed in a batching and mixing plant as per approved mix design, transported to site and mechanically laid with a fixed form / slip form paver, spread, compacted and finished in a continuous operation including provision of contraction, expansion, construction and longitudinal joints, joint filler, separation membrane, sealant primer, joint sealant, debonding strip, dowel bar, tie rod, admixtures as approved, curing compound, finishing to lines and grades as per drawing as per MoRTH clause 602.

1. The relevant specification of MoRT&H (5th revision) as given in section 602 shall apply to this item.
2. The mode of measurement & payment shall be done in Cum basis.

Item No. 110


Diversion works for Pipe culvert structure at CH 1/800 to 2/000 is part of agency's scope of work & the work is carried out as per R&B GR No. PRCH/10/2018/15/C and amount is including 70% credit which will be recovered in Final bill of RA.


This item provides for the construction of Diversion work which shall be temporary enclosure built across water to permit free traffic movement to the area during, the execution of work. It shall be vented at suitable locations for allowing river flow during the working season. The Diversion work may be made of earth, filling in suitable stable profile as per site conditions with enough working space all-round.

- 1.2 The contractor shall have to make his own arrangement for the procurement of each for the construction of Diversion work at his own cost.
- 1.3 The rate of the item includes the cost of construction and maintenance of any diversion approach bund or other devices etc. necessary for draining the flow of water or any such item of any sort whatsoever required to prevent water entering the foundation trenches.
- 1.4 The Diversion work shall have to be maintained till the completion of working period. The rates shall accordingly include the provision of reconstruction or making good the damages as per requirements for subsequent one or more working seasons if necessary. The contractor shall have no claim for any extra payment for such maintenance work due to such contingent requirements. The rate includes all arrangement for operations, excavations and earth work in embankment necessary plants, labour maintenance etc.
- 1.5 The payment for this item shall be Job basis.


Deputy Executive Engineer,
R. & B. (Panchayat) Sub Division
JAM-KHAMBHALIA.


Deputy Executive Engineer,
R. & B. (Panchayat) Sub Division
JAM-KHAMBHALIA.


Deputy Executive Engineer,
R. & B. (Panchayat) Sub Division
JAM-KHAMBHALIA.
Dwarika


Executive Engineer,
R. & B. (Panchayat) Division
JAM-KHAMBHALIA.
Devbhumi Dwarika

SECTION - 6
FORM OF BID

FORM OF BID

Description of the Works:

BID

To :

Address :

1. We offer to execute the Works described above and remedy any defects therein in conformity with the conditions of Contract, specification, drawings, Bill of Quantities and Addenda for the sum (s) of

(-----)

2. We undertake, if our Bid is accepted, to commence the Works as soon as is reasonably possible after the receipt of the Engineer's notice to commence, and to complete the whole of the Works in the Contract within the time stated in the document.
3. We agree to abide by this Bid for the period of 120 Days from the date fixed for receiving the same, and it shall remain binding upon it and may be accepted at any time before the expiration of that period.
4. Unless and until a formal Agreement is prepared and executed this Bid, together with your written acceptance thereof, shall constitute a binding contract between us.
5. We understand that you are not bound to accept the lowest or any tender you may receive.

Dated this ----- day of ----- 20

Signature ----- in the capacity of -----

----- duly authorized to sign bids for and on behalf of -----

(in block capitals or typed)

Address

Witness

Address

Occupation

SECTION - 7
BILL OF QUANTITIES

BILL OF QUANTITIES

Preamble

1. The bill of Quantities shall be read in conjunction with the Instructions to Bidder, Conditions of Contract, Technical Specifications and Drawings.
2. The quantities given in the Bill of Quantities are estimated and provisional, and are given to provide a common basis for bidding. The basis of payment will be the actual quantities of work ordered and carried out, as measured by the Contractor and verified by the Engineer and valued at the rates and prices tendered in the priced Bill of Quantities, where applicable, and otherwise at such rates and prices as the Engineer may fix within the terms of the Contract.
3. The rates and prices tendered in the priced Bill of Quantities shall, except in so far as it is otherwise provided under the Contract, include all constructional plant, layout, supervision, materials, erection, maintenance, insurance, profit, taxes and duties, together with all general risks, liabilities and obligations set out or implied in the Contract.
4. The rates and prices shall be quoted entirely in Indian Currency.
5. A rate or prices shall be entered against each item in the Bill Quantities, whether quantities are stated or not. The cost of Items against which Contractor has failed to enter a rate or price shall be deemed to be covered by other rates and prices entered in the Bill of Quantities (in case of Item rate contract).
6. The whole cost of complying with the provisions of the Contract shall be included in the items provided in the priced Bill of Quantities, and where no Items are provided the cost shall be deemed to be distributed among the rates and prices entered for the related items of Work.
7. General direction and descriptions of work and materials are not necessarily repeated or summarized in the Bill of Quantities. References to the relevant sections of the contract documentation shall be made before entering rates or prices against each item in the Bill of Quantities.
8. The method of completed work of payment shall be in accordance with the specification for Road and Bridge works. For building works specifications for building are to be followed.
9. Errors will be corrected by the Employer for any arithmetic errors pursuant to **Clause 29** of the Instructions to Bidder.
10. Rock is defined as all materials which, in the opinion of the Engineer, required blasting, or the use of metal wedges and sledgehammers, or the use of compressed air drilling for its removal, and which cannot be extracted by ripping with a tractor of at least 150 kw with a single rear mounted heavy duty ripper.

BILL OF QUANTITIES

(A) Percentage Rate Tender (Up to INR 50 Cr.)

Item No	Description of Item (with brief specification and reference to book of specifications)	Quantity	Unit	Rate In figures	Amount
	As per separate statement attached.				

I/We am/are willing to carry out the work at.....% above/below percent (Should be written in figures and words) of the estimated rate mentioned above. Amount of my /our tender works out as under.

Estimated amount put to tender

Estimated amount put to tender

Deduct.....% below

Add.....% Above

Net

Net

In words

In words

(B) For Item Rate Tender (For above INR 50 Cr.):

Item No	Description of Item (with brief specification and reference to book of specifications)	Quantity	Unit	Rate		Amount
				In-figures	In Words	
	—NA—					

(A) Total Tendered Amount

(B) Rebate on above tendered amount (if any) % (in figure)

(in words)

(C) Net Tendered Amount (A-B) (in figure)

(in words)

#

1	The Contractor shall exhibit a board with detailed specification and details of work as directed by the Engineer-In-Charge for which no extra payment shall be made.
2	The labour cess will be deducted as per prevailing rules i.e. 1% of the work done.
3	GST and Income tax TDS will be deducted at a source while making payments of bills
4	In all R.C.C. Items in Rate Analysis Standard Cement Consumption has been taken as per Govt. G.R.: PRC-10/2017 Cement Consumption/16/C Date:11/05/2017 as stated in S.O.R. therefore in R.C.C. items where there is a change as per actual mix design the cost of difference of cement consumption have been deducted from the rate of original item at the rate of input rate mentioned in all the tender.

NAME OF WORK: RE-CONSTRUCTION OF MINOR BRIDGES, SLAB DRAINS, BOX CULVERTS & PIPE CULVERTS AT VARIOUS LOCATIONS IN DEVBHUMI DWARKA DISTRICT (PANCHAYAT) UNDER MMGSY, IN THE STATE OF GUJARAT. (PACKAGE – 2)

SCHEDULE OF TESTING OF MATERIALS

For ensuring quality control and workmanship various tests prescribe below corresponding to the material concerned shall be taken as periodic intervals as stipulated below be taken.

The Material shall be got tested through Govt. Recognized Laboratory (R & B) or field Laboratory of GERI (R & B) for which 1% of the estimated amount of tender shall be recovered from the contractor's R.A. Bill and Final Bills as the testing charges shall be paid by the Govt. to the GERI. How ever if the charges increase over 1 % no excess recovery shall be made from the contractor as per resolution of B.& C. department dated 10th May 1985 vide TNC/1085 (4) S. Minimum 10% of total tests for each material shall be carried out in Govt. Laboratory i.e. GERI.

Item no.	Material to be tested	Total Qty. of Material as per Tender	Type of test which shall be carried out	Frequency @ which test shall be carried out	Test to be Carried out
1	Cement	<u>5347.15 M.T.</u>	Consistency Setting time Compressive Strength Fineness Chemical Analysis Soundness	Upto 50 MT = 1 Test 50-100 MT = 2 Test 100-200 MT = 3 Test 200-300 MT = 4 Test 300-500 MT = 5 Test 500-800 MT = 6 Test 800-1300 MT = 7 Test And 8 test for larger consignment	8 Tests
2	Sand	<u>9522.44 Cum</u>	Fineness Modules Gradation test Silt content Specific Gravity, Water absorption	1 Test / 150 Cum. For concrete or as per requirement of relevant specification	64 Test
3	Kapachi for str.	<u>10772.00 Cum</u>	Gradation Test Impact Value Flakiness Index Water Absorption Stripping Value	0 to 100 Cum = 1 Test 100 to 500 Cum = 3 Test 500 to 1500 Cum = 5 Test 1500 to 5000 Cum = 7 Test Every Additional 5000 Cum = 1 Test	8 Test

Item no.	Material to be tested	Total Qty. of Material as per Tender	Type of test which shall be carried out	Frequency @ which test shall be carried out	Test to be Carried out
4	<u>Grit for Str.</u>	<u>2693.00 Cum</u>	Gradation Test Impact Value Flakiness Index Water Absorption Stripping Value	0 to 100 Cum = 1 Test 100 to 500 Cum = 3 Test 500 to 1500 Cum = 5 Test 1500 to 5000 Cum = 7 Test Every Additional 5000 Cum = 1 Test	7 Test
5	<u>GSB Grade – I</u>	<u>1127.50 Cum</u>	Gradation Test Impact Value Flakiness Index Water Absorption Stripping Value	0 to 100 Cum = 1 Test 100 to 500 Cum = 3 Test 500 to 1500 Cum = 5 Test 1500 to 5000 Cum = 7 Test Every Additional 5000 Cum = 1 Test	5 Test
6	<u>WBM</u>	<u>346.90 Cum</u>	Gradation Test Impact Value Flakiness Index Water Absorption Stripping Value	0 to 100 Cum = 1 Test 100 to 500 Cum = 3 Test 500 to 1500 Cum = 5 Test 1500 to 5000 Cum = 7 Test Every Additional 5000 Cum = 1 Test (Carried out 1 test for Each work)	3 Test
7	<u>WMM</u>	<u>1163.20 Cum</u>	Gradation Test Impact Value Flakiness Index Water Absorption Stripping Value	0 to 100 Cum = 1 Test 100 to 500 Cum = 3 Test 500 to 1500 Cum = 5 Test 1500 to 5000 Cum = 7 Test Every Additional 5000 Cum = 1 Test (Carried out 1 test for Each work)	5 Test
8	<u>For Bituminous Work Items</u>	<u>315.71 Cum</u>	Gradation Test Impact Value Flakiness Index Water Absorption Stripping Value	0 to 100 Cum = 1 Test 100 to 500 Cum = 3 Test 500 to 1500 Cum = 5 Test 1500 to 5000 Cum = 7 Test Every Additional 5000 Cum = 1 Test (Carried out 1 test for Each work)	3 Test

Item no.	Material to be tested	Total Qty. of Material as per Tender	Type of test which shall be carried out	Frequency @ which test shall be carried out	Test to be Carried out
9	Emulsion SS-1	<u>4.20 M.T.</u>	Penetration Test as IS 1203 Ductility Test Specification Gravity Test Softening Point Test Viscosity Test	1 to 1 Tanker 1 test 2 to 15 Tanker 2 test 16 to 50 Tanker 3 test 51 to 100 Tanker 4 test Remaining Every 50 Tanker 1 Test (Carried out 1 test for Each work)	1 Test
10	Emulsion RS-1	<u>1.40 M.T.</u>	Penetration Test As IS 1203 Ductility Test Specification Gravity Test Softening Point Test Viscosity Test	1 to 1 Tanker 1 test 2 to 15 Tanker 2 test 16 to 50 Tanker 3 test 51 to 100 Tanker 4 test Remaining Every 50 Tanker 1 Test (Carried out 1 test for Each work)	1 Test
11	Asphalt VG-30	<u>24.92 M.T.</u>	Penetration Test as IS 1203 Ductility Test Specification Gravity Test Softening Point Test Viscosity Test	1 to 1 Tanker 1 test 2 to 15 Tanker 2 test 16 to 50 Tanker 3 test 51 to 100 Tanker 4 test Remaining Every 50 Tanker 1 Test (Carried out 1 test for Each work)	2 Test
12	CC Cube M-100	<u>620.50 Cum</u>	Compressive Strength (IS-516-1959)	1 to 5 Cum = 1 Test 6 to 15 Cum = 2 Test 16 to 30 Cum = 3 Test 31 to 50 Cum = 4 Test 50 & Above = 4+1 Test for Each Addition 50 Cum or Part thereof	16 Test
13	CC Cube M-150	<u>5074.70 Cum</u>	Compressive Strength (IS-516-1959)	1 to 5 Cum = 1 Test 6 to 15 Cum = 2 Test 16 to 30 Cum = 3 Test 31 to 50 Cum = 4 Test 50 & Above = 4+1 Test for Each Addition 50 Cum or Part thereof	105 Test

Item no.	Material to be tested	Total Qty. of Material as per Tender	Type of test which shall be carried out	Frequency @ which test shall be carried out	Test to be Carried out									
14	CC Cube M-200	<u>1559.90 Cum</u>	Compressive Strength (IS-516-1959)	1 to 5 Cum = 1 Test 6 to 15 Cum = 2 Test 16 to 30 Cum = 3 Test 31 to 50 Cum = 4 Test 50 & Above = 4+1 Test for Each Addition 50 Cum or Part thereof	35 Test									
15	CC Cube M-250	<u>278.90 Cum</u>	Compressive Strength (IS-516-1959)	1 to 5 Cum = 1 Test 6 to 15 Cum = 2 Test 16 to 30 Cum = 3 Test 31 to 50 Cum = 4 Test 50 & Above = 4+1 Test for Each Addition 50 Cum or Part thereof	9 Test									
16	CC Cube M-300	<u>7426.40 Cum</u>	Compressive Strength (IS-516-1959)	1 to 5 Cum = 1 Test 6 to 15 Cum = 2 Test 16 to 30 Cum = 3 Test 31 to 50 Cum = 4 Test 50 & Above = 4+1 Test for Each Addition 50 Cum or Part thereof	152 Test									
17	Steel for concrete work (Fe 500D TMT Bars)	<u>323.75 M.T.</u>	Tensile Strength, Yield stress, Elongation, Size	1 / 40 ton / per Category	8 Test									
18	Hot Applied Thermoplast Road Marking	<u>IRC 35: 2015; Section 800 of MORTH</u>	(RL) Retro Reflectivity (mcd/m2/lux)	Retro Reflectivity (mcd/m2/lux) <table><tr><td>Design Speed</td><td>Initial (7 days)</td><td>Min Threshold Level (TL) Up to 2 years</td></tr><tr><td>Up to 65 Kmph</td><td>200</td><td>80</td></tr><tr><td>65 - 100</td><td>250</td><td>120</td></tr></table>	Design Speed	Initial (7 days)	Min Threshold Level (TL) Up to 2 years	Up to 65 Kmph	200	80	65 - 100	250	120	Max. 6 (Six) Tests to be conducted per Km
Design Speed	Initial (7 days)	Min Threshold Level (TL) Up to 2 years												
Up to 65 Kmph	200	80												
65 - 100	250	120												

Item no.	Material to be tested	Total Qty. of Material as per Tender	Type of test which shall be carried out	Frequency @ which test shall be carried out	Test to be Carried out															
		IRC 35: 2015; <u>Section 800 of MORTH</u>	Proportions of Constituents of marking Material	<table><tr><th>Component</th><th>White</th><th>Yellow</th></tr><tr><td>Binder</td><td>18.0 Min.</td><td>18.0 Min.</td></tr><tr><td>Glass Beads</td><td>30-30</td><td>30-30</td></tr><tr><td>Titanium Dioxide</td><td>10.0 Min.</td><td>--</td></tr><tr><td>Calcium Carbonate and inert Filler</td><td>42.0 Max</td><td>--</td></tr></table>	Component	White	Yellow	Binder	18.0 Min.	18.0 Min.	Glass Beads	30-30	30-30	Titanium Dioxide	10.0 Min.	--	Calcium Carbonate and inert Filler	42.0 Max	--	1 Sample for each colour
				Component	White	Yellow														
				Binder	18.0 Min.	18.0 Min.														
				Glass Beads	30-30	30-30														
				Titanium Dioxide	10.0 Min.	--														
Calcium Carbonate and inert Filler	42.0 Max	--																		
	Water	IRC 35: 2015; <u>Section 800 of MORTH</u>	Skid Resistance	Not less than 45 BPN (British Pendulum Number) as per BS:6044	Every 1 Km for each Colour															
			Chemical Analysis	1 test for each Source	1 Test															

- The contractor Shall have to pay 1% of the estimate cost put to tender towards all testing of materials & same shall be deducted from their bills for the works. The testing of various materials shall be carried out in GERI and result received shall be binding to all i.e. contractor & Govt.
- Testing charges of GERI shall be borne by Govt. No refund be made or extra charge over 1% shall be recoverable from the contractor.

Signature of contractor

R.B.
Deputy Executive Engineer,
R. & B. (Panchayat) Sub Division
JAM-KHAMBHALIA.

R.B.
Deputy Executive Engineer,
Panchayat R&B Sub Division,

R.B.
Executive Engineer
Panchayat R&B Division,
Devbhumi Dwarka

R.B.
Deputy Executive Engineer,
R. & B. (Panchayat) Sub Division

Bhagved
~~Deputy Executive Engineer,~~

SECTION - 8
SECURITIES AND OTHER FORMS

BID SECURITY (BANK GUARANTEE)

WHEREAS, ----- (name of Bidder) (hereinafter called the "The Bidder") has submitted his bid Dated ----- (Date) for the construction of ----- (Name of Contractor hereinafter called "the Bid")

KNOW ALL PEOPLE by these presents that We ----- (name of Bank) of ----- (name of country) having our registered office at ----- (hereinafter called "the bank") are bound unto ----- (name of Employer) (hereinafter called "The Employer") in the sum of ----- * for which payment well and truly to be made to the said Employer the Bank itself, his successors and assigns by these presents.

SEALED with the Common Seal of the said Bank this ----- day of ----- 20

THE CONDITIONS of these obligations are:

(1) If after Bid opening the Bidder withdraws his bid during the period of Bid validity specified in the Form of Bid;

Or

(2) If the Bidder has been notified of the acceptance of his bid by the Employer during the period of Bid Validity:

A Fails or refuses to execute the Form of Agreement in accordance with the Instructions to Bidders, if required; or

B. Fails or refuse to furnish the Performance Security, in accordance with the Instructions to Bidders; or

C. does not accept the correction of the Bid Price pursuant to Clause 27 (Correction of Errors)

We undertake to pay to the Employer up to the above amount upon receipt of his first written demand, without the employer having to substantiate his demand, provided that in his demand the Employer will note that the amount claimed by him is due to him owing to the occurrence of one or any of the three conditions, specifying the occurred conditions or conditions.

This Guarantee will remain in force up to and including the date -----** days after the deadline for submission of Bids as such the deadline is stated in the Instructions to Bidders or as it may be extended by the Employer, notice of which extension (s) to the Bank is hereby waived. Any demand in respect of this guarantee should reach the Bank not later than the above date

DATE -----

SIGNATURE-----

WITNESS -----

SEAL -----

(Signature, name and address)

* The Bidder should insert the amount of the guarantee in words and figures denominated in Indian Rupees. This figure should be the same as shown in Clause 16.1(Bid Security) of the Instructions to Bidders.

****45 days after the end of the validity period** of the Bid. Date should be inserted by the Employer before the Bidding documents are issued.

PERFORMANCE SECURITY

TO,

----- (Name of Employer)
----- (Address of Employer)

WHEREAS ----- (name and address of contractor) (hereafter called "the Contractor") has undertaken, in pursuance of Contracts No. ----- dates ----- to execute ----- (name of Contract and brief description of Works) (hereinafter called "The Contract")

AND WHEREAS it has been stipulated by you in the said Contract that the Contractor shall furnish you with a Bank Guarantee by a recognized bank for the sum specified therein as security for compliance with his obligation in accordance with the Contract.

AND WHEREAS we have agreed to give the Contractors such a bank Guarantee:

NOW THEREFORE we hereby affirm that we are the Guarantor and responsible to you on behalf of the Contractor, up to a total of ----- (amount of guarantee)* ----- (in words), such sum being payable in types and proportions of currencies in which the Contract prices is payable, and we undertake to pay you, upon your first written demand and without cavil or argument, any sum or sums within the limits of ----- (amount of guarantee) as aforesaid without your needing to prove or to show grounds or reasons for your demand for the sum specified therein.

We hereby waive the necessity of your demanding the said debt from the contractor before presenting is with the demand.

We further agree that no change or addition to or other modification of the terms of the Contract to of the Works to be performed thereunder or of any of the Contract documents which may be made between your and the Contractor shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such charge, addition or modifications.

This guarantee shall be valid until 60 days from the date of expiring of the Defect Liabilities period.

Signature and Seal of the guarantor -----

Name of Bank -----

Address -----

Date -----

*An amount shall be inserted by the Guarantor, representing the percentage the Contract price specified in the Contract denominated in Indian Rupees.

ADDITIONAL PERFORMANCE SECURITY

[Clause 34.1. (A)]

TO,

----- (Name of Employer)

----- (Address of Employer)

WHEREAS ----- (Name and address of contractor) (hereafter called "The Contractor") has undertaken, in pursuance of Contracts No. ----- dates ----- to execute ----- (Name of Contract and brief description of Works) (hereinafter called "The Contract")

AND WHEREAS it has been stipulated by you in the said Contract that the Contractor shall furnish you with a Bank Guarantee by a recognized bank for the sum specified therein as security for compliance with his obligation in accordance with the Contract.

AND WHEREAS we have agreed to give the Contractors such a bank Guarantee:

NOW THEREFORE we hereby affirm that we are the Guarantor and responsible to you on behalf of the Contractor, up to a total of ----- (amount of guarantee) ----- (in words), such sum being payable in types and proportions of currencies in which the Contract prices is payable, and we undertake to pay you, upon your first written demand and without cavil or argument, any sum or sums within the limits of ----- (amount of guarantee) as aforesaid without your needing to prove or to show grounds or reasons for your demand for the sum specified therein.

We hereby waive the necessity of your demanding the said debt from the contractor before presenting is with the demand

We further agree that no change or addition to or other modification of the terms of the Contract to of the Works to be performed thereunder or of any of the Contract documents which may be made between your and the Contractor shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such charge, addition or modifications.

This guarantee shall be valid until **28 days** from the project completion date.

Signature and Seal of the guarantor -----

Name of Bank -----

Address -----

Date -----

BANK GUARANTEE FOR ADVANCE PAYMENT

TO,

----- (Name of Employer)

----- (Address of Employer)

----- (Name of Contractor)

Gentlemen:

In accordance with the provisions of the Conditions of Contract, sub-clause 51.1 ("Advance Payment") of the above mentioned Contract, -----
----- (name and address of Contractor) (hereinafter called "the Contractor") shall deposit with ----- (name of Employer) a bank guarantee his proper and faithful performance under the said Clause of the Contract in an amount of ----- (amount of Guarantee)* -
----- in words).

We, the ----- (bank of financial institution), as instructed by the Contractor, agree unconditionally and irrevocably to guarantee as primary obligator and not as Surety merely, the payment to -----
(name of Employer) on his first demand without whatsoever right of obligation on our part and without his first claim to the Contractor, in the amount not exceeding ---
----- (amount of guarantee)* ----- (in words)

We further agree that no change or addition to or other modifications of the terms of the Contractor or Works to be performed thereunder or of any of the Contract documents which may be made between ----- (name of Employer) and the Contractor, shall in any way release us from any liability under this guarantee, and we hereby waive notice of any such change, addition or modifications.

This guarantee shall remain valid and in full effect from the date of the advance payment under the Contract until ----- (name of employer) receives full repayment of the same amount from the contractor.

YOUR'S TRULY

Signature and Seal _____
Name of Bank/ Financial Institution _____
Address _____
Date _____

* An amount shall be inserted by that Bank or Financial Institution representing the amount of the Advance Payment, and denominated in Indian Rupees.

Letter of Acceptance
(Letter head paper of the Employer)

_____ (date)

To, _____ (Name and address of the Contractor)

Dear Sirs,

This is to notify you that your Bid dated _____ for execution of the _____ (Name of the contract and identification number, as given in the Instructions to Bidders) for the Contract Price of Rupees _____ () (amount in words and figures) as corrected and modified in accordance with the Instructions to Bidders* is hereby accepted by our agency.

You are requested to furnish performance security, in the form detailed in para 34.1 of ITB for an amount equivalent to Rs. _____ within **10 days** of the receipt of this letter of acceptance up to beyond **60 days** from the date of expiry of defects Liability period i.e. up to _____ and the Additional Performance Security for an amount equivalent to Rs. _____ shall be valid beyond 28 (twenty-eight) days of Project Completion Date i.e. up to _____ and sign the contract, failing which action as stated in Para 34.3 of ITB will be taken.

Yours Faithfully

Authorized Signature
Name and title of Signatory
Name of Employer

* Delete "Corrected and" or and modified if only one of these actions applies. Delete as corrected and modified in accordance with the Instructions to Bidders, if corrections or modifications have not been affected.

Issue of Notice to proceed with the work

(Letterhead of the Employer)

To, _____ (date)

_____ (Name and address of the Contractor)

Dear Sirs,

Pursuant to your furnishing the requisite security in ITB Clause 34.1 and signing of the Contract for the construction of _____

_____ at a bid Price of Rs.

_____.

You are hereby instructed to proceed with the execution of the said works in accordance with the contract documents.

Yours faithfully

(Signature, name and title of signatory authorized
To sign on behalf of Employer)

AGREEMENT FORM

This agreement, made on the _____ day of _____ between _____ (name and address of Employer) (Hereinafter called "the Employer) and _____ (name and address of contractor) hereinafter called "the Contractor" of the other part.

Whereas the Employer is desirous that the Contractor execute

Name and identification number of contract (hereinafter called "the works") and the employer has accepted the Bid by the Contractor for the execution and completion of such works and the remedying of any defects therein, at a cost of Rs.

NOW THIS AGREEMENT WITNESSETH AS FOLLOWS

1. In this Agreement, words and expression shall have the same meanings as are respectively assigned to them in the conditions of contract hereinafter referred to and they shall be deemed to form and be read construed as part of this Agreement.
2. In Consideration of the payment to be made by the Employer to the contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to executive and complete the works and remedy any defects therein in conformity in all aspects with the provisions of the contracts.
3. The employer hereby covenants to pay the Contractor in consideration of the execution and completion of the works and the remedying the defects wherein contract price or such other sum as may become payable under the provisions of the Contract at the times and in the manner prescribed by the contract.
4. The Following documents shall be deemed to form and be ready and construed as part of this Agreement viz
 - i) letter of Acceptance
 - ii) Notice to proceed with the works:
 - iii) Contractor's Bid